

NEW

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Jan / Feb 1984

A & B

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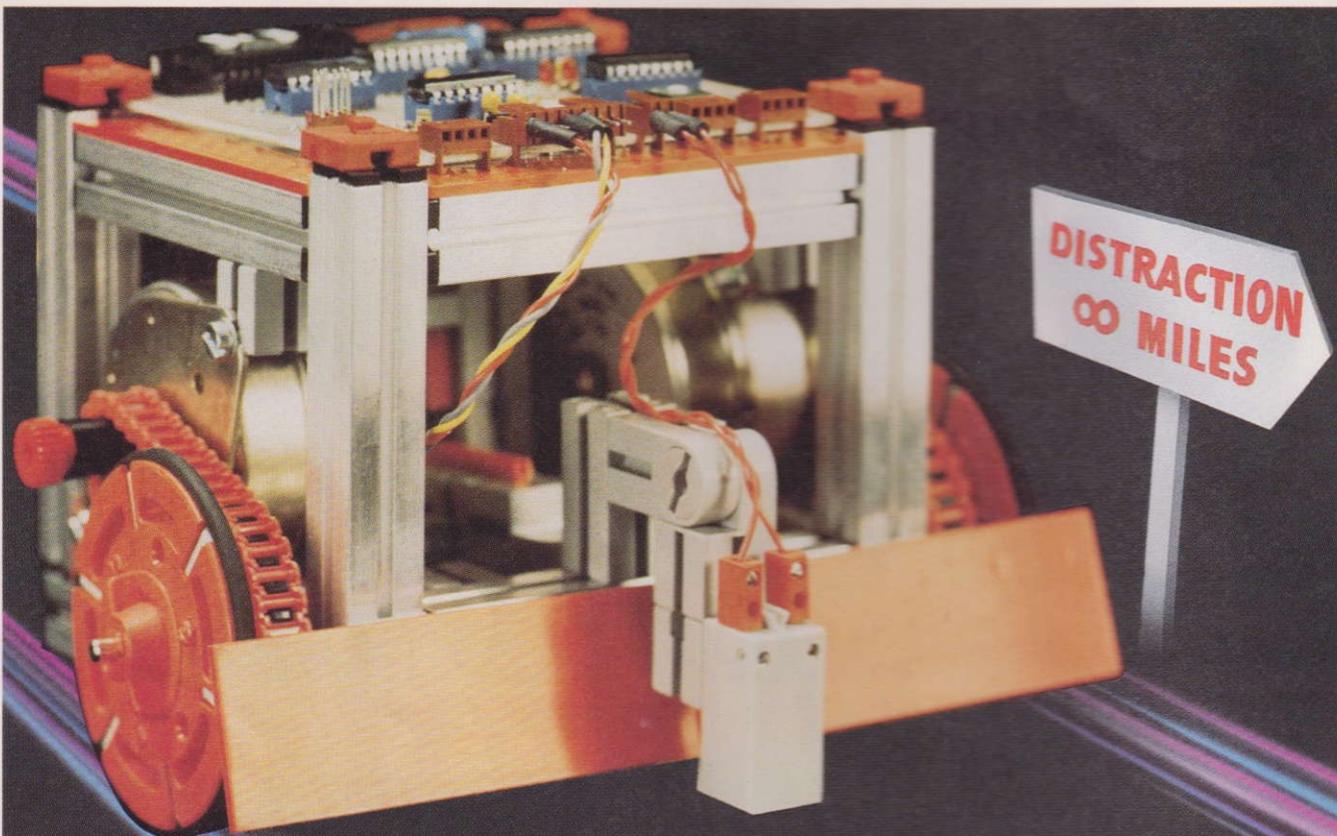
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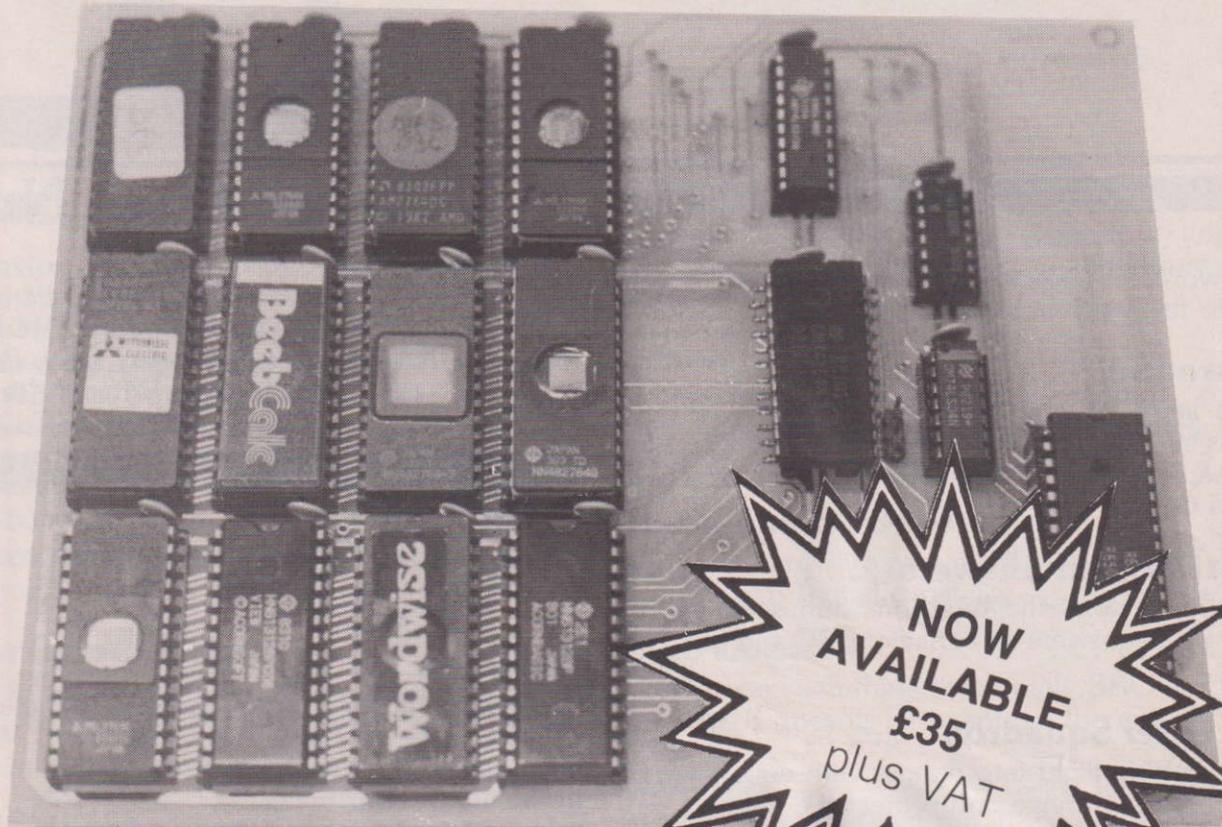
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A&B

Volume One Number

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A&B Computing is constantly on the look-out for well-written articles and programs for publication. If you feel that your efforts meet our standards, please feel free to submit your work to us for consideration.

All submitted material should be typed, double spaced if possible, and any program submitted should be listed, a cassette of the program alone will not be considered. All programs must come complete with a full explanation of the operation and, where relevant, the structure; cassettes of the program should also be included so that screen photographs and printer dumps can be included to illustrate the article. (Cassettes will, of course, be returned in due course).

All submissions will be acknowledged and any published work will be paid for at competitive rates. All work for consideration should be sent to the Editor of A&B Computing at our Golden Square address.

Editor: Elspeth Joiner
Editorial Assistant: Mark Webb
Advertising Manager: Barry Bingham
Managing Editor: Ron Harris
Chief Executive: TJ Connell

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Menu

This is where the New Year starts, with A&B Computing. We've got full coverage of all the news stories that affect the BBC Micro and Acorn Electron microcomputers. There's action on both the software and hardware front.

DRIVE ON

The BBC Micro's 32K often worries would be purchasers and current owners but memory is becoming less of a problem with ROM boards, ingenious RAM extensions and disc drive systems becoming available. The new Cumana slimline drives look good and come from a tried and tested background. Now that they are available direct from the shelves of your local store, we think it's time to take a look at the

drives from the customer's point of view.

O.K. you've got the disc drives. Next on the list could well be Disc Doctor, Computer Concepts widely used disc utility, reviewed for A&B by Trevor Attewell. And now some programs to fill up those newly formatted files.

SOFTWARE FILL UP

In the Beginning is a long running A&B series which is now ambitiously building a school's administration program. Follow in the Beginning and learn through practical programming. On the education theme we also offer two programs of the highest standard.

Addsnap offers an enjoyable

variation on the cardgame format. The game requires two players and the element of competition helps towards the program goal; learning to handle simple additional maths. Phonics deals in the area of language, specifically the recognition of words which sound alike. This program also forms a first step into the world of keyboard skills. Our competition is also educationally orientated. You can read about the new Griffin Software programs in Edsoft but you can win them in our programming competition. Go on, have a go.

EXCITEMENT

Of course our games are an important application for the

BBC and Electron, given their outstanding sound and graphics.

A&B is not short on excitement this issue with Helicopter Squadron and the more down to earth (though only just) Dunefighter game. Dunefighters is a two player game so why not get together with a fellow Beeb owner and share the programming chores as well as the excitement of this Sci Fi struggle.

If you prefer to puzzle your way through a program then we've got three brain testers in Colour Guess, Flagger and Wordgrid. With the latter you can create your own puzzles for family and friends. Plus, adventuring in Poglovia! For the more practically minded there is the flexibility of Data store.

HELP

Nor do we leave you to get on with using your micro alone. The new series Advanced Graphics introduces the theory and offers examples of what can be achieved given the knowledge in the realms of pixels and logical operators. Colour Screen Dump enables Epson owners to dump colour graphics in a variety of grey shade to their printers, with impressive results. Sounds Unlimited and Faster Basic take us where we want to go with our BBCs and Electrons, into new and exciting areas.

Bookshelf reviews some of the books which may help out both the advanced exponent and the recent beginner and there's Mailsort with plenty of good programming ideas. And Club Corner for the lonely BBC or Electron user.

For those who aren't averse to using a soldering iron, there's the hardware project Thermometric Beeb

Finally Microtext. This new piece of software for the BBC and Electron completely changes the role of the 'programmer'. Microtext allows access to the power of the micro for the user who has no knowledge of a computer language. Interesting.



News

BEEBCALC MK2

Computer Concepts are to release a new improved version of Beebcalc. The new version will be twice the size of the current program and will sell at about £15 more. The old version will remain in circulation but anyone wishing to upgrade to the improved Beebcalc will be able to do so for the difference in selling price.

EARLY LEARNING WITH EBURY

The National Magazine Company has produced a series of six software titles in the guise of Ebury Software. The programs are aimed at three to six year olds and boast structure, flair and quality. The objective has been to marry the talents of educational authors with software designers to produce the best in educational software for young children. Ebury have certainly pitched their product at an age range not currently covered by the educational publishers, who have concentrated on commercial programs based on schools-tested material.

These first products carry the name of Good Housekeeping but future releases will aim at adults and children of other age ranges. The Good Housekeeping name is designed to help Ebury in the market for mothers and daughters, who they feel (and which recent Acorn research has indicated) have missed out on using home-computers thus far. The packs are available for the BBC B at the moment and will be ready for the Electron early in 1984.

The programs feature Mr T who takes the children through a number of everyday activities such as telling the time, learning to write numbers, dealing with money, measuring, playing with shapes and practising the alphabet. They all sell for £12.95, and are available from Ebury Software, 72 Broadwick St., London W1V 2BP.

INNOVATIVE VIDEO INTERFACE

Educational Electronics have come up with a video to computer interface for £174 exclusive of VAT. The unit comes complete with mains power supply, extensive documentation, software support and connecting lead to the BBC Model B.

The interface accepts signals from a variety of sources such as a video camera, V.H.S. player and video disc. It can digitise an image with a resolution of 220 (horizontal) by 312 (vertical) pixels with 64 levels of grey.

The low cost is apparently

due to the increased use of software to perform functions usually found in hardware. This also makes for more flexibility. Specific areas can be chosen for a close up look and trade-offs can be made between computer memory size, number of pixels scanned and the number of bits per pixel stored in memory.

Data can then be stored on disc or processed to extract specific information, as well as being displayed on a monitor. Applications can be imagined for education, research and industry.

Further information from: Educational Electronics, 30 Lake Street, Leighton Buzzard, Beds LU7 8RX. Tel: 0525 373666.

CHURCH COMPUTING

The purpose of MIRE (Microcomputers in Religious Education) is to bring together people who can either contribute ideas or can turn those ideas into computer programs for Religious and Moral education.

MIRE have a number of packages available or due shortly for release. Angels and Demons is a sort of Battleships game using citadels, powers and souls. Anagrams has a number of Bible orientated word lists and there is a schools RE package. This comprises three programs: Strangers, Boy Meets Girl and Exegesis. The last is designed to give students an appreciation of textual problems, translation problems and the task of Biblical exegesis. This pack is currently available on the BBC.

Colin Price of MIRE can be contacted at Red Holt, Hainworth Wood, Keighley, W.Yorks.

GO TOURNAMENT FOR 7/8 JANUARY

The unique GO competition organised jointly by A&B Computing and Acorn Computers Ltd. moves into its final combative stages the first week in January.

The climax of the competition, which A&B set in motion in its July/August edition, will take place between 10am and 6pm on Saturday 7th January and from 11am until the final is finished on Sunday 8th January. The venue will be the Acorn showroom in Covent Garden.

Out of all the entries sent in, Acornsoft will select a minimum of two and possibly up to eight competitors to take part in the knock-out tournament for the £1,000 cash prize (or equipment of the winner's choice).

According to the British GO Association, this is a unique event, the first of its kind in the world. This first ever computer GO tournament follows on from the traditional London GO tournament being held the same weekend.

The Acorn showroom at Henrietta Street will be appropriately decked out for the occasion

and special BBC Micro GO-playing stations set up. As well as the cash prize, a trophy will be presented to the winning programmer.

Interest in the competition has come from as far afield as Japan. It was the Japanese who named the ancient game 'GO'. It originated in China about 3,000 years ago under the name 'wei qu' or 'game of enclosing'.

The game is played all over the Far East and supports a number of professional players. The game takes place on a 13x13 square grid of points. The board is initially empty and the players alternatively occupy a vacant intersection with a piece (called 'stone') of their own colour (black or white). The general idea is to occupy and encircle territory until further positive play becomes impossible. A points scoring system, based upon 'safe' territory, then decides the winner.

The competition inspired many BBC programmers to take on the GO challenge and Acornsoft were very pleasantly surprised by the standard of entries. All A&B readers who entered can thus be proud of their efforts. Good luck to all the finalists and whoever the winner should turn out to be, you can be certain that he or she will be featured in the pages of A&B Computing.

THE PLACE TO BE

From Friday January 6th to Sunday January 8th from 10am to 6pm (Sunday 4pm) the place to be for enthusiastic computer owners will be the New Hall of the Royal Horticultural Society. During these days Argus Specialist Exhibitions are staging this year's London Home Computer Show.

The show will be the ideal "try" and "buy" event for those interested in both hardware and software, for a huge range of microcomputers.

Admission to the show is £2.00 — £1.50 for the under sixteens.

THE EDUCATION SHOW

The first Acorn Education Exhibition is to be held in January at the Central Hall, Westminster. It will be a three day affair and

representatives from educational institutions and bodies throughout the United Kingdom are expected to be present.

Computer Marketplace are doing the organising after their enormously successful Acorn User Show. The idea is to get teachers, lecturers and administrators under one roof to view the latest developments.

Further information for visitors and exhibitors is available from Timothy Collins, Computer Marketplace (Exhibitions) Ltd, 20 Orange Street, London WC2H 7ED. Tel: 01-930 1612.

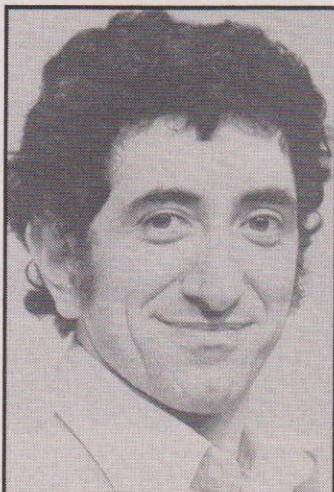
PUNTER'S PAL

Applications software now have just the program for those of you BBC owners who like a little flutter on the horses and perhaps have a horse-race tipping program that really works. Punter's Pal will work out your winnings (or otherwise) for you. The program will calculate the returns from most conventional bets win or each way and account for dead-heats, Rule 4 deductions and co-favourite bets. An additional subroutine will work out the combinations (permutations) from any number of selections. The program is available from Applications (price; £10.50) at 8, St Pauls Road, Peterborough PE1 3DW.

SYNCHRONISED SOFTWARE AND RADIO

BBC School Radio has launched itself into the microtechnology and computing fields. 'Junior Electronics' and 'Microtechnology' are introductory programmes utilising various media and kits of components. 'Using Your Computer' is a unit of five programmes in the 'Introducing Science' slot for nine to twelve year olds.

The series will help teachers in primary and middle schools introduce children to the computers supplied to schools under the Dol 'computers in schools' scheme. The broadcasts are



designed to be recorded and then played back on a cassette recorder alongside the computer as it runs the software.

The concept is that of Fred Harris, a familiar voice in radio education. The first programme is for teachers and gives guidance on using the unit. The other four broadcasts provide the 'sound-track' for the software units (which are published by BBC Publications, priced £7.00).

The cue for pressing a key to move on in the program is supplied by a chiming tone on the tape. The intention is that a small group of children will gather around the computer and take part in group discussion and decision making, as well as listening to what Fred Harris has got to say.

The Micro Electronics Education Programme (MEP) played a major role in getting together the software for the series.

Richard Fothergill, head of MEP, acknowledged the fact that "Radio was a significant provider of resources for education" and he stressed the "Innovative" aspects of this new project. The potential obviously exists for broadcasting overseas, broadcasting software direct (as occurs already in many local radio stations) and for computer clubs on the airwaves.

Richard Fothergill emphasised the way in which the software had been commissioned by the MEP. David Tee (working away from London, he added) did all

the programming. Two housewives living in the suburbs of Newcastle and calling themselves 'Harlequin Design' did all the work on the screens of graphics and presentation. Mr Fothergill indicated that these are the forerunners in the new areas of work creation, areas which will demand the sort of skills that the 'Using Your Computer' course is introducing in to our primary schools.

The software itself runs mainly in Mode 7 on the BBC, for reasons of memory but effectively explains some computer features such as graphics and sound (cheating a bit by using the tape rather than the computer on some occasions). The series progresses from simple keyboard instruction to the nature of programming and data handling, all with the help of a chunky robot-like figure and the enthusing Fred Harris. At the end of each session there is a bit of computer fun with a game to played by the class. Some of the software is available commercially and the soundtrack tapes are available to teachers who were unable to record the original broadcasts.

COMPUTERACY CARDS

Edu-cal are following up their successful "Programming Made Easy" workcards with a new series titled "Structured Program-

ming". The aim is to develop good programming habits in children. Both sets are designed for the BBC Microcomputer.

The language has been carefully chosen to provide a balance between 'computer terminology' and language that children use and understand.

The cards cover commands, statements, procedures and graphics. To back up the cards there is a support program, a program planning sheet and a checklist to monitor progress.

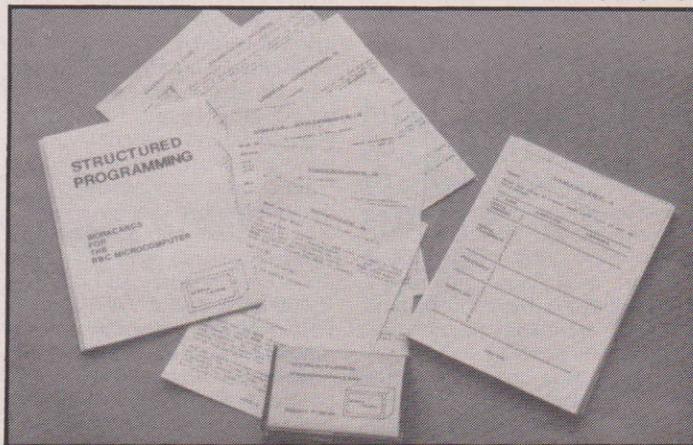
For further information, contact: Chris Drage, Tel: 01-743 1579.

BBC COMPUTER CONSULTANCY

Cambridge Systems Technology (CST) have launched a national consultancy service for business microcomputer users in distress. The service draws on the extensive computing experience of the company's founders, David Oliver and Martin Baines, both formerly with Torch computers. This link may explain why the BBC has been included in the list of micros which the company is going to specialise in.

The design division is currently developing peripheral products for the Torch and BBC and providing the company with detailed knowledge of these systems.

The service is equally ap-



CONTINUED OVER

New



appropriate to businessmen wishing to install their first computer system and to companies wishing either to upgrade their system, or to rationalise from mainframe onto micros. The BBC Micro is certainly finding itself in upmarket company these days. Further information from Cambridge Systems Technology, 30 Regent Street, Cambridge CB2 1DB.

A YOUNG PERSON'S GUIDE

The National Computing Centre have just published a Young Person's Guide to BBC BASIC. As all BBC owners know, the BBC BASIC is one of the fastest and most powerful versions of this language available. The book is aimed at the young first time user (what about the old first time users?) but will appeal to anyone interested in a tour around BASIC, especially those interested in writing their own programs.

The book assumes no previous knowledge of computing and moves step by step through the example programs with helpful tips on how to find their way out of trouble. The book is written by Michael Milan and his two sons told him whether he had got it right or not. A Young Person's Guide costs £4.50. The NCC can be found at Oxford Road, Manchester M1 7ED. Tel: 061 228 6333.

CROSSWORD PUZZLER PACK

The National Extension College, who are now getting heavily involved with producing software for the BBC Microcomputer, have released 'Crossword Puzzler', a package containing a program for crossword generation and crossword puzzle playing.

The tape contains three demonstration files: a modified version of the world's first ever

crossword puzzle, an easy adult's puzzle and a puzzle for children.

Home users can use the generating program to make puzzles for family, children or friends. They can be useful educational tools and are intended for teachers, who can use them for infant and junior spelling and revision.

The pack includes an instructional booklet and is available from bookshops, price £5.00. It is also available direct from the National Extension College.

TELETEXT TELESOFTWARE TAKES OFF

The World's first regular public broadcast of computer software, the BBC's Telesoftware service, was launched in London back in September as an extension of the BBC's teletext service, CEEFAX. Viewers already with CEEFAX can find Telesoftware by calling up pages 700 to 706.

Although computer games fans are not going to be ignored, the system is seen as a means of providing easy access to educational material for schools and colleges. There is no doubt that it is more efficient to send software across the airwaves than through the post.

The educational software will, initially, be provided by the Microelectronics Education Programme (M.E.P.) and the Telesoftware in Primary Education Project, a research project based at Brighton Polytechnic. General interest material will contain various user friendly material features and an element of self-documentation.

To take full advantage of Telesoftware, viewers will require the Acorn adapter add-ons unit (£196 exclusive of VAT) for their BBC Microcomputers. The adapter automatically 'pulls down' the broadcast computer program, decodes it and feeds it into the Beeb, which will then run the program or process it as necessary.

The unit, manufactured by

Acorn Computers, costs £225. The adapter also functions as an extremely versatile teletext receiver. All standard facilities are offered except subtitling. It allows the user to skip logically through CEEFAX pages, using the recently incorporated 'page linking' facility.

For simplicity of use, the ten function keys on the BBC Micro are preset automatically to control many of the teletext operations with a single keystroke. The whole package consists of the adapter unit which plugs into the 1MHz socket of the BBC and the 'sideways ROM' chip which goes into the circuit board, a 70 page User Guide and Function Key Label Strip.

OUT OF THE SCHOOLS AND INTO THE SHOPS

Longman's involvement in producing school's software goes back a number of years now but the move into the shops comes as a new direction for the renowned educational publisher. Four titles have been made available to the general public in specially produced versions for the home. Parent's notes replace the teachers' notes and suggestions are given for extending the learning in each program.

Longman's BBC B software has been developed by the Loughborough Primary Micro Project, directed by Tony Gray at the University of Loughborough. The schools editions form part of the Ladybird Longman Micro Software range.

Number Rally and the two

Number Skills programs are aimed at groups of children between four and eight years of age. They give practise in simple arithmetic and aim to teach the method by which the correct answer is arrived at. Sheepdog is a game designed to develop problem solving through estimation and planning. It also teaches the eight points of the compass, and their use in describing directions. All the programs retail for £9.95 including VAT.

MUSICAL MICRO

Solar Sound Ltd, have produced a 'Practise and Play Pop' music learning package for schools. As an addition to their audio cassette range they now have a computer pack costing £25.

The operator can see the melody music and hear each note in turn by pressing the keyboard. There are also auto-display features. A Pacman ball indicates notes as they are played. More information from Solar Sound Ltd, Llanrhystud, Dyfed.

MULTILINGUAL MICRO

Carsondale Enterprises, publishers of modern language software for the BBC Micro, have reduced the prices of their tapes by between 15 and 20 per cent. French Irregular Verbs is now £15.99, German £11.96, Russian £17.49 and Essential French now £9.95.

Two new products are available, French and Russian text-fill, developed in coopera-



tion with D. Adshead of Birmingham University. They are based upon the Close learning method and the French version also allows for texts in English and German characters. The Russian also allows English texts and provides both upper and lower case character sets. Each program has 20 texts supplied and there are full facilities to create new libraries of texts on tape or disc.

PRIMARY SCHOOL PRESS

Scholastic Publications have brought out a new magazine called 'Primary Teaching and Micros'. The magazine is committed to avoiding the use of computer jargon and to providing for the needs of the classroom before anything else. There will be no program listings or the like. Instead it will focus on news and views, teacher-tested ideas and projects, evaluation of software and general guidance.

The first issue is out this January. This will consider database programs, the MEP Package 2 and using micros for reading in infant school. 'Primary Teaching and Micros' is available by subscription only, priced at £6.00 per year (overseas £8.00) and will be published bi-monthly like another wellknown publication not a million miles from here.

Further details from: Scholastic Publications, Westfield Road, Southam, Nr Leamington Spa, Warwickshire CV33 0JH.

ELECTRONICS AT THE OASIS

Oasis Electronics have introduced two new BBC related products into their range. The Oasis MADC12 is a high performance data acquisition instrument, combining with the standard analogue to digital facilities to provide for precision automated measurement in the laboratory or industrial environment.

The Oasis MADC12 (what a mouthfull) incorporates a preci-

GO WEST

Following its recent highly successful series of programmes aimed at microcomputer users, Radio West's Datarama team returned this Autumn.

Datarama, a half-hour radio programme made broadcasting history earlier this year by becoming the first to regularly transmit software to micro owners. Incorporated in the programme, which covers a wide range of computer related topics, are databursts cod-

ed for many popular micros. These databursts can be downloaded directly from the radio, or recorded on cassette for later use or inspection.

Featured in the new series are reviews of the latest hardware, peripherals and add-ons, software and books, plus coverage of events, issues and trends within the industry, from manufacturing and retail to user groups, schools and universities. It is planned that a short workshop-style course, complete

with data will be transmitted once the new series is underway, and this will be aimed particularly at first-time users.

Because of the limited time available during Datarama itself, the data transmissions are supplemented by longer and more complex programs broadcast after Radio West closes down at 1 am. These are repeated every 15 minutes until 6 am. When the station resumes its normal daily service. The "Night Tapes" are popular with insomniac keyboard-bashers!

sion engineered Analogue to Digital Converter with a high accuracy, programmable input range. Control software is menu based and the whole package is designed to replace conventional displays, controls, indicators and other features of stand-alone instruments.

The software configures each channel, determines scan parameters, initiates a scan and provides orderly data recall from a scan.

Also from Oasis is the delightfully named SPP 1000. This EPROM programmer can program an extensive range of popular UV EPROMS and EEPROMS. The unit is simple to upgrade for new or unusual EPROM types by making parameter changes in software, thus, Oasis claim, ensuring the long-term usefulness of the system.

The system is protected against any short circuit on any PROM pin and has automatic

trapping facilities. It is also supported by a fool-proof menu-driven operating system with Main Menu Options. These include Memory Manager, EPROM Blower, EPROM Data Editor and Secondary Menu Options.

Further information from: Oasis Electronics Ltd, University Village, University of East Anglia, Norwich NR4 7TJ. Tel: 0603 503275.

BEEB BREAKDOWN SERVICE

Data Type Service, the independent maintenance arm of the Data Type Group, is now offering its range of maintenance service to suppliers and end users of the BBC Microcomputer. The firm has a background in supplying third part maintenance to users of microsystems and peripherals.

Data Type have recognised the importance of the BBC Micro in education, an area in which the firm already has many existing customers.

Further information can be obtained from: Brian Jones, Data Type Ltd, Llantarnam House, 104 Llantarnam Industrial Park,

NEW STORAGE POSSIBILITIES FROM YOUR HIGH STREET STORE

WH Smith now have both a new computer cassette recorder and the AMS 3" disc drive on their shelves. The recorder is specifically designed for use with computers and has appropriate

CONTINUED OVER

ME

facilities, including tape counter, LED indicators and button and connection titles like SAVE and LOAD.

The 3" Hitachi discs have now proved themselves and the decision by Smiths to stock them should further encourage software houses to produce material for the diskettes. These diskettes were recently subjected to rigorous testing (including having a truck run over them) and came out unscathed.

EXPAND MEMORY FRONTIERS WITH ARIES-B20

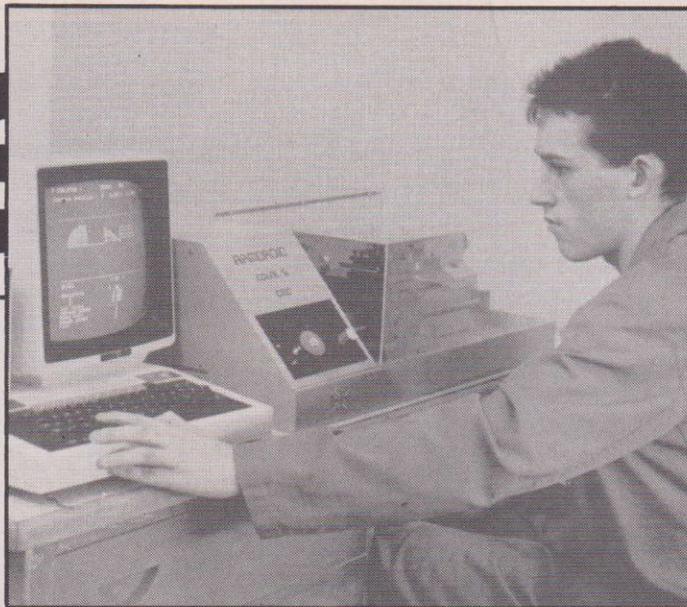
The Aries-B20 from Cambridge Computer Consultants Ltd is a remarkable add-on for the BBC Microcomputer. Essentially, it adds 20K of useable RAM to the micro, allowing programs of up to 28K to be RUN in any screen mode. The Aries-B20 uses the MOS facilities and is perfectly compatible with both versions of BASIC, Acornsoft languages and any 'correctly' written software.

The unit plugs in under the case and all you need is a screwdriver. Aries-B20 costs £99.95. Also available in January is the Cambridge Consultants' ROM expansion board. The Aries has its own connector onto which the ROM board will plug. The board will be fully buffered.

MICRO ROBOTICS

Colne Robotics Company has extended their product range with the launch of a computer numerically controlled educational tool to add to the micro controlled robots already produced.

It is the first of a planned range of advanced educational CNC machine tools designed to run from most 8-bit microcomputers, and that more often than not means the BBC.



The Colne 5 CNC Lathe is an all-British development and qualifies for the new Department of Industry grant: "pound for pound aid to Colleges of Further Education buying CNC machine tools".

The lathe comes complete with tools, accessories and documentation (handbook, separate operator's guide and exercise manual). It costs £1,889 and further details are available from: Colne Robotics Co Ltd, Beaufort Road, Off Richmond Road, East Twickenham, Middlesex TW1 2PQ.

ROBOTICS RULE O.K.

The BBC Buggy is involved in the post Christmas campaign for our cash. The suite of 12 structured programs involve the user in the potential of the BBC Micro as a switching device, memory unit, graphics terminal, programmable device, information processor and a problem solving aid.

The three-wheeled robot sells at around £190 and consists of a simple to build Fishertechnik construction kit and all the software. The Buggy was initially created by Economatics and M.E.P. in conjunction with the Continuing Education Programme Team at the BBC. It may well find itself put to use by the BBC Educational programmes in the very near future, offering as it does, a first step into the world of robotics.

CROSSING OF THE WAYS

The new Heinemann Computers

in Education software packages are spearheading the launch of English-speaking software around the world. The Dudley programs for primary schools were developed in partnership by Five Ways Software and the teachers of the Dudley Metropolitan Borough. Titles like Weather, Travel, Exploration, Myself, Food and Homes are designed to inspire children to take an interest in the subjects of Maths, Environmental Studies, Science and Language.

Each theme has four attendant programs and these are accompanied by a teacher's Theme Book, a child's runcard (which details the function of particular keys) and a set of keyboard overlays to identify the special teacher's and children's keys.

ACORN NEWS

Acorn Computers, now a public company on the Unlisted Securities Market, are currently busy spreading the message abroad. As well as the launch into the U.S.A., there are plans to move into France, Italy, and Sweden. There is a possibility of a joint venture in Spain and Acorn already have an office in Germany. From here they plan to cover Austria and Switzerland. The manual has already been translated and some software is to follow.

Both South Africa and Australia are showing great interest in the BBC and in Australia three states have already adopted it as their educational computer.

Unfortunately the launch issue failed to attract the expected rush of buyers. The offer of 11.23 million shares to raise £13.5 million was only just taken

up. American analysts are certainly dubious about their prospects in the price-cutting market across the Atlantic.

Meanwhile Wong's of Hong Kong have been awarded the contract to make the BBC Micro for the U.S. market. It is planned to produce 50,000 units over the next 12 months. They are also negotiating with the People's Republic of China to sell the BBC Micro there and the Chinese government is currently evaluating Acorn's Econet system.

DEVELOPMENTS AT HOME

Back home, Logica U.K. have announced that it has signed a contract with Acorn to port the AENIX operating system to a new processor due from Acorn in the Spring. The 32-bit second processor is designed as an 'add-on' processor for the BBC.

"The Acorn processor is the first 32-bit processor, and probably the most powerful microprocessor to which the XENIX has yet been ported" commented Hector Hart, Commercial Manager of Logica's Software Products Group. Acorn expects XENIX to be a highly popular operating system with the BBC's many users. XENIX is the ideal system to add 32-bit capability to the networks of BBC's in schools and industry. UNIX is now the predominant system in the country's universities and Acorn's system will offer a low-cost yet fully functional UNIX for students at school to cut their teeth on.

AB Electronics are to manufacture the Electron at their new plant in Rogerstone, Gwent. The contract is for 100,000 and this work will compliment their existing manufacture of the BBC.

Compact Software International are to have their system generator NUCLEUS marketed by Acorn. It will be sold in a software package with the Z80 Add-on Processor, running the CP/M operating system.

The NUCLEUS system

MS

allows a relatively inexperienced user to develop business systems quickly and easily. In addition, Compact are developing a Day Book package for Acorn — a system devised by accountants for the small business. The software will be upgradeable to a fully integrated system if required.

Two new games from Acornsoft are Carousel and Freefall. Carousel is a straightforward arcade shoot out. All the fun of the fair, plus some vengeful ducks. Freefall is rather more complicated and enigmatic space game but nevertheless a challenge to game — playing skill.

KNUCKLES RAPPED

Three complaints to the Advertising Standards Authority for false claims have been upheld against Acorn. These were for advertising products not yet available and abusing statistics.

Acorn said the adverts for second processors, Prestel and Teletext adaptors, were to show customers the BBC Micro's expansion potential. The 80% figure put on the use of the BBC in schools was based on figures from orders received under the Department of Industry scheme. The authority did not agree that any of these points was made sufficiently clear. Future advertising will be amended.

Meanwhile the contract with the BBC comes up in August. Asked if there was any chance of losing the contract, the joint managing director, Mr Chris Curry, replied, "Oh goodness me, no. They have no intention of going elsewhere".

Chris Curry believes that when the financial institutions realise how flexible Acorn is, with its software interests as well as a manufacturing interest, then confidence in the recently issued stock will revive.

Acornsoft are now distributing ASK's range of educational software. The program will be published jointly under the Acornsoft/ASK label. Each pro-



gram is accompanied by a brochure and notes. Electron versions are already available. New titles include 'Cranky' and 'Table Adventures' — exciting games bringing fun to mathematics teaching, and 'Children from Space' which encourages correct use of English by helping two space children, Beng and Zoma, to write a report from Earth.

BERKSHIRE BUSING INTO THE COMPUTER AGE

During the past few months the Bracknell and Wokingham Schools Industry Partnership has been masterminding the conversion of an ex-London Transport bus into a mobile classroom.

The bus, which has been fitted out with 15 BBC Microcomputers plus related hard and software began touring back in October. The aim is to expand the teaching of computer related topics and to improve the quality of in-service teacher training.

The Partnership is an interesting collaboration between industrialists and educationalists. Companies located in the Bracknell and Wokingham area have contributed towards the cost of the computer bus by putting in cash or undertaking specific parts of the conversion. The comprehensives involved are currently raising their share of the £35,000 cost with an number of sponsored 'compute-ins'.

ADULT EDUCATION

Two educational programs are also available from Acornsoft for adults. Indeed the programs were into the area of self-education. They are called 'I Do' and 'The Dating Game'. The former helps couples assess the good and bad

points of their relationships and pin points danger areas on which they could founder. The latter enables individuals analyse their social make-up and helps them find partners that are likely to be compatible. The 'Dating Game' is based on the work of Dr Glenn Wilson of the Institute of Psychiatry. I suppose it had to happen.

ADDENDA

```

1 REM*****
2 REM=HEADER PROGRAM FOR INVASION*
3 REM=TIMES. SETS DEFAULT VALUES *
4 REM=OF FLEET SIZE=50, VOLUME 3,*
5 REM=AND TIME LIMIT=20 SECS.*
6 REM*****
7 MODE5
8 VDU19,2,15,0,0,0,23,1,0;0;0;0;
9 COLOUR13:COLOUR1
10 CLS:PRINTTAB(3,0);"INVASION TIMES" TAB(9);"by" TAB(3);"Alan G. Rowley"
11 COLOUR0:PRINT TAB(5);"Copyright"
12 COLOUR2:PRINT TAB(2);" (C) August 1983"
13 COLOUR0:PRINT TAB(3);"B.B.C. MODEL B" O.S. Version 1.2"
14 AS=INKEY$(1000)
15 LX=2000:CX=50:VX=-15
16 MODE7
17 CHAIN"INTMS"
>
197 PRINTTAB(0,10);"CURRENT VOLUME OF SOUND="ABS(VX)/5;" O.K. ? (Y/N)"
198 PROCgetyn
199 IF INSTR("nN",Q%) THEN REPEAT CLS:PRINTTAB(0,0);"Choose the new volume 1,2
or 3 (3 is INPUTTAB(0,10);"the loudest) VX:UNTIL VX>0 AND VX<4:VX=VX-5
200 UNTIL INSTR("yY",Q%)
201 REPEAT CLS
202 PRINTTAB(0,10);"CURRENT SIZE OF FLEET="CX;" O.K. ? (Y/N)"
203 PROCgetyn
204 IF INSTR("nN",Q%) THEN REPEAT CLS:INPUTTAB(0,10);"New size of fleet (10 to
100) CX:UNTIL CX>9 AND CX<101
205 UNTIL INSTR("yY",Q%)
206 REPEAT CLS
207 PRINTTAB(0,10);"CURRENT INITIAL TIME ALLOWED TO GIVE A" "CORRECT ANSWER="
LX/100;" seconds O.K. ? (Y/N)"
208 PROCgetyn
209 IF INSTR("nN",Q%) THEN REPEAT CLS:INPUTTAB(0,10);"New initial time (10 to
60 secs) LX:UNTIL LX<61 AND LX>9:LX=LX*100
210 UNTIL INSTR("yY",Q%)
211 ENDPROC
212 DEFPROCgetyn
213 #FX15,
214 REPEAT Q%=GET$:UNTIL INSTR("yYnN",Q%)
215 ENDPROC
216 DEFPROCdust
217 LOCALIX
>
218 VDU19,1,15,0,0,0,19,3,0,0,0,0
219 COLOUR128:CLS
220 FOR I=1 TO 200
221 GCOLOR,1:PLOT69,RND(1279),RND(1023):GCOLOR,3:PLOT69,RND(1279),RND(1023)
222 NEXTIX
223 ENDPROC
>

```

Questions & Answers

Bruce Smith

Q. I have recently bought a STAR DP510 for use with my BBC B, which is fitted with WORDWISE and BEEBCALC. I am very pleased with the overall performance of the machine with one exception. When I output a program to the printer the '£' sign is produced as a " ". How can I get the printer to print the pound sign when running a BASIC program.

A. There are two ways in which you can get your printer to print the pound sign. Firstly, you can reset the sliders 6, 7 and 8 on DIP switch 1 to read 'off-on-on' (see your printer manual for details on how to do this). This will configure the printer to print the English character set; executing PRINT CHR\$(35) should have the desired result. Alternatively, you can use a 'soft' reset by placing the following VDU statement at the beginning of each program:

```
VDU 1,27,1,ASC"7",1,1,1
```

This will replace the ' ' with a character. Replacing the last digit with 0 will restore the status quo.

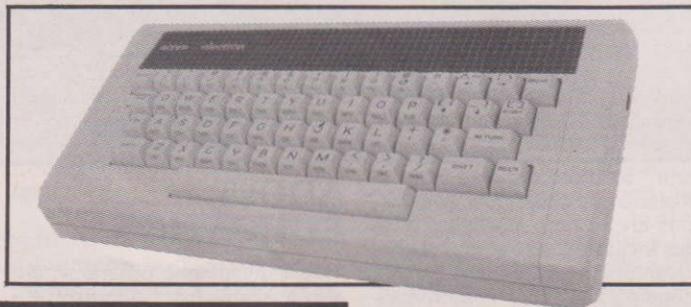
No this is not a bug. The CLS instruction is simply a VDU12 command and this gets sent to the printer as such thereby producing a formfeed. To counteract this you should ensure the printer is disabled beforehand, ie VDU3:CLS:VDU2.

Q. After reading your article on adding a speaker to my BBC, I followed it through. I have added a 5watt 8ohm speaker which functions perfectly. Could you advise me how to add a volume control to this?

A. Yes! All you need to do is to place a potentiometer across the two speaker lines, 220K would probably give good results. You could add a suitable knob to the pot spindle to allow you to adjust it readily.

Q. I have a BBC B fitted with a VIEW word processor which I use in conjunction with a JUKI 600 Printer. Whilst I find the JUKI an excellent machine I am finding it difficult to configure it for use with the DIABLO Printer Driver as recommended by the

Bruce Smith solves readers' problems and enlightens us on the inner mysteries of the BBC Micro and Electron



manufactures. I have tried the FACIT program and while this gives me the underlining facility I cannot arrange it to print bold. Similarly I have difficulty in setting the top margin. Is this a common problem?

A. I would suspect it is using the combination suggested by the manufacturers. The control codes required by the JUKI are probably different from those produced by the DIABLO Printer Driver, so unless you felt like rewriting the Driver, I would suggest you contact the shop where you obtained the printer and driver and insist that they sort things out!

Q. I've had my BBC Micro for five months now. BASIC does not cause me any problems. Assembler however is another matter. I can understand the Assembler commands but do not understand how BASIC and Assembler are intertwined. How do you call Assembler from BASIC and how does the computer know where to look for it? Indeed where does the computer store it?

A. Nice to receive a letter from a Dutch reader — P.M. Schrama.

I feel that you are getting a little confused as to the function of the Beeb's Assembler. The Assembler allows you to enter

machine code programs in a more intelligible manner.

The simplest way to enter a true machine code program is to POKE a series of hexadecimal values into memory before asking the Beeb to execute them. For example to store the number 5 in location &70 in machine code, we would need to point the Beeb to an area of memory containing the following bytes: &A9, &05, &85, &70, &60. Being mere humans these numbers don't really mean a lot to us to make things easy a short hand abbreviation for each machine code instruction was devised, called a 'mnemonic'. Thus the above coding could be read in mnemonic form as:

```
LDA #&05 / Load Accumulator with 5
STA &70 / Store Accumulator at location &70
RTS / ReTurn to BASIC
```

The Assembler allows us to enter machine code programs in a mnemonic form. When the Assembly Language Program is RUN it is transformed into machine code which can be executed by the command CALL xxxx, where xxxx is the address where the code is stored. The variable P% is used at the onset of your program to specify this storage address. This short example will produce a beep on the speaker.

```
10 P% = &C00
20 LDA #7 : JSR &FFE3
30 RTS : □
40 CALL &C00
```

Hopefully you will have been following the Assembly Language Programming series in A&B which will answer many more of your queries. If you can't wait then several books are now available on the subject (modesty stops me from naming my recommendation!).

Q. I have discovered some new error messages, namely: Language?, RENUMBER Space, Bad ROM, Bad Address, Bad String and Bad Key. What do they all mean as they are not documented anywhere?

A. Who's been disassembling their ROM's then! When you switch the Beeb on the MOS sets about doing numerous household chores before displaying the familiar prompt indicating that everything is in order. One of the many checks that it does is to see what is present in the sideways ROM sockets. If no language ROM is present then the 'Language?' error is given and the Beeb hangs up! However, a language on the Beeb need not be a language at all, for example it would be quite happy to hand control over to a word processor such as VIEW or WORDWISE. So if you wanted to turn your Beeb into a full time wordprocessor simply remove BASIC (normally in the rightmost socket) and replace it with a suitable word processing chip?

RENUMBER Space is issued when there is no RAM available for BASIC to perform its calculations that enable it to alter line numbers. This will only ever occur if you have a program that fills up the entire user memory.

The remaining three errors are new to me. I would suspect that they have been included for future expansion. Bad ROM suggests that it is associated with the ROM Filing System, while Bad Address and Bad String seem to be self explanatory although I'm not sure in what context! Anybody out there know?

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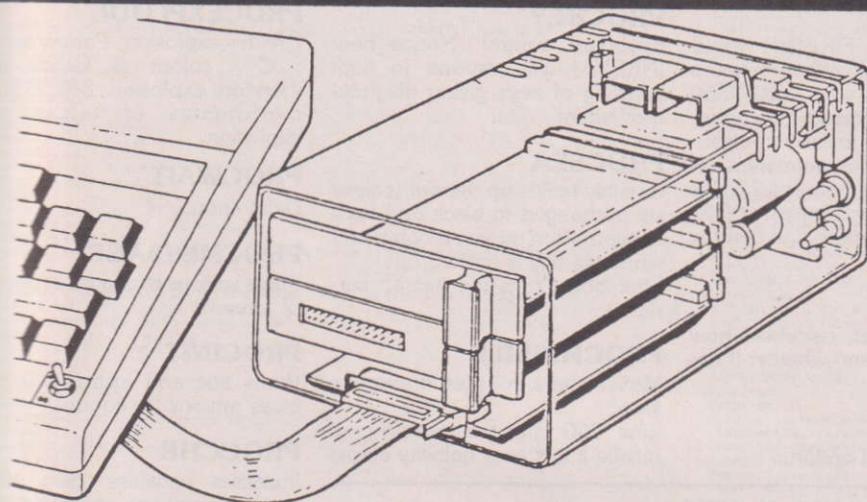
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SUITABLE 8 — 15 years

FOR USE: by teacher with whole class **OR:** by individual students.

CORONA SOFTWARE
73 High Road, South Woodford,
London E18 2QP.

CUBEFLEX 6809 2nd processor for the BBC micro



CUBEFLEX for education and software development
CUBEFLEX is supplied with a number of useful machine code handling facilities, and FLEX itself comes complete with a text editor and machine code assembler for 6809.

However, the real strength of FLEX is the enormous range of other software to run under its operating system.

Cross assemblers and macro facilities exist which allow the CUBEFLEX to develop object code for all the 68 range from 6801 to 68000, all the 80 range, and the Z80. The CUBE ROMULATOR can be added to the spare slot in the CUBEFLEX, and so emulate the developed software in a target system.

COMPILERS

PL/9 is a high level compiling language whose structure resembles BBC BASIC. However, when compiled into machine code it runs four times as fast.

"C", Pascal and 6809 extended BASIC are all also available, and allow the user to employ the language of his choice.

6809 + FLEX — the ultimate in 8-bit systems

The BBC microcomputer is already so good, how can it be improved? FLEX is the only truly machine independent operating system for 8-bit processors. Even CP/M (for Z80) is machine specific to a significant degree. But take any standard 5 1/4" FLEX diskette and it will load on CUBEFLEX. All variations of double or single sides, 40 or 80 tracks (if 80 track drives are fitted), and even double density (if an appropriate disk interface is fitted on the BBC) are automatically catered for.

CUBEFLEX connects to the BBC via the TUBE, and uses the standard BBC disk interface and disk drives. All BBC facilities are unimpaired by the addition of CUBEFLEX, and can be called up or returned to at any time. The FLEX configuration parameters are held in EPROM, and the unconfigured FLEX diskette is read in and initialised upon entry of the start-up command.

CUBEFLEX 6809 2nd Processor unit £299
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Helicopter Squadron

Richard Jones

The task force, headed by its aircraft carrier flagship, awaits the return of its helicopter squadron. The squadron is being attacked by missiles.

A sole fighter helicopter, armed with two cannon, is available to defend the incoming squadron and the vulnerable carrier. You have the controls.

The game can be played either using keys or with a joystick (use the left joystick with the firing button pointing away from you).

I think the game is slightly easier with the keyboard option but remains very difficult to beat. It is also very noisy and hopefully, addictive.

MAIN PROGRAM FUNCTIONS

Lines 60-110 These palette changing commands enable objects on the screen to appear to move in front of, or behind, other objects when used with the GCOL 3 (Exclusive CR) graphics colour command.

For example, I needed the white bullets to pass behind the green helicopters. White (colour seven) EORed with green (colour 2) produces magenta (colour 5 five), which does not work.

I therefore redefined colour 11 as white and colour nine as green. Colour 11 EORed with colour nine produces colour two (green). The effect will now work. Colour 11 (white) goes green when passing over the green helicopter and therefore appears to go behind it.

PROGRAM DESCRIPTION

Line 150 Initial printing of squadron.

Lines 160-280 This is the main loop which is exited if your helicopter or the carrier is destroyed (DEATH TRUE) or you lose all the squadron (HELINUMBER%=0) or you get all the remaining squadron to safety.

You also exit this loop every 10 seconds to reposition the squadron.

Play out this difficult game of survival as the key member of a Royal Navy helicopter squadron under missile attack.



PROCMOVE

Lines 330-340 FIRE%(1 or 2) will be TRUE if either bullet is already on its way. Line 350 points to the correct procedure for keyboard or joystick control. Line 360 Creates animation effect by printing helicopter in its new position and Exclusive ORing in its old position and thereby erasing it.

PROCFIRE

Moves the bullet, calculates how far it has gone and whether it has hit anything.

PROCJOY

Joystick control option.

Main Variables

HELINUMBER %	Number of remaining helicopters.
MX %,MY %	Missile positions.
FX %,FY %	Bullet position.
FIRE %	Flag to indicate if bullet is travelling.
RANGE %	Distance bullet has travelled.
HIT %	Flag to say if bullet has made a hit.
DEATH	Flag indicating end of game.
SAFE %	Number of helicopters reaching safety.
LX %,LY %	Your helicopter's position.
oldLX %,old LY %	Your helicopter's previous position.
CHOICE %	One for keyboard option, two for joystick.

PROCKEY

Keyboard control. Notice how INKEY(-) will respond to dual pressing of keys giving diagonal movement.

PROCSEA

Invisibly builds up the sea (colour six is changed to black and back to cyan when picture is complete) while the title is flashed up. Line 860 Prints the aircraft carrier.

PROCMISSILE

Moves three missiles through a loop. Line 960 changes trajectory of missile if it is over halfway across

Lines 980-1010 Is the missile touching a colour which indicates a hit? POINT refers to the logical colour (i.e. the number of a colour regardless of whether its actual colour has been changed). Lines 1020-30 If a bullet is in progress, check if a missile is being hit by using PROCHECK. Line 1040 Reposition missile in a new random starting position when it moves off screen.

PROCHELS

Every 10 seconds this procedure reprints the squadron nearer to safety. Once a helicopter goes off screen, PROCSAFE is called to keep a track of the number of helicopters which are safe.

PROCHELIHIT

Works out which helicopter has just been hit.

PROCMISSILEHIT, PROCFLAGSHIPHIT, PROCCARRIERHIT

All delete targets when destroyed.

PROCEXPLODE

Creates explosion. Parameters to : C - colour of targets and therefore explosion; E%, G% - coordinates of target and explosion.

PROCWAIT

Delay loop.

PROCMESSAGE

Prints various messages at bottom of screen.

PROCINIT

Prints title and instructions and gives options for control.

PROCCHR

Initialises variables. Sets initial random positions of missiles and helicopters. Defines the character set.

PROCHECK

Has a bullet hit a missile?

PROCZAP

Firing sound for cannon.

PROCSAFE

Number of helicopters safe.



PROCVIN

This is only entered when all remaining helicopters are safe and you and the carrier have survived. It is pretty difficult to get this far. Perhaps you could make the messages a little more sympathetic and encouraging.

Personally, I've got a mean streak.

To make life easier, you can also change the figure after UNTIL TIME = , in line 170. Reducing this means that you don't have to survive for so long.

PROGRAM LISTING

```

1000M: MX%(3),MY%(3),HX%(6),HY%(6),FX%(2),FY%(2),FIREX%(2),RANGEX%(2),
1010L1:
1020CLS:TV255
1030MODE4:PROCVIN
1040PROCCRR
1050MODE2
1060VDU19,0,3,0,0,0
1070VDU19,10,3,0,0,0
1080VDU19,14,5,0,0,0
1090VDU19,15,5,0,0,0
1100VDU19,11,7,0,0,0
1110VDU19,9,2,0,0,0
1120CLS
1130VDUS
1140PROCSEA
1150HELHIT%=0
1160GCOL3,2:FOR OX=1 TO HELNUMBER%:MOVE HX%(OX),HY%(OX):VDU226,227:N
1170
1180UNT TIME=0
1190REPEAT:PROCMISSILE:UNTIL TIME>=750 OR HELIHIT%=6 OR DEATH=TRUE OR
1200SAFE%0 AND SAFEX%=(6-HELHIT%)
1210IF SAFEX%0 AND SAFEY%=(6-HELHIT%) THEN 230
1220IF HELIHIT%=6 THEN 250
1230IF DEATH=TRUE THEN 270
1240PROCHELIS
1250GOTO 160
1260MODE4:PROCVIN
1270END
1280PROCMESSAGE("SQUADRON DESTROYED")
1290AF=15,0
1300REPEAT:AF=GET#:UNTIL AF="S"
1310GOTO40
1320
1330
1340DEFFROCMOVE
1350OLDLX=LX:OLDLY=LY
1360IF FIREX(1)=TRUE PROCFIRE(1)
1370IF FIREX(2)=TRUE PROCFIRE(2)
1380IF CHOICE%=1 PROCKEY ELSE PROCJOY
1390GCOL3,8:MOVE LX,LY:VDU224,225:MOVE OLDLX,OLDLY:VDU224,225
1400IF LY%216 PROCMESSAGE("CREW DROWNED")
1410ENDPROC
1420
1430
1440DEFFROCFIRE(FX)
1450SOUND0013,-10,FX(FX),1
1460RANGEX(FX)=RANGEX(FX)+1
1470MOVEFX(FX),FY(FX):GCOL3,11:VDU232:FX(FX)=FX(FX)+40:MOVEFX(FX)
1480IF FX%VDU232
1490IF RANGEX(FX)>=15 OR HITX(FX)=TRUE RANGEX(FX)=0:FIREX(FX)=FALSE:
1500MOVEFX(FX),FY(FX):VDU232:HITX(FX)=FALSE
1510ENDPROC
1520
1530
1540DEFFROCDJOY

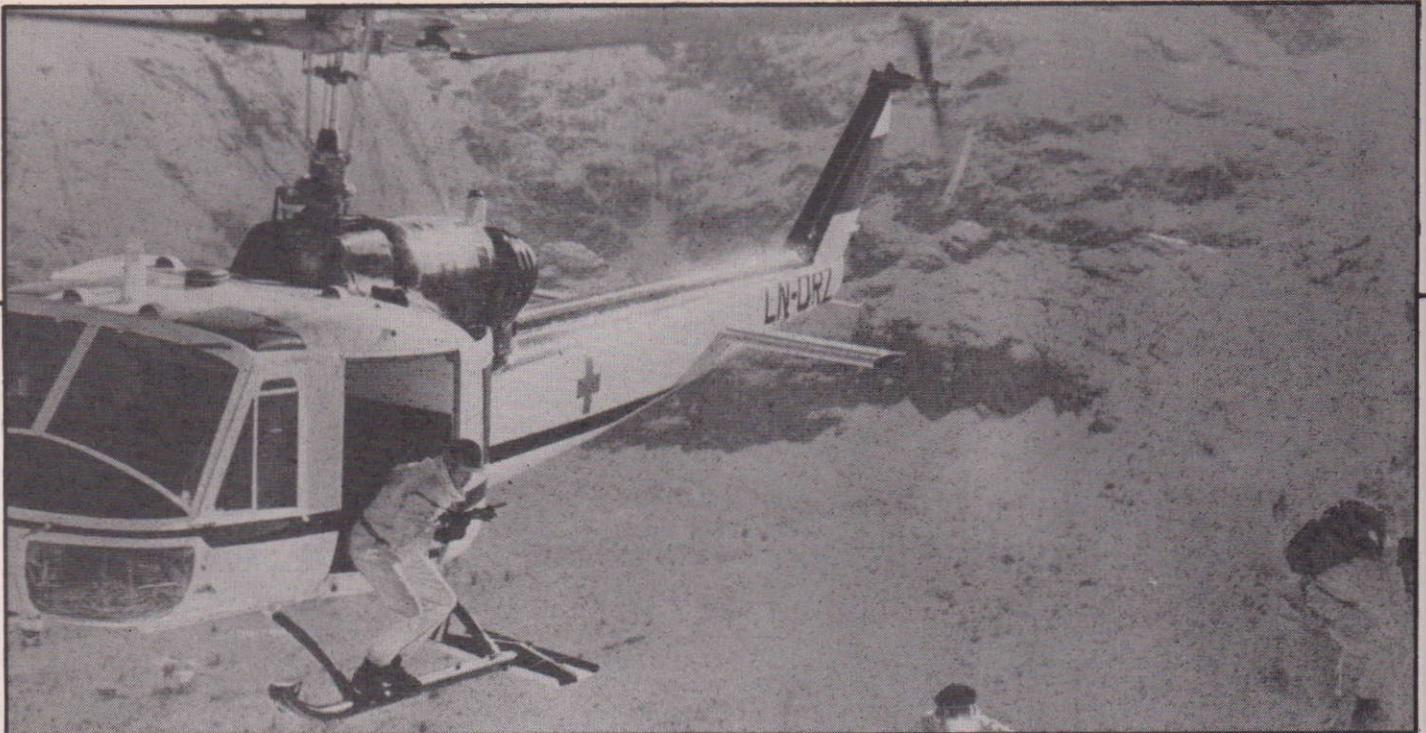
```

```

500FX21,0
510F=ADVAL(0)AND3:AX=ADVAL(1)DIV100:BX=ADVAL(2)DIV100
520IF FIREX(1)=TRUE AND FIREX(2)=TRUE THEN 560
530IF FIREX(1)=FALSE FX=1
540IF FIREX(2)=FALSE FX=2
550IF F=1 FIREX(FX)=TRUE:FX(FX)=LX+125:FY(FX)=LY:MOVEFX(FX),FY
(FX):GCOL3,11:VDU232:PROCCAP
560IF AX=400THENLX=LX-DX
570IF AX<200THENLX=LX+DX
580IF BX=400THENLY=LY+DX
590IF BX<200THENLY=LY-DX
600ENDPROC
610
620
630DEFFROCKEY
640IF INKEY(-26) LX=LX-DX
650IF INKEY(-122) LX=LX+DX
660IF INKEY(-58) LY=LY+DX
670IF INKEY(-42) LY=LY-DX
680IF FIREX(1)=TRUE AND FIREX(2)=TRUE THEN 730
690IF FIREX(1)=FALSE FX=1
700IF FIREX(2)=FALSE FX=2
710FX21,0
720IF INKEY(-99) FIREX(FX)=TRUE:FX(FX)=LX+125:FY(FX)=LY:MOVEFX(FX)
(FX),FY(FX):GCOL3,11:VDU232:PROCCAP
730ENDPROC
740
750
760DEFFROCFSEA
770GCOL0,12
780MOVE50,700:PRINT"HELICOPTER"
790MOVE150,500:PRINT"SUADRON"
800VDU19,6,0,0,0,0
810FOR X%=0TO1200 STEP64:FOR Y%=200 TO 0STEP-32
820GCOL0,6:MOVEX,Y:VDU255
830NEXT Y
840GCOL0,0:MOVE50,700:PRINT"HELICOPTER":MOVE150,500:PRINT"
SUADRON"
850VDU19,6,6,0,0,0
860MOVE10,232:GCOL3,7:VDU228,229,230
870ENDPROC
880
890DEFFROCMISSILE
910PROCMOVE:OX=0
920REPEAT
930OX=OX+1
940GCOL3,5:MOVE MX%(OX),MY%(OX):VDU231
950SOUND0011,-10,MY%(OX),1
960MY%(OX)=MY%(OX)-32:IF MY%(OX)<500 MY%(OX)=MY%(OX)-16
970MOVE MX%(OX),MY%(OX):VDU231
980P=POINT(MX%(OX)-4,MY%(OX)-16) OR POINT(MX%(OX),MY%(OX)-8)
990IF P=8 PROCFLAGSHIPIT
1000IF P=2 PROCHELIMIT
1010IF P=7 PROCCARRIERHIT
1020IF FIREX(1)=TRUE PROCHECK(1)
1030IF FIREX(2)=TRUE PROCHECK(2)
1040IF MX%(OX)=-70 OR MY%(OX)<150 GCOL3,5:MOVEMX%(OX),MY%(OX):VDU231:
MX%(OX)=1280+RND(1000):MY%(OX)=RND(1000)+200
1050UNTIL OX=3
1060ENDPROC
1070
1080
1090DEFFROCHELIS
1100FOR OX=1 TO HELNUMBER%
1110GCOL3,2:MOVE HX%(OX),HY%(OX):VDU226,227
1120HX%(OX)=HX%(OX)-50:HY%(OX)=HY%(OX)-10
1130IF HX%(OX)=-64 PROCSAFE
1140MOVE HX%(OX),HY%(OX):VDU226,227
1150SOUND0011,-10,100+(OX*4),1
1160NEXT

```

CONTINUED OVER



```

1170ENDPROC
1180
1190DEFFROCHELHIT
1200CX=0:HX=0
1210REPEAT
1220CX=CX+1
1230IF MX%(CX)>HX%(CX) AND MX%(CX)<HX%(CX)+128 AND MY%(CX)<HY%(CX)
AND MY%(CX)>HY%(CX)-32 THEN HX=1 ELSE GOTO 1270
1240 GCOL3,2:MOVE HX%(CX),HY%(CX):VDU226,227:GCOL3,5:MOVEMX%(CX),MY
%(CX):VDU231
1250PROCEXPLODE(2,HX%(CX),HY%(CX)):HELHITX=HELHITX+1
1260MX%(CX)=-200:HX%(CX)=3000
1270UNTIL CX=HELNUMBERX OR HX=1
1280ENDPROC
1290:
1300:
1310DEF PROCMISSILEHIT
1320GCOL3,5:MOVE MX%(CX),MY%(CX):VDU231:GCOL3,11:MOVE FX%(CX),FY%(CX)
:VDU232
1330PROCEXPLODE(5,MX%(CX),MY%(CX))
1340FX%(CX)=1290:MX%(CX)=-100
1350HITX(FX)=FALSE:FIREX(FX)=FALSE
1360ENDPROC
1370:
1380:
1390DEFFROCCARRIERHIT
1400GCOL3,8:MOVE LX%,LY%:VDU224,225
1410PROCEXPLODE(8,LX%,LY%)
1420PROCMESSAGE("DEFENCES DESTROYED")
1430ENDPROC
1440:
1450:
1460DEFFROCEXPLODE(C,EX,GX)
1470ENVELOPE3,1,1,0,0,10,0,0,127,-1,-1,-1,150,25
1480GCOL3,C
1490SOUND0010,3,4,20
1500FOR AX=0 TO 50 STEP 10
1510FOR TX=1 TO 2
1520GCOL3,C
1530MOVE EX-AX,GX+AX:VDU234
1540MOVE EX+AX,GX-AX:VDU233
1550MOVE EX-AX,GX-AX:VDU233
1560MOVE EX+AX,GX+AX:VDU234
1570NEXT
1580PROCWAIT(5)
1590NEXT
1600ENDPROC
1610:
1620:
1630DEFFROCCARRIERHIT
1640GCOL3,7:MOVE I0,232:VDU228,229,230
1650PROCEXPLODE(7,I0,232)
1660PROCMESSAGE("CARRIER DESTROYED")
1670ENDPROC
1680:
1690:
1700DEFFROCCWAIT(Z)
1710FIN=TIME+Z
1720REPEAT:UNTIL TIME)=FIN
1730ENDPROC
1740:
1750:
1760DEFFROCCMESSAGE(M#)
1770GCOL0,0
1780MOVE50,100:PRINTM#
1790MOVE0,32:PRINT"Press 'S' to restart"
1800DEATH=TRUE
1810ENDPROC
1820:
1830:
1840DEFFROCCINIT
1850VDU5
1860VDU19,1,6,0,0,0
1870GCOL3,1
1880FORTX=1TO2
1890FORYX=0 TO 600 STEP 32
    
```

```

1900MOVE 50,YX:PRINT"HELICOPTER SQUADRON"
1910NEXT:NEXT
1920VDU4
1930CLS
1940PRINT"HELICOPTER SQUADRON by Richard Jones"
1950PRINT""Defend your squadron until they""have passed the aircraft
carrier and""rejoined the fleet."
1960PRINT""If the carrier or defending helicopter""is hit, the whol
e squadron will perish."
1970PRINT""You can only fire two cannon at a time"
1980PRINT""You can use the cursor keys or a ""joystick to control yo
ur helicopter."
1990FX15,1
2000PRINTTAB(0,20)"Press C for Cursors, J for joysticks":AF=GET#
2010IF AF#"C" CHOICEX=1:GOTO2060
2020IF AF#"J" THEN 2000 ELSE CHOICEX=2
2030CLS
2040PRINT"Your craft is off screen to the left"
2041PRINT""To win,your helicopter and the aircraft""carrier must sur
vive and all the ""remaining squadron must be off screen"
2050PRINTTAB(0,20)"Fly with the LEFT joystick":TAB(0,22)"Fire with
the button":GOTO2070
2060PRINTTAB(0,20)"Fly with the cursors":TAB(0,22)"Fire with the Sp
aceBar"
2070PRINTTAB(0,20)"GOOD LUCK - YOU LL NEED IT":SPC(14)
2080FX15,0
2090PRINTTAB(0,24)"Press 'S' to start":REPEAT:AF=GET#:UNTIL AF#"S"
2100VDU19,1,1,0,0,0
2110ENDPROC
2120:
2130:
2140DEFFROCCCHR
2150FIREX(1)=FALSE:FIREX(2)=FALSE
2160DEATH=FALSE:SAFEX=0:DX=20
2170FOR OX=1 TO 3:MX%(OX)=1280+RND(1000):MY%(OX)=RND(1000)+150:NEXT
2180FOR OX=1 TO 6:HX%(OX)=700+RND(500):HY%(OX)=RND(500)+150:NEXT
2190RANGE=0:HELNUMBERX=6:HITX=FALSE
2200VDU23,224,195,192,33,31,15,3,1,0,23,225,252,64,248,228,230,252,24
8,0
2210VDU23,226,63,2,31,39,103,63,31,0,23,227,195,3,4,248,240,192,128,0
2220VDU23,228,8,8,8,31,63,255,63,63,23,229,0,0,0,0,0,255,255,255,23,2
30,0,0,0,0,255,255,252,252
2230VDU23,231,0,1,3,255,3,1,0,0
2240VDU23,232,0,0,73,0,73,0,0,0
2250VDU23,233,17,34,68,136,17,34,68,136,23,234,136,68,34,17,136,68,34
17
2260VDU23,255,255,255,255,255,255,255,255
2270LX=-150:LY=500
2280ENDPROC
2290:
2300:
2310DEFFROCCHECK(FX)
2320IF MX%(OX)=FX%(FX) AND HX%(OX)=FX%(FX)+124 AND MY%(OX)=FY%(FX)
+16 AND MY%(OX)=FY%(FX)-16 PROCMISSILEHIT
2330:
2340:
2350ENDPROC
2360:
2370:
2380DEFFROCCZAP
2390ENVELOPE2,7,2,1,1,1,1,1,121,-10,-5,-2,120,120
2400SOUND010,2,10,50
2410ENDPROC
2420DEFFROCCSAFE
2430SAFEX=SAFEX+1
2440VDU4:COLOUR1:PRINTTAB(0,1):SAFEX;" SAFE":VDU5
2450HX%(OX)=3000
2460ENDPROC
2470DEFFROCCWIN
2480VDU4
2490PRINTTAB(0,3)"HELICOPTERS SAVED : ";SAFEX
2500IF SAFEX=1 N#="YOU ARE DEMOTED"
2510IF SAFEX=2 N#="I'M GLAD YOU'RE NOT MY PILOT"
2520IF SAFEX=3 N#="A COMMENDABLE EFFORT,CAPTAIN"
2530IF SAFEX=4 N#="MENTIONED IN DESPATCHES"
2540IF SAFEX=5 N#="A NOBLE AND HEROIC DEED"
2550IF SAFEX=6 N#="YOU MUST BE SUPERMAN!"
2560PRINTTAB(0,10):N#
2565PRINTTAB(0,15)"Press #0 to re-run"
2570ENDPROC
    
```

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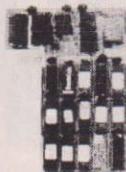
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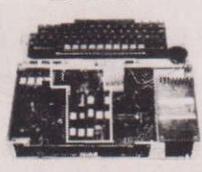
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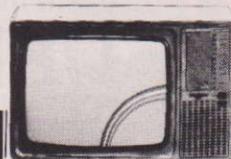
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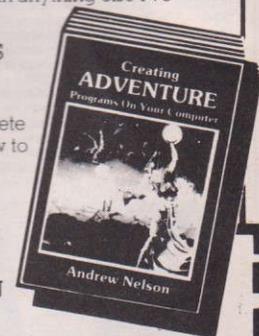
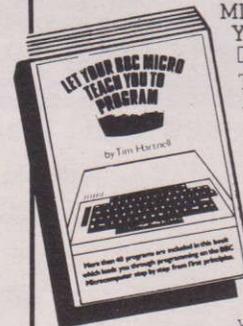
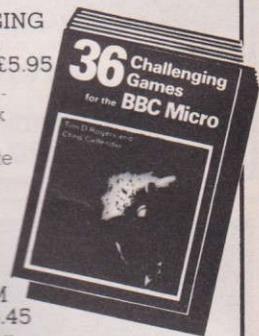
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Competition

This issue we have an educational teaser for you. The prizes are two packs of the latest six educational programs from Griffin Software, the software arm of Griffin & George. The programs are school tested and have now been made available to the general public through outlets such as W.H. Smith, Boots and other leading stores.

The programs offer educational value combined with attractive graphics and easy interaction with the BBC. There are parents' notes to go with each program.

WHAT YOU HAVE TO DO

Write a single routine in the form of a procedure which you think could be usefully included and called by any educational program. The PROC must be 10 lines long including the DEF PROC and END PROC lines. Each line must be documented by a REM statement explaining what is going on. Other than this documentation, multistatement lines are not allowed. Nor is use of the Assembler permitted. A difficult task but we at A&B have great faith in our readers' ingenuity. Good luck.

Send your entries (typed or printed) to:
A&B Computing
Griffin Software Competition
1 Golden Square
London W1

The winners of the competition will be the first two correct entries judged best by the editor. The winners will be notified once the competition has closed and the results will be published in a future issue of A&B Computing. The competition is open to all UK and Northern Ireland readers of A&B, except employees of Argus Specialist Publication Ltd., their printers and distributors, employees of Griffin & George or anyone connected with the competition.

As long as the correct coupon is used for each entry, there is no limit to the number of entries per person.

All entries must be postmarked before 23rd March 1984. The prizes will be awarded to the first two entries judged best by the editor which satisfy the rules of the competition.

No correspondence will be entered into with regard to the results and it is a condition of entry that the editor's decision is accepted as final.

WINNERS

Thanks to all who entered the Virgin Games competition. We certainly received some impressively large interpretations of user-defined characters. Unfortunately the size had no bearing upon the result and the lucky winners out of the hat were:

Kalpesh Shah, London
David C. Howarth, West Lothian
Adrian C. Smith, Cambridge
Mr. L.J. Mairs, Kent
Simon Reeve, Surrey



A&B COMPUTING COMPETITION

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Competition

Dune Fighters

Daniel J Bishop

Dunefighters is a real-time game program for two players. The program was written on BBC Micro Model B, with O.S. 1.2, BASIC II, discs and joysticks. However, the program should run on any BBC Micro Model B. It should be compatible with both BASICs and all Operating Systems. The program can be used equally well, with or without discs and joysticks.

THE ACTION

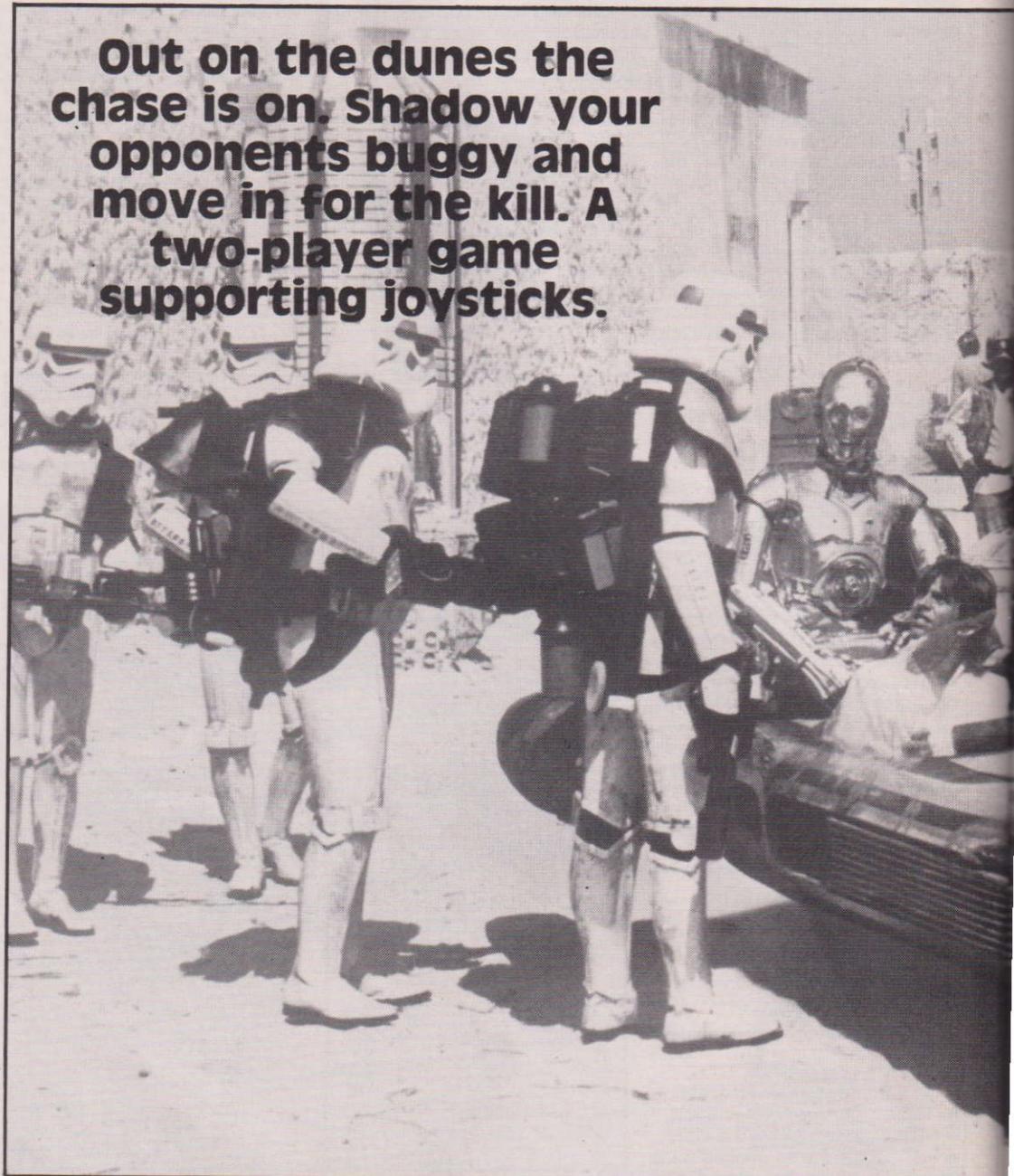
When you RUN the program, a title display in MODE 7 appears. The computer plays a tune. Then you may either press (ESCAPE) to read the instructions or you may proceed by pressing any other key. You may also start by pressing a joystick firebutton, and this will give you joystick control during the game.

Next you must wait a few seconds, while the graphics are generated. The screen will be blank during this period. The game starts as soon as the graphics appear.

Each player has control of one vehicle, called a dunefighter. You are both situated on a large barren desert. The object of each player is to destroy the other and to avoid collision. The victor wins the battle and the game ends.

SPLIT DISPLAY

The display is divided by two, in order to depict the interiors of each dunefighter cockpit. Each cockpit has a video screen, through which a view of the desert (and possibly the other dunefighter) may be seen. In the centre of each screen is a laser sight, superimposed on the horizon. Holding down the appropriate key or firebutton will cause twin laser beams to be fired, accompanied by ear-splitting sound effects. The beams converge at the position of the laser sight. If the other dunefighter is within the target area, some damage may be inflicted. The closer it is, the more damage is caused. The damage is cumulative, so several shots may be necessary to destroy the enemy dunefighter. If the dunefighter is destroyed, it will



Out on the dunes the chase is on. Shadow your opponents buggy and move in for the kill. A two-player game supporting joysticks.

then explode spectacularly and noisily and the game ends. A MODE 7 display shows the current total of wins for each player and the opportunity to play again is given.

Below the video screen, is a digital speedometer. Maximum speed is 300 mph. Your dunefighter can not reverse, so

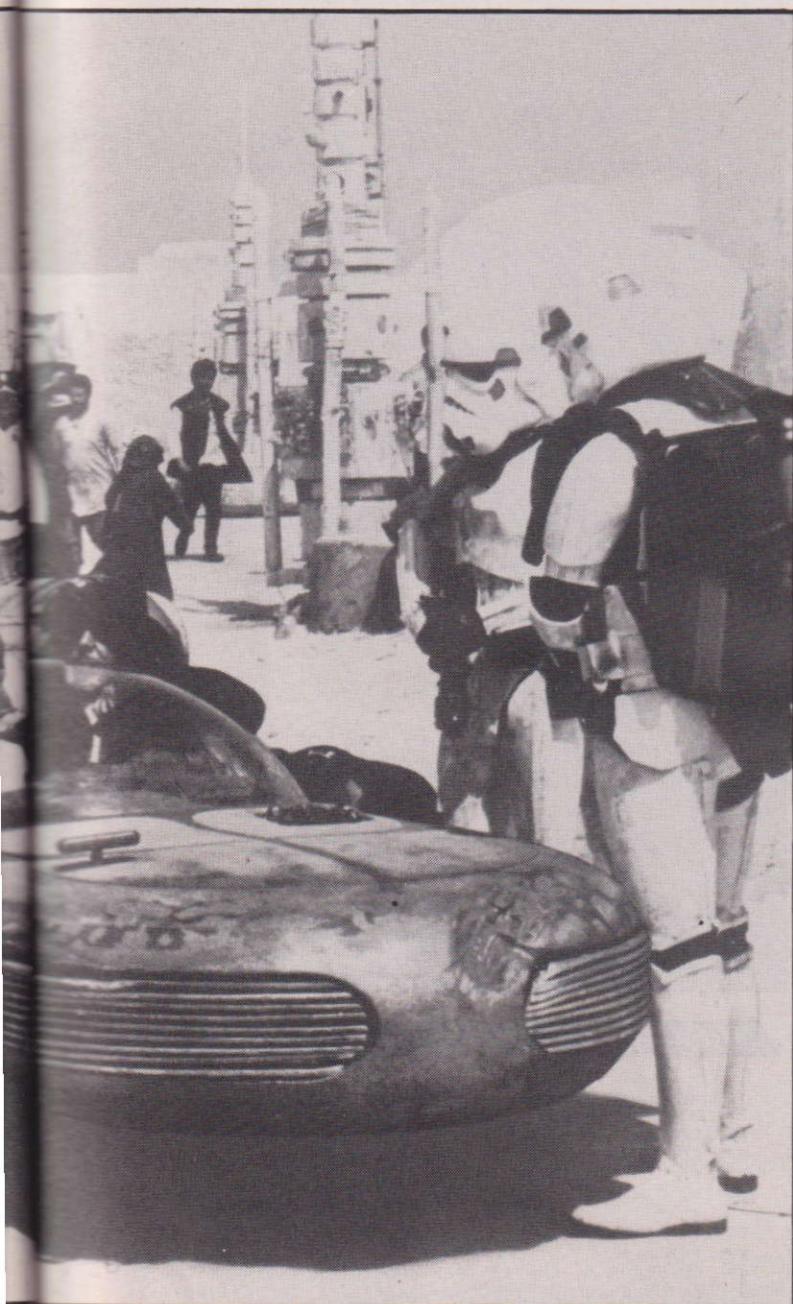
the minimum speed is 0 mph. Each player can use the relevant keys or joystick to accelerate or decelerate. The engine noise of each dunefighter increases as speed increases.

Below the digital speedometer is a direction pointer. This indicates in what direction the dunefighter is cur-

rently pointing (and in what direction the dunefighter is heading if the dunefighter is not stationary). The heading of each dunefighter can be controlled from the keyboard or with joysticks. At the start of the game, both dunefighters are pointing North.

At the top of the display, bet-

Dune Fighters



between the two cockpits, is a rectangular map of the desert, on which the current positions of each dunefighter are plotted.

Each player can therefore manoeuvre his craft across the desert to intercept the other. Note that the other dunefighter can sometimes be out of sight if the distance between the craft is

great. Also note that if a dunefighter crosses the edge of the map, it appears on the opposite side, i.e. there is wrap-around.

Brief instructions are included in the program, and may be seen at any time by pressing (ESCAPE), even in the middle of a game.

KEYBOARD CONTROL

Accelerate	DF1	DF2
Decelerate	CAPS LOCK	RETURN
Rotate anticlockwise	SHIFT LOCK	DELETE
Rotate clockwise	Z	,
Fire lasers	X	.
	TAB	Up arrow

Fast key – used with other controls to change speed and turn faster

C M

Note: DF1 = Dunefighter 1, DF2 = Dunefighter 2

JOYSTICK CONTROL

Accelerate	Joystick forward
Accelerate faster	Joystick hard forward
Decelerate	Joystick backward
Decelerate faster	Joystick hard backward
Rotate anticlockwise	Joystick left
Rotate anticlockwise faster	Joystick hard left
Rotate clockwise	Joystick left
Rotate clockwise faster	Joystick hard right
Fire lasers	Firebutton

Note: Two joysticks are necessary, one for each dunefighter (each player).

PROGRAM STRUCTURE

10-50	Remarks
60-90	Initialisation
100	Error handling
110-910	Main program loop
110-420	Initialisation
430-530	Title display and tune. Joystick?
540-550	15 second warning
560-550	Draw dunefighter cockpit interiors
580	Alal colours made black
760	Colours returned to normal
770	Game continues until end of game
780-790	Scores incremented depending on result of game
800	Graphic and sound effects at end of game
810-920	Scores displayed. Play again or END
930-2320	Procedure definitions
930	DEF PROCwindow: draws desert and sky
940-1230	DEF PROCgameLoop: gets inputs from players and acts on them. Updates everything, including graphics display
1240-1260	DEF PROCaccel: acceleration
1270-1280	DEF PROCright: rotate clockwise
1290-1310	DEF PROCdecel: deceleration
1320-1340	DEF PROCleft: rotate anticlockwise
1350-1370	DEF PROCdunefighter: draws dunefighter
1380-1400	DEF PROCclaser: graphic and sound effects of laser. Damage caused is assessed
1410	DEF PROCvector: draws direction pointer
1420-1540	DEF PROCdestroyed: explosion effects

CONTINUED OVER

1550 DEF PROCengines: engine noise
 1560 DEF PROCTune: haunting melody!
 1680-1970 DEF PROCInstructions: brief instructions and
 description game
 1980-2010 DEF PROCcapslock: puts CAPS LOCK on
 2020-2080 DEF PROCkeybuff: flushes keyboard buffer
 2050-2080 DEF PROCkeys: returns editing keys to normal
 and turns auto-repeat on again
 2090-2110 DEF PROCpause: halts program for a time
 sepecified in seconds
 2120-2220 DEF PROCcircle: draws circles
 2230-2240 DEF FNother: if zero — returns one, and vice
 versa, if one — returns zero
 2250-2270 DEF PROCfire: detects whether lasers are to be fired
 2280-2320 DEF PROCcont: waits for firebutton or keypress
 or time limit to expire before continuing

VARIABLES USED

A%: number of battles won by DF1.

B%: number of battles won by DF2.

TITLE\$: program titles, i.e. "DUNEFIGHTERS".

CONT\$: 'continue' message.

JPOS0%, JPOS1%, JPOS2%, JPOS3%: joystick positions.

GVECTOR%(15,1): relative x & y movements to draw direction
 pointer in 16 different positions.

VECTOR%(1,1): dunefighters' heading and speed

DFPOS%(1,1): dunefighters' x & y co-ordinates on the desert.

COL%(1): dunefighters' graphics colours.

ANG%(1): bearings of each DF from each DF (in degrees).

LAS%(1): whether either dunefighters' laser is to be fired.

GPOS%(1, 3, 1): six important points on the screen, three in
 each cockpit (graphics absolute).

SPOS%(1,1): dunefighters' x & y co-ordinates on the map
 (graphics absolute).

WINDOW%(1): whether either dunefighters' video screen needs
 clearing.

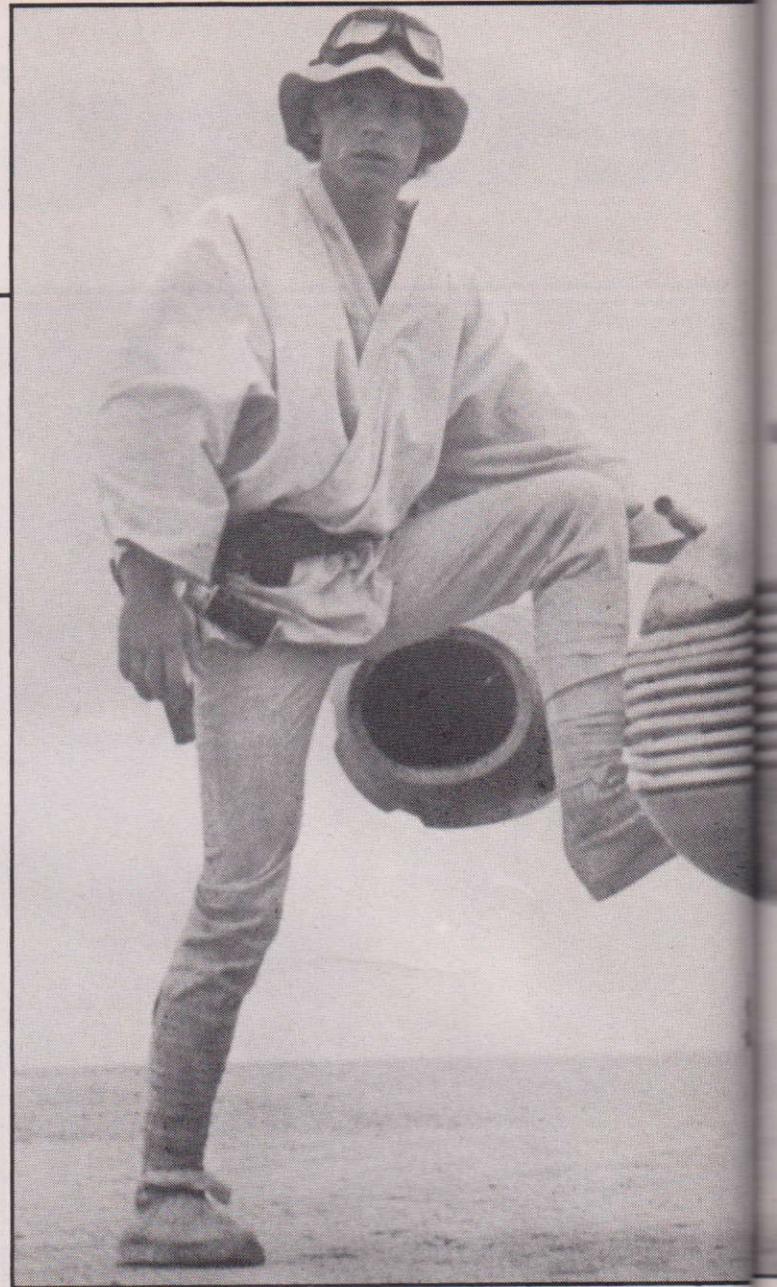
SPEEDO%(1): whether either dunefighters' speedometer needs
 updating.

DAMAGE%(1): damage accumulated by each dunefighter.

JOYSTICKS%: whether joysticks are in use or not.

GAMEND%: whether game has ended and how (0=DF1 won,
 1=DF2 won, 2=collision, 3=game not ended).

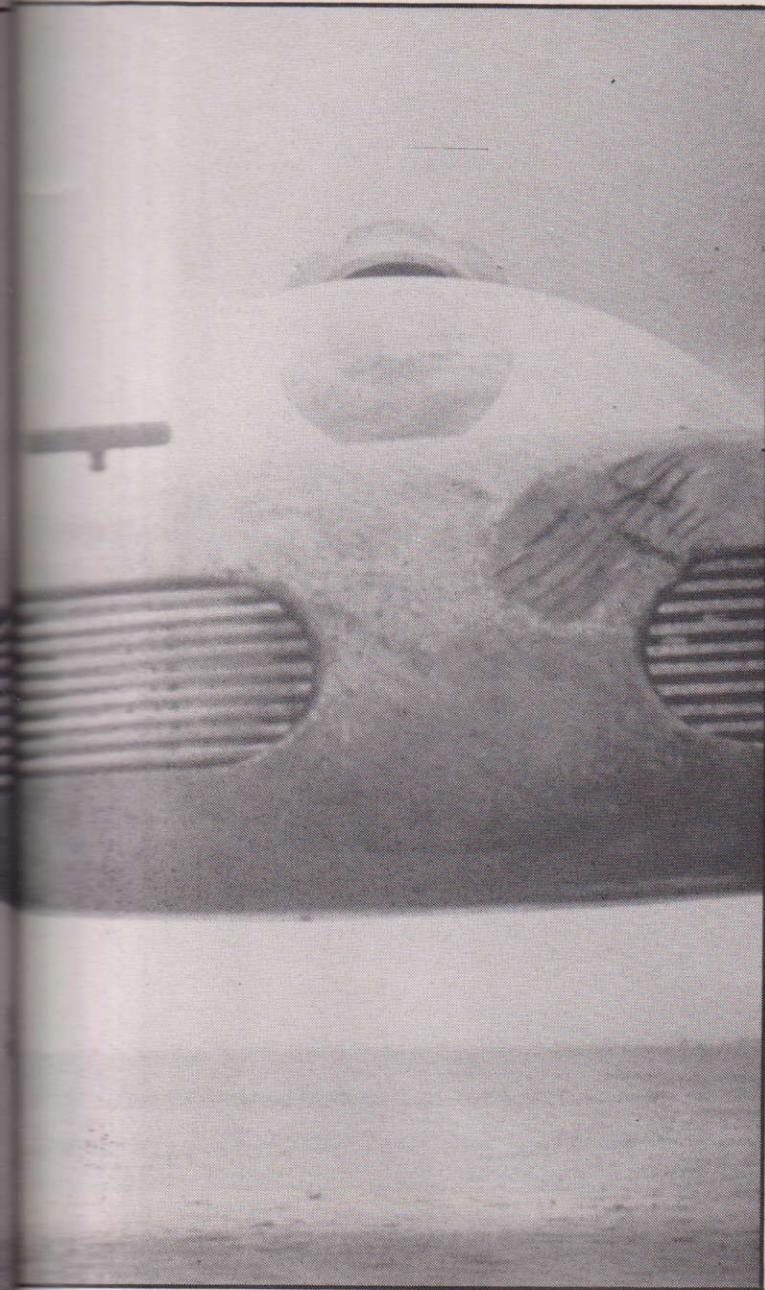
N0,N1,N0%,N1%,S0\$,S1\$ etc: utility variables used for various
 purposes in different parts of the program.



PROGRAM LISTING

```

10 REM DUNEFIGHTERS / A GAME FOR 2 PLAYERS
20 REM BY DANIEL J. BISHOP
30 REM VERSION 1.0 / 1 AUG 1983
40 REM NEEDS BBC MICRO MODEL B
50 REM COMPATIBLE WITH DISKS AND JOYSTICKS
60 AZ=0:BZ=0
70 *FX4,1
80 *FX11,0
90 *FX15,0
100 ON ERROR IF ERR=17 THEN MODE7:PROCInstructions:GOT
0110 ELSE ON ERROR OFF:PROCcapslock:MODE7:REPORT:PRINT:*
at line *;ERL:PROCKeybuff:PROCKEYS:END
110 RESTORE:CLEAR:TITLE$="DUNEFIGHTERS":CONT$=CHR$136+
"Press any key or firebutton to continue":JPOS0%=1000:JPO
S1%=21840:JPOS2%=43680:JPOS3%=64520
120 DIM GVECTORZ(15,1),VECTORZ(1,1),DFPOSZ(1,1),COLZ(1
),ANGZ(1),LASZ(1),GPOSZ(1,3,1),SPOSZ(1,1),WINDOWZ(1),SPEE
DOZ(1),DAMAGEZ(1)
130 DATA 0,0,1,0,-1,-1,0
140 DATA 208,416,304,240,304,640,128,640
150 DATA 0,42,79,103,112,103,79,42,0,-42,-79,-103,-112
,-103,-79,-42
160 DATA 0,0,3,0,-1,-1,0
170 DATA 880,416,976,240,976,640,800,640
    
```



```

180 DATA 112,103,79,42,0,-42,-79,-103,-112,-103,-79,-4
200 FOR LOOP0%=0 TO 1
210   FOR LOOP1%=0 TO 1
220     READ N0%:VECTORX(L00P0%,L00P1%)=N0%
230     DFPOSX(L00P0%,L00P1%)=RND(9999)
240     NEXT
250     READ N0%:COLX(L00P0%)=N0%
260     READ N0%:LASZ(L00P0%)=N0%
270     READ N0%:WINDOWX(L00P0%)=N0%
280     READ N0%:SPEED0X(L00P0%)=N0%
290     READ N0%:DAMAGEZ(L00P0%)=N0%
300     FOR LOOP2%=0 TO 1
310       READ N0%:GPOSX(L00P0%,L00P1%,L00P2%)=N0%
320       NEXT
330     NEXT
340   FOR LOOP1%=0 TO 15
350     READ N0%:GVECTORX(L00P1%,L00P0%)=N0%
360     NEXT
370   NEXT
380 ENVELOPE 1,1,-12,-1,-1,6,3,3,127,0,0,-5,126,126
390 VDU 23,230,255,255,255,255,255,255,255,255
400 VDU23,233,231,195,165,24,24,165,195,231
410 VDU23,235,4,32,1,4,32,4,65,200
420 VDU23,236,8,130,64,16,32,16,68,128
430 MODE7

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```

440 VDU 23;8202;0;0;0;
450 PRINT TAB(12,10)CHR$141;CHR$131;TITLE$
460 PRINT TAB(12,11)CHR$141;CHR$131;TITLE$
470 PRINT TAB(9,13)"A game for two players"
480 PRINT TAB(10,15);CHR$(131);"BY DANIEL J. BISHOP"
490 PROctune
500 PRINTTAB(4,20)CHR$136"Press ESCAPE for instruction
s"TAB(6,21)CHR$136"or any other key to start"TAB(4,22)CHR
$136"Press firebutton for Joysticks"
510 PROckeybuff
520 PROccont(0)
530 IF N2X>0 THEN JOYSTICKSZ=-1 ELSE JOYSTICKSZ=0
540 CLS:PRINTTAB(6,12)CHR$136"Game starts in 15 second
s":PROcrause(1):PROckeybuff
550 PROccont(1)
560 MODE5
570 VDUS
580 VDU19,1,0;0;19,2,0;0;19,3,0;0;
590 VDU 23;8202;0;0;0;
600 GCOL0,1
610 MOVE0,1023:PLOT85,608,0:MOVE608,1023:PLOT85,0,1073
620 GCOL0,3
630 MOVE672,0:MOVE672,1023:PLOT85,1279,1023:MOVE1279,0
:PLOT85,672,0
640 GCOL0,0
650 FOR LOOP0%=0 TO 1
660   MOVE GPOSX(L00P0%,2,0),GPOSX(L00P0%,2,1):PLOT0,-
304,0:PLOT0,0,383:PLOT81,304,0:PLOT0,304,0:PLOT81,0,-383
670   PROcvector(L00P0%,0)
680   MOVE GPOSX(L00P0%,0,0)-6,GPOSX(L00P0%,0,1)+10:PL
OT1,202,0:PLOT1,0,-42:PLOT1,-202,0:PLOT1,0,42
690   PROccircle(GPOSX(L00P0%,1,0),GPOSX(L00P0%,1,1),1
30):PROccircle(GPOSX(L00P0%,1,0),GPOSX(L00P0%,1,1),220)
700   SPOSX(L00P0%,0)=500+DFPOSX(L00P0%,0)DIV36:SPOSX(
L00P0%,1)=800+DFPOSX(L00P0%,1)DIV46
710   PROcwindow(L00P0%)
720   NEXT
730 GCOL0,2:MOVE 490,798:PLOT1,0,224:PLOT1,300,0:PLOT1
,0,-224:PLOT1,-300,0
740 MOVE208,80:GCOL0,0:PRINT "DF1":MOVE880,80:PRINT "D
F2"
750 GAMENDZ=3
760 VDU19,1,1;0;19,2,3;0;19,3,6;0;
770 REPEAT:PROccameloop:UNTIL GAMENDZ<3
780 IF GAMENDZ=0 THEN AX=AX+1
790 IF GAMENDZ=1 THEN BX=BX+1
800 PROcdestroyed(GAMENDZ)
810 VDU 23;8202;0;0;0;
820 PROckeybuff
830 PROccaslock
840 MODE7
850 PRINT TAB(10,5)CHR$141CHR$131TITLE$TAB(10,6)CHR$14
1CHR$131TITLE$TAB(11,7)CHR$131"HALL OF FAME"
860 PRINT "Dunefighter One has won"CHR$129CHR$136;AXCH
R$137CHR$135"battle";:IF AX=1 THEN PRINT"." ELSE PRINT"s.
"
870 PRINT "Dunefighter Two has won"CHR$134CHR$136;BXCH
R$137CHR$135"battle";:IF BX=1 THEN PRINT"." ELSE PRINT"s.
"
880 PROckeybuff
890 INPUT TAB(0,15)"Do you wish to play again",S0$
900 IF S0$<>"Y" AND S0$<>"YES" AND S0$<>"N" AND S0$<>"
NO" THEN 840
910 IF S0$="Y" OR S0$="YES" THEN 110
920 PRINT"BASIC":PROckeys:ON ERROR OFF:END
930 DEF PROcwindow(N0%):GCOL0,2:MOVE GPOSX(N0%,2,0),GP
OSX(N0%,2,1):PLOT0,-224,0:PLOT0,224,-128:PLOT81,224,128:P
LOT0,-448,4:PLOT0,448,0:GCOL0,0:PLOT81,-224,316:ENDPROC
940 DEF PROccameloop
950 IF INKEY(-65) OR (ADVAL(2)>JPOSZ% AND JOYSTICKSZ)
THEN PROccancel(0)
960 IF INKEY(-74) OR (ADVAL(4)>JPOSZ% AND JOYSTICKSZ)
THEN PROccancel(1)
970 IF INKEY(-67) OR (ADVAL(1)<JPOS1% AND JOYSTICKSZ)
THEN PROccright(0)
980 IF INKEY(-104) OR (ADVAL(3)<JPOS1% AND JOYSTICKSZ)T
HEN PROccright(1)

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990 IF INKEY(-81) OR (ADVAL(2)<JPOS1% AND JOYSTICKSZ)
THEN PROCdecel(0)
1000 IF INKEY(-90) OR (ADVAL(4)<JPOS1% AND JOYSTICKSZ)
THEN PROCdecel(1)
1010 IF INKEY(-98) OR (ADVAL(1)>JPOS2% AND JOYSTICKSZ)
HEN PROCleft(0)
1020 IF INKEY(-103) OR (ADVAL(3)>JPOS2% AND JOYSTICKSZ)
HEN PROCleft(1)
1030 PROCfire:IF VECTORZ(0,1)>0 OR VECTORZ(1,1)>0 THEN
SOUND&10,-3,4,-1 ELSE SOUND&10,0,0,0
1040 FOR LOOP0%=0 TO 1:IF VECTORZ(LOOP0%,1)<0 THEN VECT
ORZ(LOOP0%,1)=0
1050 DFPOSZ(LOOP0%,0)=(DFPOSZ(LOOP0%,0)+VECTORZ(LOOP0
%,1)*SIN(2*PI*(VECTORZ(LOOP0%,0)/16)))/MOD10000:DFPOSZ(LOO
P0%,1)=(DFPOSZ(LOOP0%,1)+VECTORZ(LOOP0%,1)*COS(2*PI*(VECT
ORZ(LOOP0%,0)/16)))/MOD10000
1060 FOR LOOP1%=0 TO 1:IF DFPOSZ(LOOP0%,LOOP1%)<0 THEN
DFPOSZ(LOOP0%,LOOP1%)=10000+DFPOSZ(LOOP0%,LOOP1%)
1070 PROCfire:NEXT:NEXT
1080 DISTZ=SQR((DFPOSZ(0,0)-DFPOSZ(1,0))^2+(DFPOSZ(0,1)
-DFPOSZ(1,1))^2):IF DISTZ<10 THEN GAMENDZ=2
1090 FOR LOOP0%=0 TO 1:N3%=FNother(LOOP0%)
1100 N0%=DFPOSZ(N3%,0)-DFPOSZ(LOOP0%,0):ANGZ(LOOP0%)=
DEG(ASN(N0%/DISTZ)):IF DFPOSZ(LOOP0%,0)<DFPOSZ(N3%,0) AN
D DFPOSZ(LOOP0%,1)>DFPOSZ(N3%,1) THEN ANGZ(LOOP0%)=180-AN
GZ(LOOP0%)
1110 IF DFPOSZ(LOOP0%,0)>DFPOSZ(N3%,0) AND DFPOSZ(LOO
P0%,1)>DFPOSZ(N3%,1) THEN ANGZ(LOOP0%)=180-ANGZ(LOOP0%)
1120 IF DFPOSZ(LOOP0%,0)>DFPOSZ(N3%,0) AND DFPOSZ(LOO
P0%,1)<DFPOSZ(N3%,1) THEN ANGZ(LOOP0%)=(360+ANGZ(LOOP0%)
)/MOD360
1130 N0%=360*(VECTORZ(LOOP0%,0)/16):N1%=N0%-90:IF N1%
<0 THEN N1%=N1%+360
1140 N2%=N0%+90:IF N2%>359 THEN N2%=N2%-360
1150 N3%=0:IF ANGZ(LOOP0%)>N1% AND ANGZ(LOOP0%)<N1%+1
80 THEN ANGZ(LOOP0%)=ANGZ(LOOP0%)-N1%:N3%=1:GOTO 1170
1160 IF ANGZ(LOOP0%)>N2%-180 AND ANGZ(LOOP0%)<N2% THE
N ANGZ(LOOP0%)=180-(N2%-ANGZ(LOOP0%)):N3%=1
1170 IF WINDOWZ(LOOP0%) THEN PROCwindow(LOOP0%)
1180 IF DISTZ<5000 AND N3%=1 THEN PROCdunefighter(LOO
P0%,ANGZ(LOOP0%)*1.9,50-DISTZ/100)
1190 PROCfire:IF LASZ(LOOP0%) THEN PROCclaser(LOOP0%)
1200 MOVE GPOSZ(LOOP0%,2,0),GPOSZ(LOOP0%,2,1):PLOT0,-
32,16:GCOL0,COLZ(LOOP0%):VDU233:IF SPEED0Z(LOOP0%) THEN S
0%=STR$(VECTORZ(LOOP0%,1)) ELSE GCOL0,0:GOTO 1230
1210 IF LEN(S0%)<3 THEN S0%="0"+S0%:GOTO 1210
1220 MOVE GPOSZ(LOOP0%,0,0),GPOSZ(LOOP0%,0,1):GCOL0,C
OLZ(LOOP0%):VDU230,230,230:GCOL0,0:MOVE GPOSZ(LOOP0%,0,0)
,GPOSZ(LOOP0%,0,1):PRINTS0%:SPEED0Z(LOOP0%)=0
1230 PLOT69,SPOSZ(LOOP0%,0),SPOSZ(LOOP0%,1):SPOSZ(LOO
P0%,0)=500+DFPOSZ(LOOP0%,0):DIV36:SPOSZ(LOOP0%,1)=800+DFPO
SZ(LOOP0%,1):DIV46:GCOL0,COLZ(LOOP0%):PLOT69,SPOSZ(LOOP0%,
0),SPOSZ(LOOP0%,1):NEXT:ENDPROC
1240 DEF PROCcaccel(N0%):IF (N0%=0 AND (INKEY(-83)OR(JOYS
TICKSZANDADVAL(2)<JPOS3%))OR(N0%=1 AND (INKEY(-102)OR(JO
YSTICKSZANDADVAL(4)<JPOS3%))) THENN1%=30ELSEN1%=10
1250 VECTORZ(N0%,1)=VECTORZ(N0%,1)+N1%:IF VECTORZ(N0%,1
)>300 THEN VECTORZ(N0%,1)=300
1260 PROCengines(N0%,VECTORZ(N0%,1)):SPEED0Z(N0%)=-1:EN
DPROC
1270 DEF PROCright(N0%):IF (N0%=0AND(INKEY(-83)OR(JOYSTI
CKSZANDADVAL(1)<JPOS0%))OR(N0%=1AND(INKEY(-102)OR(JOYSTI
CKSZANDADVAL(3)<JPOS0%))) THENN1%=4ELSEN1%=1
1280 PROCvector(N0%,COLZ(N0%)):VECTORZ(N0%,0)=(VECTORZ
(N0%,0)+N1%)/MOD16:PROCvector(N0%,0):ENDPROC
1290 DEF PROCdecel(N0%):IF (N0%=0AND(INKEY(-83)OR(JOYSTI
CKSZANDADVAL(2)<JPOS0%))OR(N0%=1AND(INKEY(-102)OR(JOYSTI
CKSZANDADVAL(4)<JPOS0%))) THENN1%=30ELSEN1%=10
1300 VECTORZ(N0%,1)=VECTORZ(N0%,1)-N1%:IF VECTORZ(N0%,1
)<0 THEN VECTORZ(N0%,1)=0
1310 PROCengines(N0%,VECTORZ(N0%,1)):SPEED0Z(N0%)=-1:EN
DPROC
1320 DEF PROCleft(N0%):PROCvector(N0%,COLZ(N0%)):IF (N0
%=0AND(INKEY(-83)OR(JOYSTICKSZANDADVAL(1)>JPOS3%))OR(N0%
=1AND(INKEY(-102)OR(JOYSTICKSZANDADVAL(3)>JPOS3%))) THENN1
%=4ELSEN1%=1
1330 VECTORZ(N0%,0)=VECTORZ(N0%,0)-N1%:IF VECTORZ(N0%,0

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)<0 THEN VECTORZ(N0%,0)=VECTORZ(N0%,0)+16
1340 PROCvector(N0%,0):ENDPROC
1350 DEF PROCdunefighter(N6%,N2%,N8%):N2%=N2%+GPOSZ(N6%
,3,0):N9%=FNother(N6%)
1360 N0%=N2%-N8%:N1%=640-(N8%/2):N3%=640+(N8%/2):N4%=N2
%+N8%:IFPOINT(N0%,N1%)=2ANDPOINT(N2%,N3%)=0ANDPOINT(N4%,N
1%)=2THENMOVE0%,N1:MOVE2%,N3:MOVE4%,N4:COLZ(N9%):PLOT85,N
4%,N1%:GCOL0,0:DRAWN2%,N3%:DRAWN0%,N1%:DRAWN4%,N1%:WINDOW
Z(N6%)=-1
1370 ENDPROC
1380 DEF PROCclaser(N0%):LASZ(N0%)=0:N1%=FNother(N0%)
1390 IF POINT(GPOSZ(N0%,2,0),GPOSZ(N0%,2,1)-10)<>2 THEN
DAMAGEZ(N1%)=DAMAGEZ(N1%)+(5000-DISTZ)+(RND(1000)-500):I
F DAMAGEZ(N1%)>15000 THEN GAMENDZ=N0%
1400 GCOL0,COLZ(N0%):MOVE GPOSZ(N0%,2,0),GPOSZ(N0%,2,1)
:PLOT17,-144,-128:PLOT0,288,0:PLOT17,-144,128:SOUND&13,1,
220+30*N0%,20:WINDOWZ(N0%)=-1:ENDPROC
1410 DEF PROCvector(N0%,N1%):GCOL0,N1%:MOVE GPOSZ(N0%,
1,0),GPOSZ(N0%,1,1):PLOT1,GVECTORZ(VECTORZ(N0%,0),0),GVEC
TORZ(VECTORZ(N0%,0),1):ENDPROC
1420 DEF PROCdestroyed(N0%)
1430 N1%=FNother(N0%)
1440 N4%=0:IF N0%=2 THEN N4%=-1:N0%=0:N1%=1
1450 *FX15,0
1460 FOR LOOP0%=150 TO 0 STEP-1
1470 IF RND(3)=1 THEN SOUND&10,LOOP0%/-10,RND(2)+4,5
1480 IF N4%=0 THEN 1500
1490 N0%=FNother(N0%):N1%=FNother(N1%)
1500 VDU19,COLZ(N1%),RND(4)-1,0,0,0:IF RND(10)=1 AND
N4%=0 THEN MOVE GPOSZ(N0%,2,0)+(RND(100)-50),GPOSZ(N0%,2,
1)+(RND(100)-50):GCOL0,COLZ(N1%):VDU(234+RND(2)):MOVE GPO
SZ(N0%,2,0)-32,GPOSZ(N0%,2,1)+16:GCOL0,COLZ(N0%):VDU233
1510 NEXT

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y be severely damaged. A number of hits will cause
destruction."
1740 PRINT'CONT$
1750 PROCpause(1)
1760 PROCkeybuff
1770 PROCcont(0)
1780 CLS:PRINT''The 3-figure digital display shows"
1790 PRINT'the speed at which the dunefighter is trav
elling (maximum 300MPH). A pointer on each dashboard sho
ws the direction inwhich each dunefighter is heading,
relative to the map at the top of the'
1800 PRINT'display. When a player moves across theedge
of the map, he appears on the opposite side - i.e.
there is 'wrap-around'."
1810 PRINT'CONT$
1820 PROCpause(1)
1830 PROCkeybuff
1840 PROCcont(0)
1850 CLS:PRINT''CHR$131'CONTROLS:''TAB(14)'DF1'TAB(26)'
DF2"
1860 PRINT'Accelerate'CHR$129TAB(14)*CAPS LOCK*CHR$134T
AB(26)*RETURN"
1870 PRINT'Decelerate'CHR$129TAB(14)*SHIFT LOCK*CHR$134
TAB(26)*DELETE"
1880 PRINT'Left'CHR$129TAB(14)*Z*CHR$134TAB(26)*,"
1890 PRINT'Right'CHR$129TAB(14)*X*CHR$134TAB(26)*,"
1900 PRINT'Fire'CHR$129TAB(14)*TAB*CHR$134TAB(26)*Up ar
row"
1910 PRINT''To accelerate and decelerate more rap
idly, and to turn the dunefighter around quicker, each
player has a special key for this purpose, which m
ust be held down at the same time as the relevant contr
ol key."
1920 PRINT'For DF1 this is key'CHR$129*C*CHR$135"and fo
r DF2 this is key'CHR$134*M*CHR$135". Finally, do not ap
proach your enemy too closely or you may crash!"
1930 PRINT'CHR$136'Press ESCAPE at any time to see thes
e''CHR$136'instructions again.'"CONT$
1940 PROCpause(1)
1950 PROCkeybuff
1960 PROCcont(0)
1970 ENDPROC
1980 DEF PROCcapslock
1990 IF ?216=16 OR ?216=48 THEN ?216=32
2000 IF ?602=16 OR ?602=48 THEN ?602=32
2010 ENDPROC
2020 DEF PROCkeybuff
2030 *FX15,1
2040 ENDPROC
2050 DEF PROCkeys
2060 *FX4,0
2070 *FX12,0
2080 ENDPROC
2090 DEF PROCpause(N0)
2100 TIME=0:REPEAT:UNTIL TIME>N0*100
2110 ENDPROC
2120 DEF PROCcircle(N0,N1,N4)
2130 N2%=100: N3=2*PI/N2%
2140 N9=SIN(N3):N10=COS(N3)
2150 N5=N4:N6=0
2160 MOVE N0+N5,N1+N6
2170 FOR LOOP1%=1 TO N2%
2180 N7=N5*N10-N6*N9
2190 N8=N5*N9+N6*N10
2200 DRAW N0+N7,N1+N8
2210 N5=N7:N6=N8
2220 NEXT:ENDPROC
2230 DEF FNother(N0%):IF N0%=0 THEN =1
2240 =0
2250 DEF PROCfire:N0%=ADVAL(0) AND 3:IF INKEY(-97) OR (
JOYSTICKS% AND (N0%=1 OR N0%=3)) THEN LASZ(0)=-1
2260 IF INKEY(-58) OR (JOYSTICKS% AND (N0%=2 OR N0%=3))
THEN LASZ(1)=-1
2270 ENDPROC
2280 DEF PROCcont(N0%)
2290 N1%=0:REPEAT
2300 N1%=N1%+N0%:N2%=ADVAL(0) AND 3: N3%=INKEY(-129)
2310 UNTIL N1%=1000 OR N2%>0 OR N3%=0
2320 ENDPROC

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1520 VDU19,3,6,0,0,0,19,1,1,0,0,0
1530 CLS:PROCpause(1)
1540 ENDPROC
1550 DEF PROCengines(N0%,N1%):SOUND&10+N0%+1,-10*(N1%/3
00),N1%/10,-1:ENDPROC
1560 DEF PROCtune
1570 DATA 165,3,0,185,3,0,185,1,0,177,1,0,169,1,0,193,6
,0,165,1,1,185,1,0,177,1,0,169,1,0,193,6,0,165,1,1,185,1,
0,177,1,0,185,1,0,169,10,1
1580 RESTORE 1570
1590 ENVELOPE2,1,0,0,0,0,0,0,120,-2,0,-2,120,80
1600 FOR LOOP0%=0 TO 15
1610 READ N0%,N1%,N2%
1620 SOUND &201,2,N0%,N1%*2
1630 SOUND &202,2,N0%-48,N1%*2
1640 SOUND &203,2,N0%-96,N1%*2
1650 PROCpause(((14*N1%)+(30*N2%))/100)
1660 NEXT
1670 ENDPROC
1680 DEF PROCinstructions
1690 VDU 23;B202;0;0;0;
1700 PRINTTAB(10)CHR$131CHR$141TITLE$TAB(10,1)CHR$131CH
R$141TITLE$TAB(11,2)CHR$131'INSTRUCTIONS"
1710 PRINT'TITLE$' is a real time game for 2 players.
Each has control of one dunefighter. The object o
f the game is to fly over the desert sands and to fin
d and destroy your enemy."
1720 PRINT''Each player sees a view of his dashboardand
videoccreen from inside his cockpit.At the centre of eac
h videocreen a laser sight is superimposed on the
horizon. When the lasers are fired,"
1730 PRINT'twin beams converge on the laser sight, if t
he enemy dunefighter is close, and in your sights, it ma

```

Disc Doctor

Trevor Attewell

'Disc Doctor', from Computer Concepts, is a rom-based set of 20 utilities, including six non-disc ones, and does not occupy any normal user memory. It is simply inserted into one of the spare sockets below the rear of the keyboard — instructions for this are included. If all your sockets are full, extension boards for 13 roms are now available. A spiral-

An essential tool for all Disc based systems. We look at Computer Concepts comprehensive version.

by the cursor keys, using SHIFT for line or block jumps. The disc is not overwritten until an attempt is made to exit the sector, which produces a SAVE (Y/N)? message, and fails safe for anything other than a case-specific Y.

A similar memory editor is called by *MZAP, with the important (and necessary) differences that editing is instantaneous. Great care is needed to avoid accidental key depression, but cursor keys, SHIFT, CTRL, TAB and ESCAPE are safe. These keys provide movement by single bytes, by lines or blocks (16 lines = &80 bytes). By holding down SHIFT you can zip through the entire memory from 0 to &FFFF in ten seconds! *MZAP is circular, passing through 0 to &FFFF and vice versa. The star-

file names per disc in two catalogues. The *SWAP facility reserves a special, locked file, and the careless use of wildcard ACCESS and WIPE commands can delete it, with the loss of half or all the disc contents. Both catalogues can be tilted separately, and the current catalogue is always the last used, regardless of switch-off or disc change.

```
DISC DOCTOR 1.05
DIS <<sta>> <<end>> <<ofs>>
DISCTAPE <afsp> <<afsp>>
DOWNLOAD <fsp> <<adr>>
DSEARCH <str> <trk> <<trk>><trk>><sct>><drv>>
DZAP <<trk>> <<trk>><sct>><drv>>
EDIT <<key no.>>
FIND <str>
FORM <drv> <no. trks> <<stt>> <<S>>
JOIN <fsp> <afsp> <<afsp>>
MENU <<drv>>
MOVE <<dest page>> <<src page>>
MSEARCH <str> <<adr>>
MZAP <<adr>>
PARTLOAD <fsp> <ofs> <ext> <adr>
RECOVER <trk> <sct> <sct> <adr> <drv>
RESTORE <trk> <sct> <sct> <adr> <drv>
SHIFT <src> <dest> <ext>
SWAP <<drv>>
TAPEDISC <<fsp>>
VERIFY <<drv>> <<no. trks>> <<stt>>
```

OS 1.20

>

bound manual devotes at least one of its 39 pages to each command, plus command lists and general information. It is comprehensible as well as comprehensive.

Typing *HELP DISC DOCTOR (return) — (*H.DI. will usually be enough) — displays all the commands together with their arguments, those enclosed in rounded brackets being optional. These won't be needed very often, since the Disc Doctor is friendly, responding to incorrect syntax with a reminder of the correct version. It will not prompt for optional arguments, of course! All commands are prefaced with '*', since they are treated as system commands, and offered to each ROM in turn until recognised. Hence a valid abbreviation for any command is the minimum number of letters required to distinguish it from any other.

COMMANDS

For review purposes it is convenient to divide the commands into arbitrary groups, starting with formatting. *FORM will format any number of tracks up to 99, though most users will only use 40 or 80. The number must suit the drive, of course, and for unusual reason it has not been possible to check the operation with unusual numbers of tracks. The command can also format a limited, specified sequence of tracks, often a cure for reported 'disc faults'. An optional *VERIFY is incorporated, which can be called independently to check any disc without corrupting its contents. Another *FORM option effectively divides the disc into two halves (e.g. a 40-track disc becomes a 2 x 20-track) which are separately accessible using a *SWAP command, allowing 60

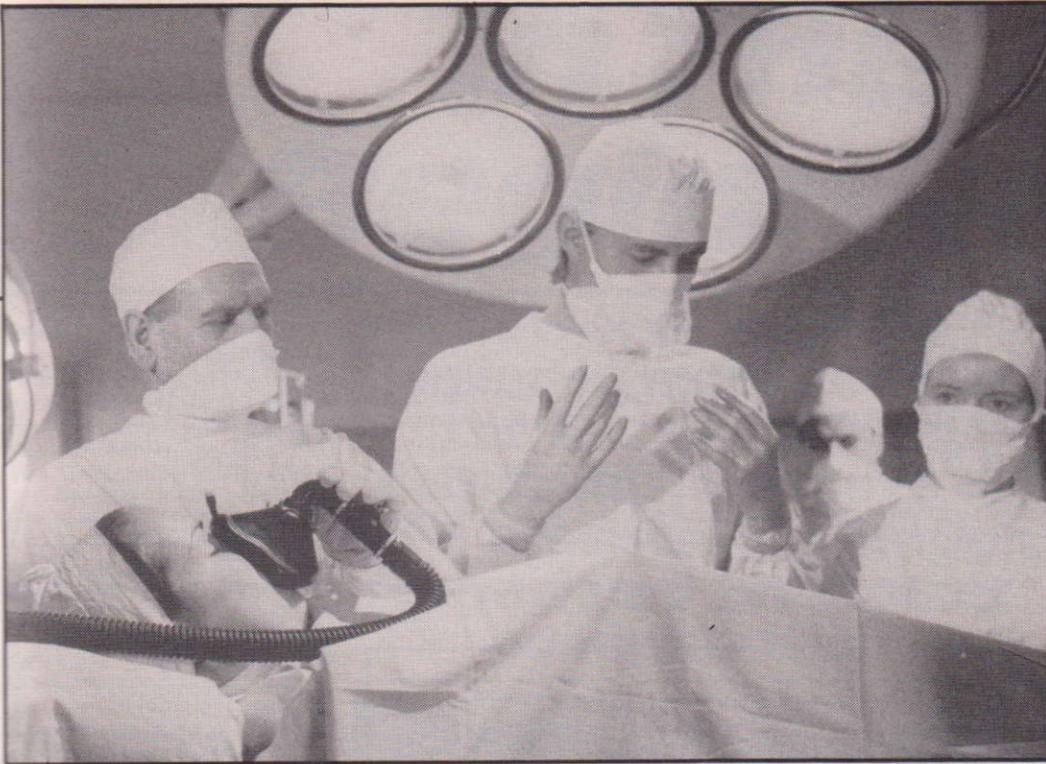
ADDR	HEX CODE	ASCII
7FEB	20 20 20 20 20 20 20 20	
7FF0	20 20 20 20 20 20 20 20	
7FF8	20 20 20 20 20 20 20 20	
8000	00 00 00 4C 65 80 82 1A	...Le...
8008	05 44 49 53 43 20 44 4F	.DISC DO
8010	43 54 4F 52 20 00 31 2E	CTOR .1.
8018	30 35 00 28 43 29 20 20	05.(C)
8020	43 4F 4D 50 55 54 45 52	COMPUTER
8028	43 4F 4E 43 45 50 54 53	CONCEPTS
8030	00 42 79 20 50 61 75 6C	.By Paul
8038	20 48 69 73 63 6F 63 6B	Hiscock
8040	2B 4F 6C 69 76 65 72 20	+Oliver
8048	57 75 72 73 74 6C 69 6E	Wurstlin
8050	20 6F 66 20 50 4F 4D 20	of POM
8058	53 4F 46 54 57 41 52 45	SOFTWARE
8060	20 31 39 38 33 08 48 8A	1983.H.
8068	8E 30 01 48 98 48 BA BD	.O.H.H.=
8070	03 01 C9 03 F0 0B C9 04	.I.p.I.
8078	F0 2C C9 09 D0 25 4C 2B	p,I.P%L+
8080	84 A9 7A 20 F4 FF E0 65	.)z t#fe
8088	D0 10 A9 78 20 F4 FF A9	P.)x t#)
8090	0F 20 F4 FF A9 00 AA 20	. t#).*

Two 'ZAP' commands are used for interactive editing, and not for the total obliteration suggested by their names! *DZAP displays the contents of any disc sector, and CTRL-cursor keys permit jumping in either direction between tracks or sectors. The display header gives the current track and sector, and an indication of the type of keyboard input expected. This may be ASCII, hex, decimal or binary, and a pair of arrows indicates the byte available for alteration, moveable

location can be specified, defaulting to the current PAGE. Another very useful command (*EDIT) displays the contents of any one or all the user-defined keys (0-15), and allows them to be edited.

SEARCH TIMES THREE

Search utilities are almost indispensable adjuncts to editors, and Disc Doctor provides three.



memory. *DOWNLOAD loads a file from disc and then shifts it up or down to a specified address, the default being the file re-load address. For any page between &C00 and &1100 the cassette interface is automatically selected to avoid corruption by the DFS. Among the more obvious uses are the execution of programs too long to be run from disc. *MOVE is similar to *DOWNLOAD, but operates between page boundaries only on the whole of a program already in memory. Source and destination addresses are optional, defaulting to current address and &E00 respectively, and non-boundary addresses are rounded down to the next lower boundary. *SHIFT is similar to *MOVE, but moves a specified block of memory from any start address to any other. In this way a large block can be moved as little as one byte if necessary. The original and shifted programs can

this job, ignoring the normal DFS conventions. *RECOVER loads any specified group of sectors into memory, where *MZAP can be used to inspect and edit them, after which *RESTORE will return them to the disc. The latter command requires considerable

```

>*DIS A00
0A00 BRK 00
0A01 ??? 03
0A02 STA &73 85 73
0A04 LDX #&00 A2 00
0A06 JSR &0A95 20 95 0A

JUMPS
<&8000

0A95 LDA #&01 A9 01
0A97 JSR &FFEE 20 EE FF
0A9A LDA &0AA6,X BD A6 0A
0A9D JSR &FFEE 20 EE FF
0AA0 INX E8
0AA1 CPX &73 E4 73
0AA3 BNE &0A95 D0 F0
0AA5 RTS 60

0A09 LDA #&02 A9 02
0A0B JSR &FFEE 20 EE FF
0A0E LDX #&04 A2 04
0A10 LDA #&85 A9 85
0A12 JSR &FFF4 20 F4 FF
0A15 STY &0A22 8C 22 0A
    
```

*DSEARCH looks for strings and/or numeric codes of disc, starting at a specified track. Numeric codes can include Basic tokens. After each occurrence the display is held until the COPY key is pressed before moving on to the next. *MSEARCH performs the same function for the whole of memory, and is extremely fast. In each case the search halts with the defining arrows enclosing the single code sought, or the first character of a string. Both *DSEARCH and *MSEARCH are also interactive. Finally, *FIND (non-interactive) will locate all occurrences of a string in a Basic program, and responds with the relevant line

numbers. Where the hunted string appears more than once in a line, that line number is repeated for every appearance. Keywords can be found by using their tokens, and mixed strings are allowed. The search is so fast that a whole screenful of line numbers (if needed) appears in little more than a second.

If a file cannot be loaded from disc for any reason (for example because it has been deleted), the only hope is to load the appropriate sectors directly from the disc (as long as they haven't been overwritten!), sort out any problem and rewrite the result back to the disc. *RECOVER and *RESTORE do

DRIVE:	00	TRACK:	00	SECTOR:	00			
00	53	43	52	41	54	43	20	SCRATCH
08	44	45	4D	4F	20	20	49	DEMO I
10	44	45	4D	4F	20	20	A4	DEMO \$
18	49	4E	44	45	58	45	A4	INDEXERS
20	54	4F	4E	45	44	4D	A4	TONEDMP\$
28	54	4F	4E	45	50	52	A4	TOPEPTS
30	53	50	4C	4F	52	44	A4	SPLORDS\$
38	4C	41	4E	44	45	52	A4	LANDER \$
40	50	48	4F	54	4F	20	A4	PHOTO \$
48	→54	4F	4E	45	43	44	A4	TOPECD\$
50	53	50	4C	4F	52	44	A4	SPLORD \$
58	43	44	4C	4E	50	52	A4	COLNPR2\$
60	43	44	4C	4E	50	52	A4	COLNPR1\$
68	42	49	47	43	48	52	A4	BIGCHR \$
70	53	50	49	44	45	52	A4	SPIDER \$
78	46	49	4C	45	53	20	A4	FILES \$
80	4D	45	4E	55	20	20	A4	MENU \$
88	50	41	49	4E	54	45	A4	PAINTERS
90	53	57	49	4E	47	20	A4	SWING \$
98	42	4F	55	4E	43	45	A4	BOUNCE \$
A0	44	55	41	4C	20	20	A4	DUAL \$

circumspection in use, for obvious reasons, and gives an 'Are you sure?' warning. *DSEARCH (see above) is very useful in locating a file for which the start sector is unknown.

Three commands are available to shift things around in

overlap, and the former is only deleted where overlap occurs. Disc Doctor itself cannot be moved — guess why?

DISSASSEMBLY

No set of utilities would be com-

CONTINUED OVER

plete without a machine-code disassembler, and *DIS has optional start, finish and offset parameters. Disassembly can be stepwise or continuous, and the usual paged-mode controls will work, as will a printer, the use of CTRL-B making the display black-and-white (some printers are upset by colour codes). The disassembled code can be saved on the current filing system using *SPOOL "FILENAME". Other facilities include backspacing, optional jump execution (excluding jumps into the O.S. if required), display in data or mnemonic form, return from jumps (useful in ducking out of a loop entered by mistake), and shifting to a new disassembly address.

The last group comprises miscellaneous file-handling commands. *DISCTAPE and *TAPEDISC automatically transfer one or more files (with directory letter is wished) from disc to tape or vice versa, via memory. Motor control is not really necessary because transfers between disc and memory are so rapid. Everything comes to a grinding halt if a named file is not found, or other loading errors occur, but *OPT2,* helps.

*JOIN links several specified files into a single, named file, leaving the originals intact. The object file can be of any length within the spare disc capacity, and a single file can be 'joined' to give a copy of itself under another name. The command has many uses, not least in joining WORDWISE files, permitting a long text to be edited and previewed in sections (retaining 80-column mode) and then printed as a whole *PARTLOAD is a complementary command that loads part of a long file (specified as one or more disc sectors) into memory. The sector-specific limitations of this utility can be overcome by the judicious use of *MZAP and *SHIFT. *MENU display files previously given special directory letters, and any of these, including machine-code, is loaded and run by merely pressing one

key. Files chained by the selected file are also accommodated.

FLEXIBLE AND FRIENDLY

All the commands can be called from Basic programs, facilities (WORDWISE for example) and other languages. Thus programs can move themselves for security

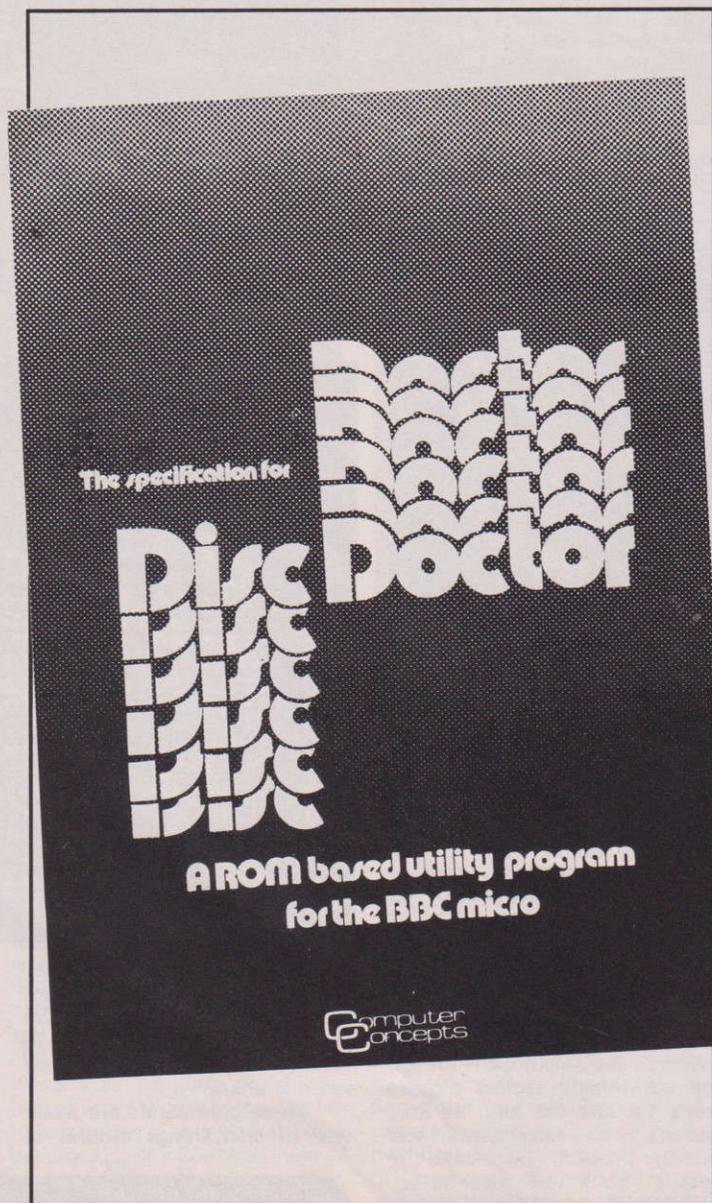
or space reasons, files produced can be joined, areas of 'special' discs interchanged, and so on. A fascinating feature of Disc Doctor is that numerical arguments can be given in any radix up to 99! Binary, decimal and hex will be used most, perhaps octal (any duodecimal freaks out there?), but base 37 may be less common! Shorthand symbols can preface decimal or hex input (there are always defaults), and system

variables (eg EDIT X% from within programs) are valid.

Disc Doctor uses colour in its displays, which are clearly readable in black-and-white, except that red characters (not much used) require good contrast. After some weeks of use, trying just about every command variation possible, no bugs have been spotted (version 1.05). Being naturally greedy, I should like an option to make the disassembly interactive, but no set of utilities will ever satisfy everyone! I found only one minor irritation, namely that the keyboard input in search mode reverts to ASCII at each string occurrence, and in this mode the cursor steps on automatically if a key is pressed. If you are not using ASCII, and forget to reselect your alternative mode at the next occurrence, you may obliterate several bytes before realising it.

I would be happier without the auto-advance, probably because I happen to use hex more than ASCII. Disc Doctor appears to borrow bytes in page &A00 and from &1100 upwards for temporary storage, so any machine-code programs in these areas should be relocated (or reloaded) after using D.D.).

Disc Doctor will provide anyone who has a reasonable working knowledge of the Beeb micro and its filing systems with a number of powerful tools, particularly necessary in potentially disastrous situations. The less experienced will find it useful for exploration, leading to better understanding and a more effective use of its facilities. Frequent recourse to the manual is necessary at first, but the need soon becomes minimal. At £33.35 including VAT this impressive piece of firmware is a worthy companion to WORDWISE, and if I now had to do without it I should certainly be looking for its nearest relative! Buyers should make sure that the vendor gives them a postpaid registration card, and a serial numbered manual. If the completed card is not returned to Computer Concepts you will not receive any subsequent upgrade concessions or technical backup.



In The Beginning

G W Gallagher

To the uninitiated, the appearance of even one microcomputer in a school suggests that the drudgery of record-keeping should be taken over, and the cry goes up "What about the Admin?" It is even possible that those holding the purse strings were persuaded to invest in micro-technology because the carrot of help with such chores was dangled before them. But, in practice, the subject can be a thorny one.

Consider the practical points which need to be decided before the project can get under way.

Does the school own one micro, or a few, or a larger number? Will any 'Admin' program have to use a small fraction of the computer time available or will it have its own facilities?

Will the bursar or school secretary take over the running of the program, or will it be left to an enthusiastic member of staff in his/her 'free' time? I have known of schools where the information about pupils was entered by fourth formers as part of a Computer Studies program, and this in itself limits the type of information which can be stored to that which is not a confidential nature.

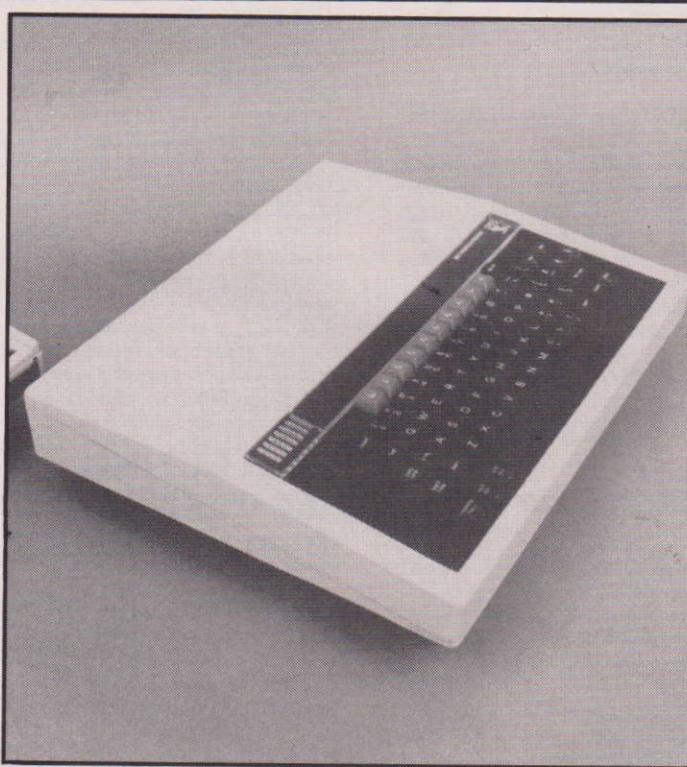
NEW VERSUS OLD

From experience, some pieces of information are more easily extracted in a hurry from a card system or filing system, particularly if the computer is stored in a room in a different part of the building, and there is a class already there. Such details as addresses and telephone numbers, which can be needed frequently in emergency should probably not be kept solely on disc. On the other hand, lists of all kinds, whether by form, sex or subjects can be produced very easily and accurately, while the provision of the figures for Form 7 can be seen in a few minutes.

In the coming issues, we shall set up a suite of programs, planned as follows:

1. Set up a file of student names, date of birth etc.
2. Add to each record the subjects being taken at A,O or CSE or other level.

Now that we have looked in more detail at the BBC BASIC filing commands, we move on to a practical application formulated for schools administration.



3. Program to produce lists of as many types as possible.
4. Program to produce the figures to complete Form 7.
5. Program to review the data at the end of each academic year, or to alter an individual record.
6. To print out an individual timetable, for any student whose subjects have been decided.

SETTING UP THE FILE

Since the record of each individual pupil is stored as a string

+ spaces for subjects, at two spaces per subject.

Thus a record might read:
A\$ = "1234SMITH JONATHAN M110965A 5CDN + subjects"
i.e. Jonathan Smith, males, born on the 11th September, 1965, came from feeder school D and from catchment are N. He was in Division A and Form 5C. His number on the school roll was 1234.

Using the string notation introduced in previous articles.

LEFT\$(A\$,4) = roll number

MID\$(A\$,5,24) = name

MID\$(A\$,29,1) = male or female

MID\$(A\$,30,6) = date of birth

MID\$(A\$,36,4) = form reference

MID\$(A\$,40,1) = feeder school

MID\$(A\$,41,1) = catchment area

The subject section will be individual to the school concerned. The original program from which this was developed was run in a Sixth Form College, and there we needed four 'A' levels or 'O' or CSE, or a mixture of the three types. A secondary school without a sixth form will not be interested in A levels, but could need 10 or 11 subjects at other levels. A school with younger pupils may not wish to record subjects, but could have other needs.

In later articles it is hoped to include assistance with any other additions which are of interest to readers. If you have a particular interest, please write to me, c/o the magazine, and I will try to help.

The length of the string used above is 41 bytes. The filing system on the BBC automatically includes 2 pieces of information in each record, giving the type of record (numerical or string) and the length. These do not affect our program, except that we must include two spaces in our total length of string. I have actually used 70 spaces, allowing for subjects etc.

It is important that each piece of information added should be in a standard form, and the program includes procedures to add spaces where necessary.

CONTINUED OVER

PROGRAM LISTING

```

10DIM A$(50)
20CLS:PRINT"Is this a new file?(Y/N)"
40INPUT N$:IF N$="Y" OR N$="v" THEN 60
50IF N$="N" OR N$="n" THEN 70 ELSE 40
60 F=0:GOTO 100
70 F=1
100CLS
110PRINT"The following information is required"
120PRINT"for each addition to the file:"
130PRINT"1. Roll number"
140PRINT"2. Name"
150PRINT"3. Male or female"
160PRINT"4. Date of birth"
170PRINT"5. Feeder school"
180PRINT"6. Catchment area"
190PRINT"7. Course year"
200PROCWAIT:CLS
210PRINT"The program will allow up to 50 names"
220PRINT"to be added at a time before"
230PRINT"transferring the details to the file."
240PRINT"To stop adding new names at any time"
250PRINT"type = when asked for the next student."
270PROCWAIT:ADD=0
280CLS:A$=""
290PRINT"Next student"
300PRINT"Type = if you have finished."
310PRINT"School number"
320INPUT N$:IF N$="" THEN 540 ELSE 330
330PROCnumber:A$=A$+N$
340INPUT "Name,e.g. SMITH JONATHAN",N$:PROClength
350A$=A$+LEFT$(N$,24)
360INPUT"Male or female,M or F",N$
370A$=A$+LEFT$(N$,1)
380INPUT "Year of birth,e.g.83",N1
390INPUT "Month of birth,1 to 12",N2
400INPUT "Day of the month,1 to 31",N3
410PROCdate:A$=A$+N$
420PROCfeeder:INPUT"Feeder school",N$
430A$=A$+N$
440PROCcatchment:INPUT"Catchment area",N$:A$=A$+N$
450INPUT"Which year group",N$:PROCform
460A$=A$+N$
470CLS:PRINT":A$
480PRINT"Is this correct?(Y/N)":INPUT N$
490IF N$="v" OR N$="Y" THEN 530
500IF N$="n" OR N$="N" THEN 520 ELSE 480
520PRINT"You will have the opportunity to redo this":FOR T=1 TO 2000:NEXT:GOTO 280
530ADD=ADD+1:A$(ADD)=A$:IF ADD < 50 THEN 280 ELSE 540
540PRINT"These names will now be filed"
550 IF F=0 THEN PROCnewfile ELSE PROCaddnames
560CLS:PRINT"Do you wish to add more names?(Y/N)"
570 INPUT N$:IF N$="Y" OR N$="v" THEN 600
580IF N$="N" OR N$="n" THEN 900 ELSE 570
600PROCarrav: ADD=0:F=1:GOTO 280
900 END
1000DEFPROCWAIT
1010PRINT"Press the space bar to continue"
1020IF GET = 32 THEN 1030 ELSE 1020
1030ENDPROC
1040DEFPROCnumber
1050IF LEN(N$) > 3 THEN 1090
1060IF LEN(N$) = 3 THEN N$=" "+N$:GOTO 1090
1070IF LEN(N$) = 2 THEN N$=" "+N$:GOTO 1090
1080IF LEN(N$) = 1 THEN N$=" "+N$:GOTO 1090
1090ENDPROC
1100DEFPROCdate
1110IF N3<10 THEN N$="0"+STR$(N3) ELSE N$=STR$(N3)
1120IF N2<10 THEN N$=N$+"0"+STR$(N2) ELSE N$=N$+STR$(N2)
1130N$=N$+RIGHT$(STR$(N1),2)
1140ENDPROC
1150DEFPROCfeeder
1160CLS:PRINT"A St Andrews V Davison"
1170PRINT"B Bedford P Pringle"
1180PRINT"D Durrington O Others"
1240ENDPROC
1250DEFPROCcatchment
1260CLS:PRINT"N North"
1270PRINT"S South"
1280PRINT"E East"
1290PRINT"W West"
1350ENDPROC
1360DEFPROClength
1370IF LEN(N$)>23 THEN 1390
1380N$=N$+" ":GOTO 1370
1390ENDPROC
1400 DEFPROCnewfile
1410X=OPENOUT("ListB4")
1420PX=PTR#X
1430FOR I=1 TO ADD
1440PTR#X=PX
1450PRINT#X,A$(I)
1460PX=PX+70
1470NEXT
1480CLOSE#X
1490ENDPROC
1530ENDPROC
1540DEFPROCaddnames
1550RENAME ListB4 TEMP
1560Y=OPENOUT("ListB4")
1570X=OPENIN("TEMP")
1580PY=PTR#Y
1590PX=PTR#X
1600REPEAT
1610PTR#X=PX
1620INPUT#X,A$
1625 PRINT#Y
1630PTR#Y=PY
1640PRINT#Y,A$
1650PY=PY+70
1660PX=PX+70
1670UNTIL EOF#X
1680CLOSE#X
1700FOR I=1 TO ADD
1710PTR#Y=PY
1720PRINT#Y,A$(I)
1730PY=PY+70
1740NEXT I
1750 CLOSE#Y
1760 *DELETE TEMP
1770 ENDPROC
1800DEFPROCform
1810IF LEN(N$) > 3 THEN N$=LEFT$(N$,4):GOTO 1850
1820IF LEN(N$) > 2 THEN N$=LEFT$(N$,1)+" "+RIGHT$(N$,2):GOTO 1850
1830IF LEN(N$) > 1 THEN N$=LEFT$(N$,1)+" "+RIGHT$(N$,1):GOTO 1850
1840N$=N$+" "
1850ENDPROC
1860DEFPROCarrav
1870FOR I=0 TO 50
1880A$(I)=""
1890NEXT
1900ENDPROC
2000 X=OPENIN("ListB4")
2010 PX=PTR#X
2020 REPEAT
2025 PTR#X=PX
2030 INPUT#X,A$
2040 PRINT#X
2050 PX=PX+70
2060 UNTIL EOF#X
2070 CLOSE#X

```

COLLECTING the INFORMATION from the KEYBOARD

Introduction

The first lines of the program detail the information which is expected for each student. It explains that up to 50 names may be added at one time. ADD is the variable which counts the records entered and stored in the array A\$: when ADD reaches 50 the records are automatically transferred to the disc file. The symbol '=' is used as a way out of the process of adding names. The array used for storing these records is dimensioned at line 100,A\$(50).

Line 280

320

A\$=" ", for the next record. Takes in the school number, so that there is the opportunity to end the process by inputting '='. If N\$ is '=' then the program jumps to line 540 to open the disc file.

330

The format of the string includes four spaces for the roll number, so PROCnumber (lines 1040-1090) checks the length of the string N\$ and adds space if necessary.

340

The name should be entered as surname first, as in searching for a particular student, it is easier to check the surname than a first name. Even with 24 spaces allowed for the name,

there will be the occasional student whose name will not fit! Some decision will need to be taken on how the name is to be shortened, keeping the surname intact if possible.

PROClength checks that the full 24 bytes are used, by adding spaces where necessary. (1400-1430)

350 In the case where the name entered is longer than 24 bytes, only the left-hand 24 characters are added to the string.

360 Male or female.

The program which gives the facility to list male or female pupils can be made to accept upper or lower case letters, but consistency in typing entries should be the aim, particularly where names are concerned.

380-400 The date is entered in three sections, in numerical form.

410 PROCdate (1100-1140) puts the date in correct form, adding blanks where necessary, on the month and day. To allow for the entry such as 1983 instead of 83, only the right-hand 2 figures of the year given are used.

420 Every school will have its own feeder schools, and PROCfeeder (1150-1240) should be amended accordingly.

430 Catchment areas do seem to be more important in these days of changing school populations, and PROCcatchment (1250-1350) should be adapted to suit requirements.

450 The 'form' or year group could take various shapes. This program assumes a letter (which could represent a House or Division of the school), followed by up to three numbers or letters PROCform (1800-1850) adds blank spaces after the first letter to take up the four bytes allocated. If this does not fit your school organisation, then it should be altered at this stage, remembering to allow enough bytes for the MAXIMUM possible length of the description.

470-520 This is the chance to check whether the entry is correct. If it is wrong, then it is scrapped, and the program reverts to line 280. If the string is correct, then ADD = ADD + 1, and A\$ is stored as A\$(ADD). If ADD is less than 50, the program returns for the next name, but if ADD = 50, or if the operator wishes to end the process the records are filed.

560 This is the choice between adding more names or ending the run.

600 If more names are to be added, then ADD = 0 and PROCarray clears the array. This latter is not strictly necessary, but it does tidy up the array, removing records already saved, instead of waiting for them to be replaced.

PROCnewfile (1400-1490)

1410 OPENOUT is the instruction which opens out a file for 'writing to'.

1420 PTR is the name for the 'pointer' which points to the next position in the string in the file. In a random access file, this position should be increased by the length of the string (70 in this case) between the first positions of following strings. The opening of the loop which will be used to feed in the values of each member of the array in turn.

1440 The pointer is moved to the current value of PX.

1450 The next string is added to the file.

1460 The value of PX is increased by the length of each string i.e. 70.

1470 Next, to complete the loop.

1490 Close the file, necessary to avoid problems caused by an open file.

PROCaddnames(1540-1770)

The command OPENOUT which opened out the file for writing, also has the unfortunate characteristic that if a file of that name already exists, it is automatically destroyed. A different procedure is therefore needed to ADD names to a file already in existence.

The command RENAME is used to set up a temporary file, (here called TEMP), which is identical to List84.

1550

The file List84 is copied under the name TEMP.

1560

The new file List84 is opened to receive data.

1570

The file TEMP is opened so that data may be read.

1580

PTRY is the pointer which indicates the position of the pointer in the file List84. The existence of the pointer is the main reason for the speed of using a random access file as opposed to a sequential file.

1590

PTRY is the pointer which indicates the next string to be read in TEMP.

1600-1670

The REPEAT...UNTIL instruction takes a string out of the TEMP file and places it into the List84 file, until the EOF (End of File) marker is found on the TEMP file.

1680

Close the TEMP file.

1700-1750

Adds the contents of the A\$ array to the List84 file.

1760

Delete the TEMP file from the disc.SP12

During the time the file is being prepared, it is most unlikely that there will be no interruptions. In most cases, the names will be added at several sessions. This does mean that we may not always be sure which name was added last. The facility to call up a list of names on the file is a very useful

one while the file is being prepared, and the lines from 2000 onwards contain an independent program to do so.

Line 20 SHOULD NOT BE INCLUDED IN THE PROGRAM, but should be added at any time when it would be useful to see the names added to date.



THE FILING PROCS

The name used for the file here is 'List 84'. Giving the file a name inside the program means that

once a year the program will need to be amended to include the next year's file. This is a simpler process than feeding the name in from the keyboard each time the program is run during the year.

Doodlebug

S W M axwell

There is little doubt that the sophistication of arcade games is only possible through the use of machine-code programs. However, the speed and facilities of the BBC micro allow the programmer to write quite acceptable graphics games in Basic.

'Doodlebug' is a fast-moving game which operates entirely in Basic, its speed and interest is achieved by following a few simple guidelines.

1. The graphics are kept as simple as possible, avoiding unnecessary movement, but maintaining the player's interest.
2. Where possible, lengthy calculations are kept outside of the main program loop. Where this is unavoidable the calculations are performed whilst the player's attention is on other features like sound effects, tunes, flashing screen etc, which can be executed before the calculations.
3. Single letter integer variables used wherever speed is critical. (It may be possible to further increase speed by compacting, but this will have penalties on readability — refer to User Guide).
4. REM statements are only used in places where speed is unimportant or in areas outside of the main procedures. These can be deleted.
5. Extensive use is made of procedures, this also makes the program easy to modify or expand if desired. Some of the procedures may be useful to people wishing to write their own games programs.
6. The finish of each 'play' is made interesting since these 'end-routines' have no effect on the speed of the main program, but serve to improve the overall appearance of the game.
7. The game is frustrating, but not impossible, requiring a reasonable

A super-fast BASIC game for the quick-witted and quick fingered. Avoid the bug and defeat the blips as you strive for the higher skill levels.

combination of skill and luck.

THREE MAIN ELEMENTS

The game, which is briefly described in the play instructions (lines 2520 to 2650), consists of three main elements:

1. A cursor, under player control, which is used to draw rectangles on the screen.
2. A bouncing ball, called the 'Bug', which acts as the opposition.
3. A time-limit feature, called 'Blips', which force the player to act and serve to increase the pace of the game at higher skill levels.

For those wishing to study the program in detail, Table 1 lists the variables and gives a brief description of the function of each. (Note that, if any modification or expansion of the program is planned, reference should be made to this table to prevent duplication of variables).

MAIN PROGRAM FEATURES

A detailed discussion of the program listing is not practical, but the following information covers the main features in general terms.

Initialisation (Lines 10 to 290)

This section offers instructions, creates sound envelopes, sets variables and prepares the graphics screen for the start to play.

Main Program Loop (Lines 330 to 400)

This is the 'driving' section of the program, it loops through the main procedures which control the cursor, bug and blips. It also checks for a result of play — i.e. a 'win' or 'lose'.

DEFPROCinput (Lines 560 to 610)

This procedure determines the player's input, checks for validity (i.e. that cursor is in play area), calculates the next position, determines the colour of the point the cursor wants to move to and sets 'direction' and 'key-pressed' flags.

DEFPROCincursor and DEFPROCcursor (Lines 660 to 740)

If the player is not attempting to draw, these procedures move the cursor around the boundary of the play area. Movement is determined by the information supplied from DEFPROCinput.

DEFPROCdoodle (Lines 780 to 950)

This procedure controls the drawing of rectangles on the screen, it checks for the validity of an attempted move, maintains a record of maximum and minimum co-ordinates for use in scoring, and draws the boundaries of the rectangle. Because of the complexity of determining which block of the screen the player is trying to fill, lines 830 to 850 limit the player to only one horizontal line per block. This ensures that the player fills the screen from the bottom upwards,

and greatly simplifies the block-filling routine.

DEFPROCfillblock (Lines 1010 to 1210)

If the player manages to draw a rectangle (or block), this procedure fills it with colour, increments the score, and resets the variables. Lines 1080 to 1140 play a sequence of notes determined by the size of the block which has been completed. If the cursor is at the 'top' of the screen, lines 1170 to 1200 check whether the screen is full, and, if it is, report a 'win'.

DEFPROCbug, DEFPROCsetbug and DEFPROCprintbug (Lines 1270 to 1560)

These procedures are concerned with the control and display of the bug, and because of the large amount of essential calculations, are the most time-consuming sections of the program. Line 1300 controls the 'intelligence' of the bug, if the condition at the start of the line is met the bug 'homes-in' on the cursor. Line 1340 checks whether the bug is within striking distance of a part-drawn rectangle, and, if so, checks to see if it is about to cross one of the player's lines. Lines 1380 and 1390 prevent the bug from becoming 'trapped' by limiting the number of attempts to find an empty screen position. Lines 1460 to 1490 perform a search of the entire screen until an empty position is found, and the bug is re-set to that position.

DEFPROCblips and DEFPROCprint (Lines 1620 to 1790)

This is the time-limit feature which involves a count-down with numbers displayed on the screen and an accompanying sound effect. Line 1640 decides the frequency of appearance of the blips which depends on a comparison of random numbers and skill level. The variable Z% acts as a counter and as the horizontal text co-ordinate for printing the countdown, if Z% reaches a value of 14 the player loses.



DEFPROCsound (Lines 1830 to 1860) to 2410)

This simply drives two of the sound channels and is called by other procedures where sounds are required.

DEFPROCfailure (Lines 1900 to 2080)

If the player is caught out by the bug or the blips then this procedure is used, its purpose is to produce graphics and effects which depend on the type of failure. It also calls PROCscoreinc to decrease the total score.

DEFPROCsuccess (Lines 2120 to 2160)

This procedure is used when a full-screen 'win' is achieved, it calls PROCscoreinc to increase the total score and plays a short tune signifying this success.

DEFPROCscoreinc and DEFPROCscore (Lines 2210

Depending on whether the player has won or lost, these procedures increase or decrease the total score and provide appropriate sound effects. If the player has achieved a full screen the skill level is increased.

DEFPROCwait (Lines 2450 to 2470)

This is a simple procedure which is called by the main routines when a time delay is required.

DEFPROCtext and DEFPROCnewpage (Lines 2510 to 2760)

This section contains a brief explanation of the game and a few simple instructions. The PRINT statements are written in a way which enables easy reading direct from the listing.

PROGRAM MODIFICATION

OR EXPANSION

The program has been deliberately kept to a reasonable length in order to cut down on the amount of keying-in necessary. It is unlikely that any additional features can be added to the main program area without causing a decrease in program speed (unless these features use machine codes). There are, however, numerous possibilities for developing other areas, and a few suggestions are given here:

1. All of the SOUND statements are controlled by the envelopes (lines 90 to 110) and the volume of each envelope is set to maximum, i.e. 126. The volume could instead be controlled by a variable, e.g. 'vol' and this variable could be controlled by an input statement between lines 70 to 80.
2. The start of the program

3. could be expanded using graphics, sound effects or a tune. This section should be placed between lines 140 to 150.
4. If desired the skill level at the start of the program can be made player-selectable by replacing the statement "L% = 1" in line 150 with an input statement.
5. At present line 460 simply re-starts the game, this could be altered to call a "high-score" procedure, and to allow a second-player facility.
6. The player input section, DEFPROCinput (lines 560 to 610), can be modified for joystick control or for different control keys.
7. The bug is simply a graphics dot printed using the PLOT 69, X, Y

CONTINUED OVER

(or VDU 25, 69, X, Y) command, the graphics can be improved (although the speed reduced), by printing user defined characters instead of a simple dot. The procedure DEFPROCprintbug (lines 1540 to 1560) could be changed to one which sequentially prints, for example, different views of a flat disc, giving the impression of a spinning plate bouncing around the screen.

7. The 'Blips' can be changed to any set of

characters by altering line 1660.

8. The fail, win and score-increment routines (lines 1900 to 2410) can be expanded considerably since they have no effect on the speed of the game.

When attempting any modification to the program ensure that variables are not duplicated, and that the relevant flags are set at the end of each procedure. It is also advisable to keep back-up copies of the program at each stage of the modification.

DOODLEBUG VARIABLES

- A% — Current horizontal co-ordinate of Bug.
- B% — Current vertical co-ordinate of Bug.
- C% — Next horizontal co-ordinate Bug (next A%).
- D% — Next vertical co-ordinate of Bug (next B%).
- E% — Direction of Bug in horizontal plane (+ 1 right, - 1 left).
- F% — Direction of Bug in vertical plane (+ 1 up, - 1 down).
- G% — Flag indicating that Bug has changed direction.
- H% — Counter indicating that Bug is trapped.
- I% — Direction of cursor movement (1 left, 2 right, 3 down, 4 up).

- J% — Indicator showing last cursor movement (last I%).
- K% — Flag indicating player is pressing a key.
- L% — Skill level.
- M% — Flag indicating that player has drawn a vertical line.
- N% — Flag indicating that player has drawn a horizontal line.
- O% — Outcome — i.e. the result of the current "play".
- P% — Colour of the next point the cursor is moving to.
- Q% — Flag indicating whether in drawing mode.
- R% — Maximum value of X% in current "play".
- S% — Minimum value of X% in current "play".
- T% — Maximum value of Y% in current "play".
- U% — Minimum value of Y% in current "play".
- V% — Next horizontal co-ordinate of cursor (next %).
- W% — Next vertical co-ordinate of cursor (next Y%).
- X% — Current horizontal co-ordinate of cursor.
- Z% — Counter indicating the number of Blips and whether "time-out".
- c% — Colour of the next point the bug is moving to.
- d% — Loop count in Bug routine.
- x% — Loop count during check for 'full screen'.
- z% — Loop count in fail routine and temporary storage of store in score incrementing routine.
- SC1% — Temporary storage of score during block-filling routine.
- score% — Current total score achieved.
- failmode — Flag indicating the type of failure to decide the end-routine.

Other miscellaneous variables used are PA%, PB%, print \$, freq%, status%, sndvar%, note%, dur%, now, pause.

PROGRAM LISTING

```

10 ON ERROR GOTO500
20 MODE7
30 PRINTAB(0,5) "DOODLEBUG"
40 PRINTAB(0,7) "by Scott Maxwell"
50 INPUTAB(0,10) "do you want instructions ",A#
60 IF LEFT$(A#,3)="N" THEN B#
70 IF LEFT$(A#,1)="Y" PROCtext:ELSE 20
80 MODE5
90 ENVELOPE1,2,3,-6,3,1,1,1,127,0,0,-127,126,126
100 ENVELOPE2,4,-8,4,-12,1,1,1,127,0,0,-127,126,126
110 ENVELOPE3,1,0,0,0,0,0,0,0,0,-127,126,126
120 REM
130 REM SET VARIABLES & FLAGS
140 REM
150 score%=0:LX=1
160 VDU20
170 failmode=0
180 O%=FALSE:G%=TRUE
190 M%=FALSE:N%=FALSE
200 X%=72:Y%=35:VX%=72:W%=35
210 R%=X%:S%=X%:T%=Y%:U%=Y%
220 J%=0:Q%=0:Z%=0
230 REM
240 REM SET GRAPHICS
250 REM
260 VDU18,18,0,130,16,24,80:39:1200:901:18,0,128,16,26
270 PROCcursor
280 PROCsetbug
290 PROCscore
300 REM
310 REM MAIN PROGRAM LOOP
320 REM
330 REPEAT
340 PROCbug
350 PROCinput
360 IF K% THEN 370 ELSE 390
370 IF P%>0 AND Q%=FALSE PROCinccursor ELSE PROCdoodle
380 PROCbug
390 PROCblips
400 UNTIL O%>0
410 REM
    
```

```

420 REM DECIDE END ROUTINE
430 REM
440 IF O%=1 PROCfailure
450 IF O%=2 PROCsuccess
460 GOTO160
470 REM
480 REM ON-ERROR INSTRUCTION
490 REM
500 MODE7:PRINT:PRINT:REPORT:PRINT" at line ":ERL:PRINT"Page mode ON"
510 VDU14:END
520 REM
530 REM CHECK KEYBOARD INPUT/
540 REM SET VARIABLES & FLAGS
550 REM
560 DEFFPROCinput
570 IF INKEY(-122) AND V%<1200 I%=2:VX=X%+16:W%=Y%:K%=TRUE:P%=POINT(VX,WX):ENDPROC
580 IF INKEY(-26) AND V%>80 I%=3:VX=X%-16:W%=Y%:K%=TRUE:P%=POINT(VX,WX):ENDPROC
590 IF INKEY(-42) AND W%>39 I%=3:W%=X%-16:V%=X%:K%=TRUE:P%=POINT(VX,WX):ENDPROC
600 IF INKEY(-58) AND W%<800 I%=4:W%=Y%+16:V%=X%:K%=TRUE:P%=POINT(VX,WX):ENDPROC
610 K%=FALSE:P%=POINT(VX,WX):ENDPROC
620 REM
630 REM MOVE CURSOR IF NOT
640 REM DRAWING
650 REM
660 DEFFPROCinccursor
670 PROCcursor:X%=V%:Y%=W%:PROCcursor
680 ENDPROC
690 REM
700 REM PRINT CURSOR
710 REM
720 DEFFPROCcursor
730 VDU18,3,3,25,4,X%-24:Y%+16:43
740 ENDPROC
750 REM
760 REM DRAWING ROUTINE
770 REM
    
```

```

790 DEFPROCdead1e
791 IF OX THEN B10
800 OX=TRUE:RX=XX:SY=XX:TX=YY:UX=YY:PROCcursor
810 IF IX=JX THEN B70
820 IF FX=1 ENDPROC
830 IF IX<3 AND NX=FALSE NX=TRUE:GOTOB70
840 IF IX=3 MX=TRUE:GOTOB70
850 IF IX=4 AND MX=FALSE AND NX=FALSE MX=TRUE:GOTOB70
860 ENDPROC
870 JX=IX
880 IF VX>RX RX=VX
890 IF VX<SX SX=VX

900 IF WX>TX TX=WX
910 IF WX<UX UX=WX
920 MOVEXX,Y:GCOL0,1:XX=VX:YX=WX:DRAWXX,YX
930 SOUND0,3,8,1
940 IF FX=2 PROCfillblock
950 ENDPROC
960 REM
970 REM FILL BLOCK WITH COLOUR,
980 REM PLAY SOUNDS AND RESET
990 REM VARIABLES & FLAGS
1000 REM
1010 DEFPROCfillblock
1020 IF OX=1 ENDPROC
1030 #FX15,0
1040 PROCprintbug:VDU18,0,130,24,SX:0:RX:TX:16,26:PROCcursor
1050 PROCprint(5,5,"")
1060 SC1X=24X*(TX-UX)+(RX-SX)
1070 scoreX=scoreX+SC1X:PROCscore
1080 IF SC1X=800 sndvarX=1
1090 IF SC1X<800 sndvarX=2
1100 IF SC1X<400 sndvarX=3
1110 ON sndvarX GOTO 1120,1130,1140
1120 PROCsound(105,5):PROCsound(89,5)
1130 PROCsound(41,10)
1140 PROCsound(69,10)
1150 PX=0:MX=FALSE:JX=0:NX=FALSE:GX=FALSE:ZX=0:PROCsetbug

1160 IF TX<796 ENDPROC
1170 FOR WX=0 TO 1279 STEP8
1180 IF POINT(WX,797)=0 AND POINT(WX+8,797)=0 WX=1279:GOTO1200
1190 IF WX<1270 OX=2:ENDPROC
1200 NEXT
1210 ENDPROC
1220 REM
1230 REM CONTROL AND DISPLAY
1240 REM THE BUG / CHECK FOR
1250 REM PART-DRAWN BLOCKS
1260 REM
1270 DEFPROCbug
1280 GCOL3,3
1290 IF GX THEN 1300 ELSE 1310
1300 IF RND(100)<LX-1 EX=ABSEY+SGN(X-AZ):FX=ABSFX+SGN(Y-BX):GX=FALSE
1310 CX=AX+4*EX:DX=BX+4*FX:ZX=POINT(CX,BX)
1320 IF OX=FALSE THEN 1350
1330 IF BX>TX+16 THEN 1350
1340 IF AX<RX+16 AND AX>SX-32 THEN FOR DX=1 TO 31CX=EX+POINT(AX+DX*EX,BX+DX*FX)
NEXT
1350 IF CX=0 OR CZ=3 PROCprintbug:AX=CX:BX=DX:PROCprintbug:HX=0:ENDPROC
1360 IF OX AND CX=1 OX=1:failmode=2:ENDPROC
1370 IF POINT(CX,BX)=2 EX=-EX ELSE FX=-FX
1380 HX=HX+1
1390 IF HX=4 PROCprintbug:PROCsetbug
1400 GX=TRUE:GOTO1310
1410 ENDPROC
1420 REM
1430 REM RESET BUG POSITION
1440 REM
1450 DEFPROCsetbug
1460 REPEAT
1470 AX=100+RND(1000):BY=70+RND(800)
1480 UNTILPOINT(AX,BX)=0
1490 EX=-8:FX=-4:PROCprintbug
1500 ENDPROC
1510 REM
1520 REM PRINT BUG
1530 REM
1540 DEFPROCprintbug
1550 VDU18,3,25,69,AX,BX:
1560 ENDPROC
1570 REM
1580 REM TIME LIMITING "BLIPS"
1590 REM CHECK FOR TIME-OUT
1600 REM BEFORE BLOCK DRAWN
1610 REM
1620 DEFPROCblips
1630 IF ZX=1 THEN1670
1640 IF RND(100)<LX THEN 1650 ELSE ENDPROC
1650 ZX=4:TX=TIME
1660 PROCprint(5,5,"9876543210"):ENDPROC
1670 IF TIME-tX>25 tX=TIME ELSE ENDPROC
1680 ZX=ZX+1
1690 PROCprint(ZX,5,""):SOUND3,2,100,7
1700 IF ZX=14 OX=1:failmode=1
1710 ENDPROC
1720 REM
1730 REM PRINT BLIPS
1740 REM

1750 DEFPROCprint(pAX,pBX,print#)
1760 VDU4,17,3,17,128,31,pAX,pBX
1770 PRINTprint#
1780 VDU5
1790 ENDPROC
1800 REM
1810 REM SOUND CONTROL
1820 REM

```

```

1830 DEFPROCsound(noteX,durX)
1840 SOUND1,3,noteX,durX
1850 SOUND2,3,noteX,durX
1860 ENDPROC
1870 REM
1880 REM FAIL ROUTINE
1890 REM
1900 DEFPROCfailure
1910 VDU19,2,4,0,0,0
1920 GCOL0,3
1930 ON failmode GOTO 1940,2000
1940 ZX=150:REPEAT
1950 ZX=ZX+1:SOUND1,1,ZX,1
1960 UNTIL ZX=180
1970 SOUND0,1,4,30
1980 MOVEAX,BX:FLOT21,XX,YX
1990 PROCwait(150):GOTO2010
2000 X=AX:Y=BX
2010 SOUND0,3,4,40
2020 FOR Z=50 TO 120
2030 MOVEXX,Y:DRAWXX-Z:RND(2+Z),Y-Z:RND(2+Z)
2040 NEXT
2050 PROCwait(200)
2060 PROCscoreinc(255,1)
2070 PROCwait(100)
2080 ENDPROC
2090 REM
2100 REM WIN ROUTINE
2110 REM
2120 DEFPROCsuccess
2130 PROCscoreinc(0,2)
2140 PROCsound(97,20):PROCsound(105,20):PROCsound(89,20):PROCsound(41,20):PROCsound(69,40)
2150 PROCwait(700)
2160 ENDPROC
2170 REM
2180 REM ROUTINE FOR INCREMENTING
2190 REM SCORE AT END OF GAME
2200 REM
2210 DEFPROCscoreinc(freq,status)
2220 ZX=scoreX
2230 ON status GOTO 2240,2290
2240 REPEAT
2250 scoreX=scoreX/1.005:freq=freq-2
2260 PROCsound(freq,1):PROCscore
2270 UNTIL scoreX<ZX/1.5 OR scoreX<100
2280 GOTO2330
2290 REPEAT
2300 scoreX=scoreX*1.005:freq=freq+2
2310 PROCsound(freq,1):PROCscore
2320 UNTIL scoreX>ZX*1.5:ZX=LX+1
2330 VDU4,31,6,10:PRINT"LEVEL "LX:VDU5

2340 PROCwait(100)
2350 ENDPROC
2360 REM
2370 REM DISPLAY SCORE
2380 REM
2390 DEFPROCscore
2400 VDU4,17,1,17,130,31,2,2:PRINT"SCORE "scoreX:VDU5
2410 ENDPROC
2420 REM
2430 REM TIME DELAY
2440 REM
2450 DEFPROCwait(pause)
2460 now=TIME:REPEAT UNTIL TIME-now=pause:
2470 ENDPROC
2480 REM
2490 REM PLAY INSTRUCTIONS
2500 REM
2510 DEFPROCtext
2520 CLS:PRINTTAB(0,3)"DOODLEBUG is an easy game to play but""less easy to explain. The best way to""learn is by practice!"
2530 PRINT""The object is simple, you colour-in""around 90% of the screen by drawing""rectangles, filling the screen from""the bottom."
2540 PRINT""The method is even simpler! You draw""rectangles using the CURSOR KEYS."
2550 PRINT""The only difficulty is in completing a""rectangle before being countered by the""BUG or counted out by the BLIPS. These""two exceptionally frustrating features""deserve further explanation....."
2560 PROCnewpage
2570 PRINTTAB(0,3)"THE BUG bounces around the screen""searching for a partially completed""rectangle. If it finds one you lose."
2580 PRINT""At levels 1 and 2 the bug is reasonably""predictable but at higher levels it""becomes very aggressive."
2590 PRINT""THE BLIPS appear at level 2, they help""the bug by forcing you to draw when you""least want to do so. The blips give a""countdown and if you do n't complete a""rectangle by the time they finish....""you lose again!!!!"
2600 PROCnewpage
2610 PRINTTAB(0,3)"SCORING"
2620 PRINT""The score is increased each time a""rectangle is drawn, the score will""depend on your skill and ""daring!."
2630 PRINT""A win (full-screen) will give you""bonus points and progression to the""next level."
2640 PRINT""Failure results in a score penalty""but you stay on the same level."
2650 PRINT""The game requires a great deal of""patience, so if you are easily annoyed""hit 'ESCAPE' now, otherwise..."
2660 PROCnewpage
2670 ENDPROC
2680 REM
2690 REM DISPLAY NEXT TEXT SCREEN
2700 REM
2710 DEFPROCnewpage
2720 PROCwait(50)
2730 PRINTTAB(10,23)"HIT SPACE BAR"
2740 IF NOT INKEY(-99) THEN 2740
2750 CLS
2760 ENDPROC

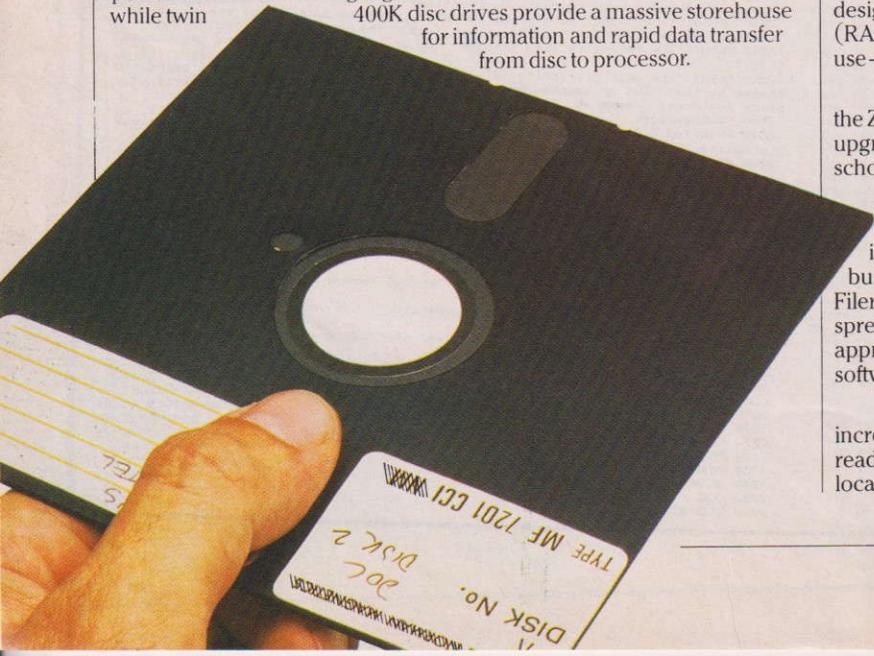
```

The best thing next



The BBC Model B microcomputer is widely recognised as an impressive first computer for the home or the school, but its capabilities are restricted by its lack of data storage and the limitations of Basic for serious programming. For the user who needs more from this computer the Torch Z80 Disc Pack is a gateway to the world of advanced computing.

Model B's fitted with disc interface can be upgraded to full business machines by the Torch Z80 Disc Pack thereby offering the use of more powerful and flexible languages such as Fortran, Pascal, BCPL and Cobol, while twin 400K disc drives provide a massive storehouse for information and rapid data transfer from disc to processor.



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At only £730* including installation at your dealer, the Torch Z80 Disc Pack offers real value for money. It is supplied with an impressive package of software including the PERFECT® range of business software comprising Perfect Writer (word processing) Perfect Filer (database management) and Perfect Calc (advanced, powerful spreadsheet). Add to that COMANEX®, the interactive management game, approved and used by leading Management Consultants – and you have a software package valued at over £1,000.

The Torch Z80 Disc Pack is a proven and cost-effective way of increasing the computing power of your BBC Model B micro, so if you are ready to take a step into the world of serious computing, contact your local dealer, listed on the facing page.

to a BBC micro.



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Text, graphics and keyboard provided by BBC Model B.

Microtext

Gordon Taylor

Acornsoft are about to launch another language for the BBC Micro and the Electron. Known as MICROTEXT, it is an authoring language — intended for the creation of interactive programs for information, instruction or interview. Unlike conventional programming languages such as BASIC, which is line-orientated, it is based on a series of screen displays called frames. Also MICROTEXT uses a smaller command set than BASIC and has simpler, English-like syntax. The aim is that the program material be written by the "expert" author — without the need for a (language) programmer. It should thus be invaluable for use in exhibitions, in schools and other education and training situations and at the increasing number of interfaces between computer systems and people. They include those in health and social services, banking and finance — many using interviewing or form-filling — which could benefit from being computer-aided.

MICROTEXT was devised by Britain's National Physical Laboratory, whose experience in electronic computing dates from the very beginnings in the 1940's. The origins of MICROTEXT date from early 1970's, with notable milestones being MICKIE — a system for interviewing people about their medical history and condition — and EDUTEXT — an earlier form of MICROTEXT itself. The MICKIE system has been commercialised and other versions of MICROTEXT have already been implemented on Commodore 64, Apple, CP/M and IBM PC machines. Most attention, however, is currently being given to the Beeb implementation — although MICROTEXT program material is intended to be portable between different computers.

The first task in creating a MICROTEXT program is to plan it — usually with the aid of a flow chart. This is more necessary than in conventional programming due to the number of outcomes possible in any interactive dialogue.

The main features of MICROTEXT are: Text Creation

Acornsoft's new Microtext language seems destined to further extend both the power and accessibility of the BBC Micro and Electron. A&B takes an early in depth look at this advanced piece of software.

and Editing. MICROTEXT has an integrated whole-screen editor — with full cursor-key control. The material is organized into frames, which make up modules, which in turn make up programs. Complete modules are loaded from the (cassette or disc etc.) file storage system into memory one at a time — and allow rapid branching between frames.

RESPONSE MATCHING AND BRANCHING

Response may be numeric, single letter or free text. They may be tested numerically (equal, not equal, greater than and less than), by multiple choice and by keyword matching respectively.

USING VARIABLES

Among other things, these provide an easy way of writing general-purpose frames and may be used to make the program responsive to the user's answers.

SUMMARY REPORTS

The author may switch between "edit" and "command"

modes with the escape key — and, from the latter mode, call "test" and "run" modes. This last is the normal mode for the user.

MICROTEXT files containing text only are stored in simple ASCII format. Material can therefore be created in other programs using such files — such as word processors like VIEW or WORDWISE — and then accessed by MICROTEXT.

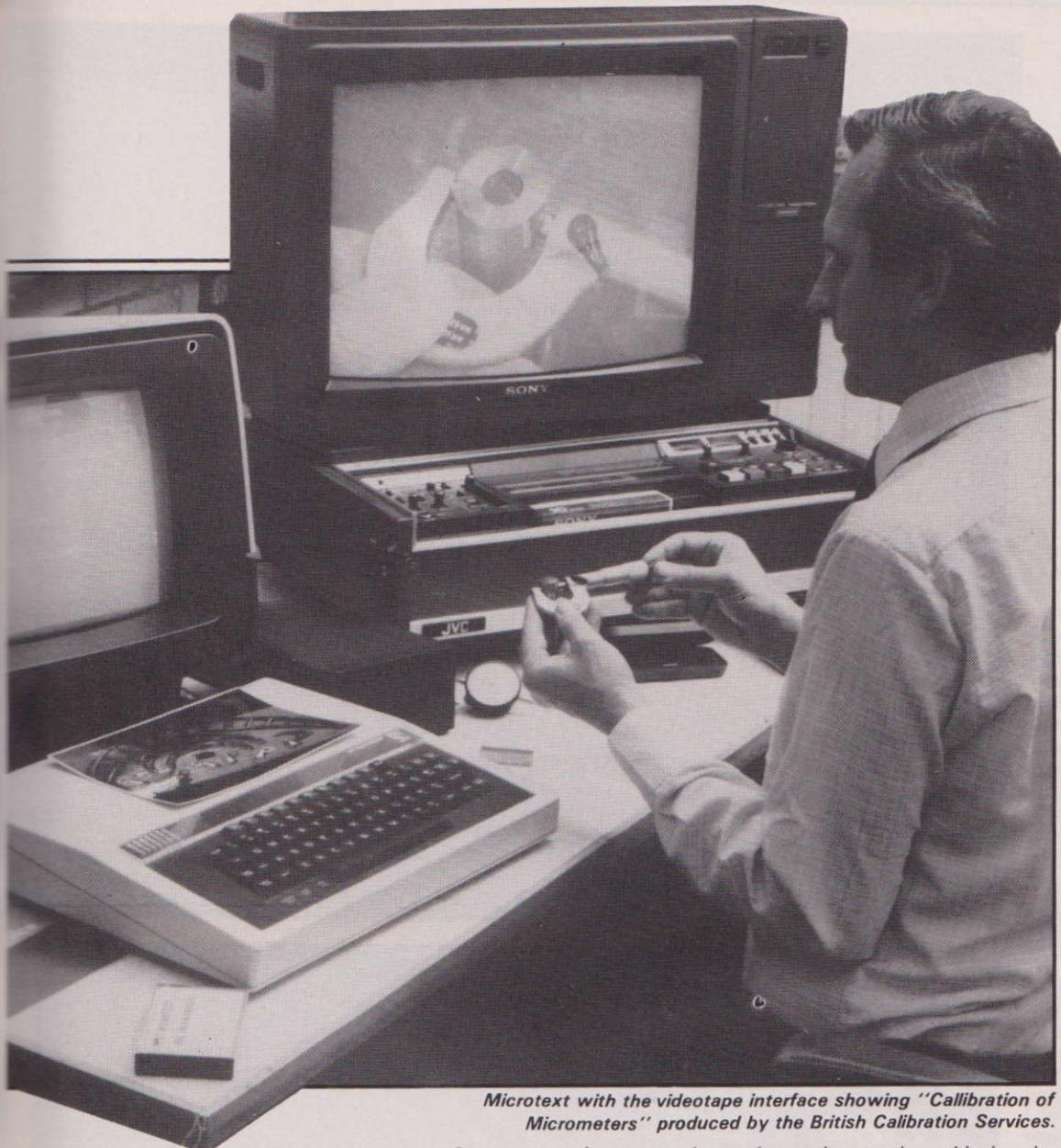
A major feature of MICROTEXT on the Beeb is compatibility with the Teletext (TV broadcast) and Prestel/Viewdata (telephone line) screen formats. This means that MICROTEXT programs can utilize frames and modules taken from these channels while MICROTEXT allows the searching of such files by conditional branching on keywords, rather than a multiple choice inputs. MICROTEXT programs can also be delivered to users via such channels (though the Teletext adaptor cannot be operational at the same time).

This implementation of MICROTEXT has the full graphics capabilities of the Beeb but these are limited in practice by the small amount of user RAM available (save in the ROM version or with a second processor). Moreover, this level of MICROTEXT does not include any graphics tools. Thus there is no (high level) support for input devices other than the keyboard



(e.g. joystick, light pen, arm-type digitiser or tablet) or any graphics editor software. (Such input devices may, however, be connected either to the RS 423 serial port or to the user port — see below). One way to prepare graphics images is within MICROTEXT, using replicas of the Beeb BASIC commands (e.g. \$MOVE, \$DRAW, \$PLOT etc.). However, it is also possible to step out of MICROTEXT back into BASIC. This enables the use of proprietary programs, such as Grafdisk or Easy Graphics.

Perhaps the most exciting feature of MICROTEXT is the capability for interactive control of audio and video replay devices connected to the user port. Such control has already been demonstrated for audio tape, photographic slides, video tape and video discs (and would be possible for audio discs). These media go far beyond the sound



Microtext with the videotape interface showing "Calibration of Micrometers" produced by the British Calibration Services.

and graphics capabilities of the Beeb — excellent as they are (by the standards of home computers).

Audio tape recordings under random access control from MICROTEXT can be used to illustrate or reinforce either questions or answers. At least one suitable cassette tape recorder is available — designed to accept computer control. (1)

If only still pictures are required, then slides may be used — for example, in a tape-controlled back-projector. Such devices are quite modestly priced and many have already been sold for exhibition and educational purposes. Moreover, they have the advantage of being designed for control by low level signals — such as computers can produce — which minimises the hardware interface requirements. (2)

Opportunities for using video tape interactively are clearly enormous. This is partly because the number of video tape players sold is already very large — some four million in the U.K. to date. Furthermore, the cost of video camera systems, to produce the necessary recordings, is comparatively modest.

The tape (serial) format suffers from the usual limitation for random access — as shown by the rewind time of several minutes for a long recording. This can however be minimised in practice by placing the separate recordings in the appropriate sequence.

The most impressive external device so far controlled from MICROTEXT is the video disc player. This is also the one which is receiving most attention — due to the interest shown by users in

the audio-visual world, by the manufacturers of such players and by the N.P.L.'s master in the Department of Trade and Industry. It enables the use of realistic TV-type video images — not only still but also of moving sequences, with audio (even bilingual or stereo) as well if required. One disc can hold up to 54000 still-frame pictures or up to 35 minutes of "movies". Moreover, the disc — as opposed to tape — format enables very rapid random access, which is ideal for interactive programs.

MICROTEXT programs using video discs are currently limited by the number of "active play" discs that are commercially available — only about 30 at present. Although such discs are relatively costly to create at present, this is expected to fall sufficiently to allow authors to create

their own in the near future.

N.P.L. and their co-operators have already demonstrated the use of single monitor display — fed with R.G.B. signals from the computer and composite video signals from the video tape or disc players and switching automatically.

As well as the replay devices themselves, specific interface hardware (i.e. cables) and device driver software is required. N.P.L. another organizations co-operating with it are developing such hardware interfaces and software drivers to enable the desired random access to such recordings or images at reasonable cost. Moreover, they are striving to keep the driver software for the different devices as consistent as possible.

Acornsoft MICROTEXT includes two commands for controlling the user port, which go beyond any provided in BASIC (although such control is possible using machine code). The control of both video tape and video disc players from this level of MICROTEXT has been demonstrated. (3)

Acornsoft MICROTEXT is to be sold in three versions — tape, disc and ROM. All include some 14K of software (machine-coded for speed and compactness) and a typeset manual, a set of demonstration programs and a Welcome booklet describing them, a strip of labels for the Beeb's red function keys and a quick reference card. However, no cables or software drivers for controlling external devices are included.

The tape version will support only the tape filing system whereas the disc version will support both tape and disc files — but not Econet. (A separate Econet version will be offered later). Already listed in the Acornsoft catalogue for Autumn 1983, the tape version SBL04 cost £49.85 and the disc version SNL04 £59.80 — both inclusive of V.A.T. at 15%.

MICROTEXT will work with the Electron, using Modes 6 and 4. This means that — lacking

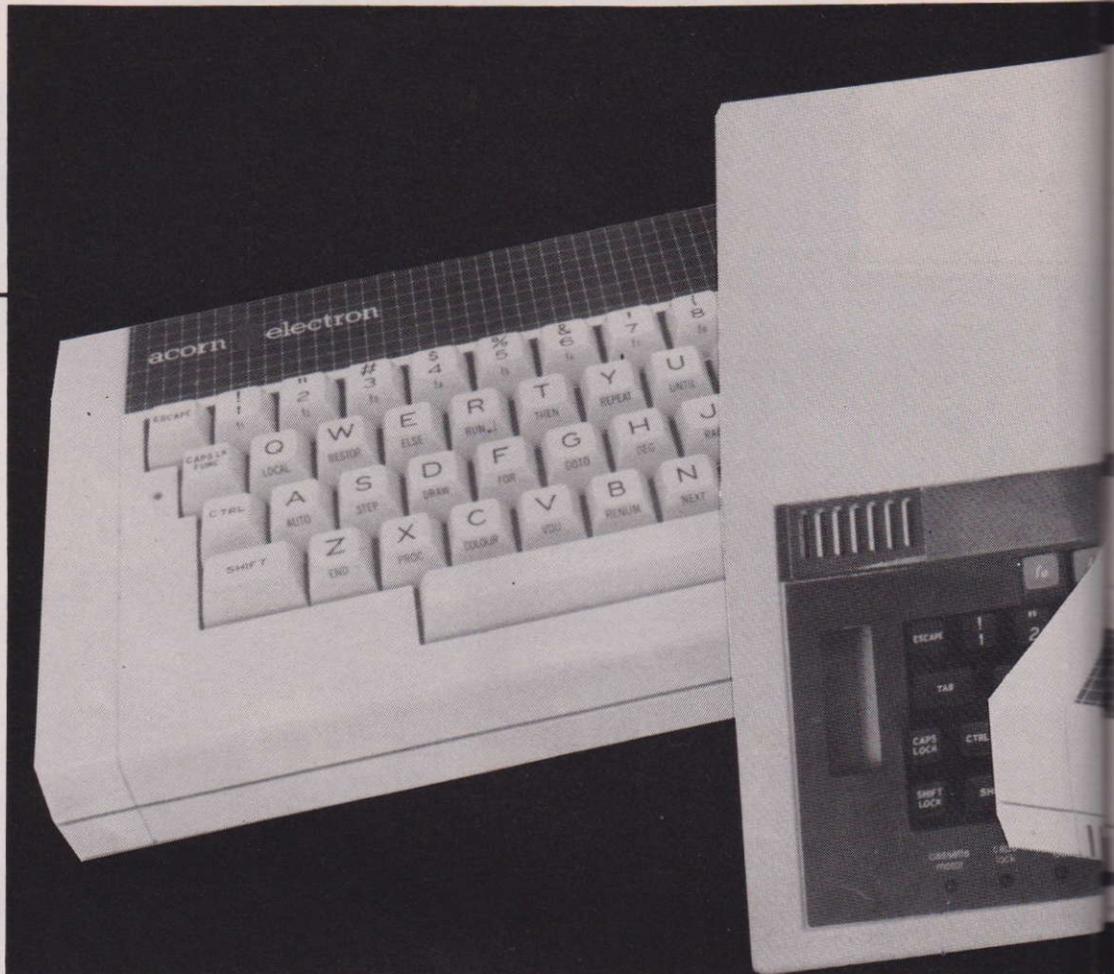
CONTINUED OVER

Mode 7 — the maximum work area is reduced by some 7200 characters compared with a Beeb.

The disc version will offer the well-known advantages of much faster loading and saving of files — together with random access. Against this, the 2.75K of ROM taken by the Acorn disc filing system has an even greater impact than usual since MICROTTEXT itself takes some 14K.

Both tape and — especially — the disc versions thus leave limited RAM for the author's own creations and allow only the highest screen modes to be used. (See Table 1). As in the case of other major application programs — such as word processors — and languages for the Beeb, this fact makes a ROM version especially desirable. By occupying one of the "sideways" ROM sockets, such languages can be switched in place of BASIC and so enable access to 16K of additional user RAM work area. This allows not only all the 40-column modes — 7,6,4,2 and 1 — but also the 80-column modes — 3 and 0 — to be used — notably for graphics (Modes 7,4,2,1 and 0). In addition, the MICROTTEXT language is available immediately on switch-on and is much less likely to be lost or damaged. While such a version is to be offered, the price has not yet been decided. However, some idea might be gained from the price for BCPL — which for ROM, disc and manual costs £99.65, including V.A.T.

Acorn itself has announced a professional version of MICROTTEXT, together with the cable and software for controlling a suitable video disc player. The MICROTTEXT language will be in ROM and include two additional commands. These make the control of external devices very much easier by allowing authors to write their own device driver commands in assembler. However, in addition to that for the video disc player, the package is likely to include the cable and software to control a



£100

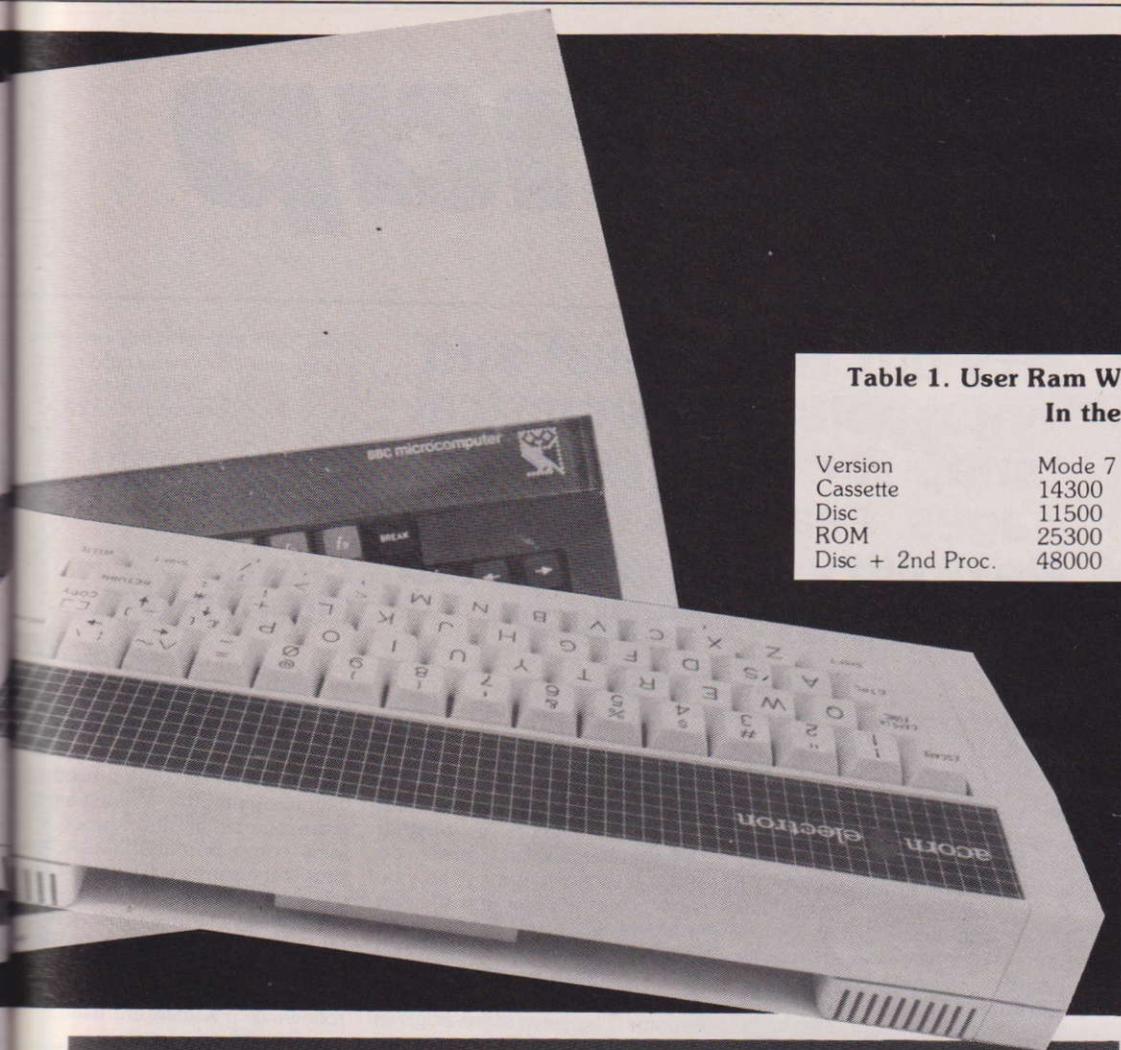
If you cannot find anything wrong
just press the RETURN button.
I would prefer some reply though.

So what do you think is wrong?

?
EARTH/GROUND/(GREEN&YELLOW)/BLUE →340
NEUTRAL/REVERS/COLD/CROSS →340
WRONG/CORRECT/WIRE/SWITCH →302
→305 (SCORE-2)
* Fault is: <ANS>

Command Mode DISK PLUG A

Microtext in action 1



**Table 1. User Ram Work Area with MICROTEXT
In the BBC Micro**

Version	Mode 7	Mode 4	Mode 1
Cassette	14300	5100	—
Disc	11500	2300	—
ROM	25300	16100	5800
Disc + 2nd Proc.	48000	48000	48000

suitable audio cassette tape recorder — which is intended to provide voice-over for still-frame pictures from the video disc. (4) When available some time next year, the price is expected to be £299 + V.A.T.

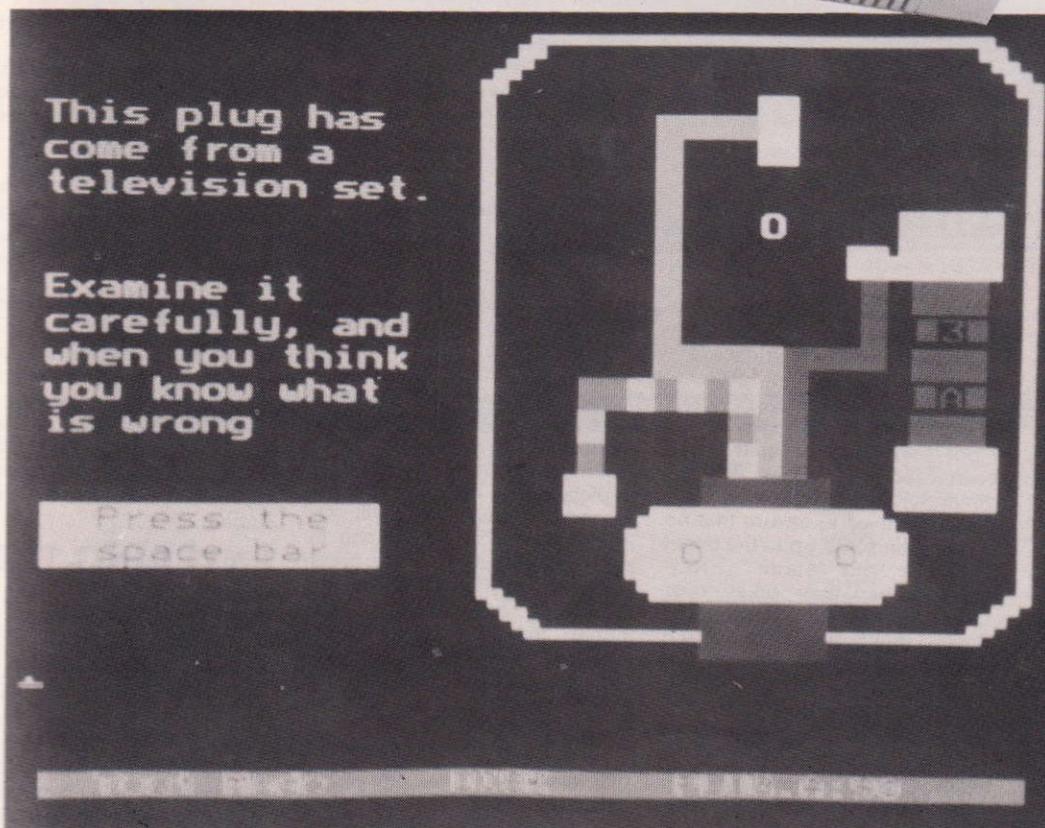
The case for authoring languages for creating computer-aided instruction programs has been well made over the last decade. Probably the closest contender to MICROTEXT is PILOT — which is popular in the U.S.A. However, authors report that MICROTEXT is easier to use and it also offers the advantage of full interactive control of both external, input and audio and video replay devices. MICROTEXT offers substantial advantages over BASIC for interactive use of all these sources. Moreover, in the Beeb implementation, it is compatible with Teletext and Viewdata and affords access to excellent computer-sound and computer-graphics. Finally, MICROTEXT is supported by continuing development at N.P.L. — a world-class centre of computing research. In time, this is likely to link up with work on artificial intelligence — another field in which Britain is amongst the leaders.

(1) Tandberg Ltd, Unit 1, Revie Road, Elland Road, Leeds LS11 8JG. Tel: 0532 774844.

(2) Bell and Howell A-V Ltd, Alperton House, Bridgewater Road, Wembley, Middlesex HA0 1EG. Tel: 01-903 5411.

(3) Mantissa Ltd, 97 Lee Road, London SE3 9DZ. Tel: 01-852 8430.

(4) Interactive Computer Services, The Old School House, Medcroft Road, Tackley, Oxford DX5 3AH. Tel: 086 983 479.



Microtext in action 2

Addsnap

J A Sheard

"Addsnap" is a simple yet flexible game for two that helps young children learn their number bonds and sharpens the addition skills of older children and adults. It's also great fun to play! In a nutshell, the game entails the two players looking for pairs of numbers adding up to a total they have decided on and then — instead of shouting "Snap!" and arguing over who said it first — pressing their chosen keys on the computer, which announces who was first and scores accordingly. And you can't argue with a computer, can you?

The program makes extensive use of procedures and variables with descriptive names. In addition, the procedures are organised in a hierarchy with the higher or more general ones (eg PROCplay) forming the framework and calling others (eg PROCdeal) which in turn call the lower ones (eg PROCdisplay) that are the nuts and bolts of the program. These two characteristics of the program mean that its structure and the structure of any of the procedures is easily seen, and that an outline of the game itself — and what happens on the screen — can include mention of all the important procedures and variables.

TIME TO CHOOSE

At the start of a game (PROCsetup), the players are asked to assign values to the following program variables over which they have control:

1. "total": During the game they will be looking for pairs of numbers adding up to this total. If children are playing, therefore, it is important to ensure that a realistic number within the permitted range of 10 to 100 is chosen.
2. "cards": This determines how many numbers will be displayed on the screen at once, from two to a maximum ("maxpos") of up to eight, determined by the size of the total. Note that the number of cards does not affect the probability of there being two numbers adding up to the total, but that the more cards there are

Try out this robust and enjoyable mathematical snap for children of all ages. Features include flexibility of choice, bold display and clear structure.

on display the more difficult it is to see a pair, especially with the larger totals.

3. "winscore": The players decide how long they want the game to be, choosing a winning score of between 2 and 8.

4. "left" and "right": Finally, each player chooses a letter key to press the game when he or she sees two numbers adding up to the target total. It obviously helps if they are on different sides of the keyboard.

At this stage there is an option to continue or change the above variables. Instructions are then given on playing the game which can now commence!

GETTING ON WITH THE GAME

The game itself is contained within PROCplay which is repeated until one player's score ("leftscore" or "rightscore") equals "winscore". In PROplay the cards are first dealt (PROCdeal) into positions ("pos") whose co-ordinates have been read into arrays (PROCdimarray). During the real PROCcheck is used to ensure that no two numbers add up to the target total at this stage. PROCnewnumber then takes over and is repeated until either of the players' keys is pressed. Each number in turn, as defined by its position, is replaced and there is a one on five chance that each new number will pair up with an existing number to add up to the target total. This probability is determined by the variable "prob" in line 980 which can be

changed to a lower number if a quicker game is desired.

When a player's key is pressed, PROCsnap is called and PROCcheck used to see whether two numbers on the screen do add up to the target. If so, the player gains a point and the two numbers ("correct1" and "correct2") are displayed (PROCrigh); if not, the point is given to the other player (PROCwrong). The new score is given (PROCscore) and the next round of the game started by pressing the space bar.

When one player's score equals the winning score, PROCendgame is called. This simply congratulates the winner and asks if another game with the same player-determined variables is wanted or whether the players wish to change them.

At the start of the program one other option is available to the user — turning the sound off. Only elementary use is made of sound (plenty of opportunity for the enthusiast to improve things there!), but even this can irritate some parents or teachers. So when the program title is displayed on its own for two seconds, pressing Q will call PROCquiet. The sound can be restarted by subsequently pressing S for PROCsound at the same stage of the program. (Note though that this facility is not available on machines with the 0.1 Operating System — see below, in the section "Entering the Program".)

The only three procedures not mentioned in the above description are the often-used PROCdisplay which handles vir-

tually all the printing on the screen and allows any colour text to be printed double-height on any colour background; PROCclear; used to clear part of the screen, between specified lines and PROCdelay which makes the program pause for varying numbers of seconds.

CHILD-PROOFING

Any program which is to be used by children, especially if they are to be left unattended, needs a number of safeguards designed to prevent the program crashing or the screen becoming filled up with wrong inputs. Making a program completely idiot-proof is a fairly complex matter, but a few simple measures will usually cater for most mistakes, deliberate or otherwise. Thus *KEY 10 OLD:M RUN:M makes the program RUN if the BREAK key is pressed on its own, and the following *FX calls are used:

- *FX 11,0 disables the auto-repeat
- *FX 220,0 disables the ESACPE key but allows CTRL @ (the two keys are unlikely to be pressed together by accident) to be used instead.
- *FX 15,1 flushes the keyboard buffer, ensuring that any key that has been pressed when no key should be pressed will be ignored.
- *FX 202,32 ensures that the CAPS LOCK is on.

All input, except the assignment of the target total, is single key (ie RETURN does not have to be pressed), using REPEAT....UNTIL with GET to ignore out-of-range or mistaken key presses (line 320 for example).

ENTERING THE PROGRAM

A minor disadvantage of using long variable and procedure names is the extra typing they demand. One answer is to abbreviate them as you type them in, but this can cause problems not least if any debugging is necessary. A better solution is

program the ten red function keys to print the longest and/or most frequently used variables. For example

*KEY 4 leftscore is all that is needed for "leftscore" to be printed every time f4 is pressed. If you wish to do this, may I suggest you program the following top ten, all of which occur more than ten times:

```
PROCdisplay
total
number
cards
left
right
leftscore
rightscore
winscore
pos
```

And a useful hint for the remaining lower-case entries. If you press the CAPS LOCK and SHIFT together, you will find that pressing the SHIFT on its own thereafter causes lower-case letters to be printed.

Note that line 1570 must be entered as such for the formula after RESTORE to work. The 1590 in the line would not be automatically adjusted if the program were to be numbered.

Finally, if you have the 0.1 Operating System (you can find out by typing *FX 0 and pressing RETURN), certain *FX calls and VDU commands are not available. However, with the exception of the sound on/off option, they can be effected in other ways:



line 70 ON ERROR RUN (Enter this at the very end, when you have satisfied yourself the program is running correctly.)
line 270

(!&FE00 = &10720A (restores cursor)
lines 200 and 410
!&FE00 = &10200A (removes cursor)

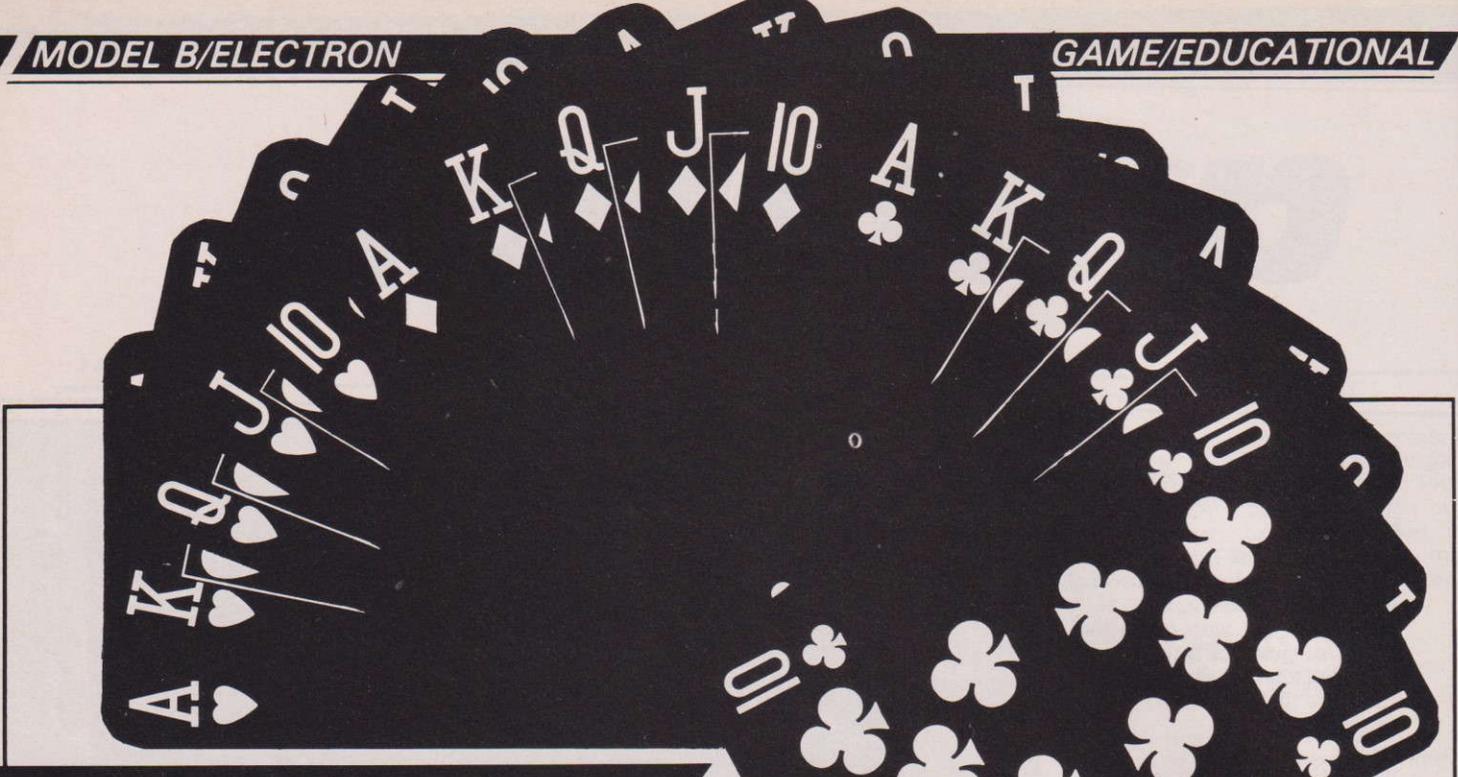
line 370 ?&D8 = &20 (ensures CAPS LOCK is on)
Line 260 and lines 1760 - 1830 will have to be omitted altogether.

PROGRAM LISTING

```
10 REM"ADDSNAP"
20 REM(c)John Sheard(1983)
30 :
40 *KEY10 OLDIM RUNIM
50 *TV 255
60 *FX11,0
70 *FX220,0
80 MODE7
90 :
100 :
110 PROCsetup
120 PROCdimarrays
130 REPEAT:REPEAT
140 PROCplay
150 UNTIL leftscore=winscore OR rightscore=winscore
160 PROCendgame
170 UNTIL carryon<>32
180 RUN
190 :
200 :
210 DEFPROCsetup
220 VDU23,1,0,0,0,0,0;
230 *FX15,1
240 CLS:leftscore=0:rightscore=0
250 PROCdisplay(132,135,8,0,"Addition Snap")
260 sound=INKEY(200):IF sound=81 PROCquiet ELSE IF sound=83 PROCsound
270 VDU23,1,1,0,0,0;
280 PRINTTAB(0,4)"Enter a SNAP TOTAL (any number from 10 to 100), and press R
RETURN:"
```

```
290 REPEAT:VDU7:PRINTTAB(27,5)SPC10:INPUTTAB(27,5)total:total=INT(total):UNTIL
total>9 AND total<101
300 maxpos=INT(total/3):IF maxpos>8 maxpos=8
310 PRINTTAB(0,7)"How many00cards to be dealt? (2 - ;maxpos;)" ;
320 REPEAT:VDU7:cards=GET-48:UNTIL crds>1 #<maxpos:TAB(36,7);cards
330 PRINTTAB(0,9)"Now decide what the winning score will be (2-8):" ;
340 REPEAT:VDU7:winscore=GET-48:UNTIL winscore>1 AND winscore<9:PRINTTAB(10,10
);winscore
350 PRINTTAB(0,12)"And finally, you both need to choose a letter key to use i
n the game."
360 PRINTTAB(0,15)"Which letter key will the player on the left use? " ;
370 *FX202,32
380 REPEAT:VDU7:left=GET:UNTIL left>64 AND left<91:PRINTTAB(10,16)CHR:left
390 PRINTTAB(0,18)"Which letter key will the player on the right use? " ;
400 REPEAT:VDU7:right=GET:UNTIL right>64 AND right<91 AND right<>left:PRINTTAB
(11,19)CHR:right
410 VDU23,1,0,0,0,0;
420 PRINTTAB(3,21)CHR#131"Press the SPACE BAR to continue";TAB(0,22)CHR#130"Pr
ess H if you want to change anything"
430 REPEAT:VDU7:carryon=GET:UNTIL carryon=32 OR carryon=72
440 IF carryon=72 THEN RUN
450 CLS:PROCdisplay(129,135,1,0,"Snap total: "+STR$(total))
460 PROCdisplay(135,129,21,0,"First to: "+STR$(winscore))
470 PROCscore(3)
480 PRINTTAB(0,8)"Now you are ready to play. The player on the left uses the";C
HR#129;CHR:left;CHR#135"key, and the player on the right uses the";CHR#130;CHR#
```

CONTINUED OVER



```

right;CHR#135;"key."
490 PRINT "As soon as you see TWO numbers that add up to";CHR#131;total;CHR#1
29;"- PRESS YOUR KEY."
500 PRINT "The first player to press their key wins a point, or gives one to t
heir opponent!"
510 VDU7;PRINTTAB(5,22)CHR#130;"Press the SPACE BAR to start."
520 REPEAT UNTIL GET=32
530 ENDPROC
540 :-----
550 DEFPROCplay
560 PROCclear(3,22)
570 PROCscore(3)
580 PROCdeal
590 PROCdelay(2)
600 pitch=105;pos=0
610 REPEAT
620 *FX15,1
630 PROCnewnumber
640 UNTIL key=left OR key=right
650 PROCsnap
660 IF leftscore=winscore-1 AND rightscore=winscore-1 THEN PRINTTAB(6,21)CHR#1
36;CHR#131;"THIS IS THE DECIDER!"
670 *FX15,1
680 IF leftscore<winscore AND rightscore<winscore THEN PROCscore(10);PRINTA
B(4,18)CHR#130;"Press the SPACE BAR to continue";REPEAT UNTIL GET=32
690 ENDPROC
700 :-----
710 DEFPROCendgame
720 PROCdelay(2);PROCclear(3,22)
730 PROCscore(3)
740 IF leftscore=winscore THEN winner$=CHR#left ELSE winner$=CHR#right
750 PROCdisplay(132,135,0,6,"Well done "+winner$+"! You have that game")
760 PROCdisplay(129,135,1,11,"Press the SPACE BAR for another ")
770 PROCdisplay(129,135,1,13," game with the same numbers. ")
780 PROCdisplay(135,132,1,18,"Press H to change these numbers.")
790 REPEAT;carryon=GET;UNTIL carryon=32 OR carryon=72
800 leftscore=0;rightscore=0
810 ENDPROC
820 :-----
85 -
830 DEFPROCdeal
840 FOR pos=1 TO cards
890 UNTIL check=0
900 IF number(pos)>9 number$=STR$(number(pos)) ELSE number$=" "+STR$(number(po
)
910 SOUND 1,-10,101,8
920 PROCdisplay(132,135,X(pos),Y(pos),number$)
930 NEXT
940 ENDPROC
950 :-----
960 DEFPROCnewnumber
970 pos=pos+1;IF pos>cards pos=1
980 prob=5;TIME=0
990 IF RND(prob)=1 REPEAT;number(pos)=RND(total-1);PROCcheck(cards);UNTIL chec
k=1 ELSE IF check=0 REPEAT;number(pos)=RND(total-1);PROCcheck(cards);UNTIL check
=0;ELSE number(pos)=RND(total-1);PROCcheck(cards)
1000 PROCdisplay(134,134,X(pos),Y(pos)," ")
1010 key=INKEY(100);IF key=left OR key=right THEN number(pos)=0;ENDPROC
1020 IF number(pos)>9 number$=STR$(number(pos)) ELSE number$=" "+STR$(number(po
)
1030 pitch=pitch+4;SOUND1,-10,pitch,8
1040 PROCdisplay(132,135,X(pos),Y(pos),number$)
1050 REPEAT;key=INKEY(0);UNTIL TIME>400 OR key=left OR key=right
1060 ENDPROC
1070 :-----
1080 DEFPROCsnap
1090 SOUND 1,-15,101,15
1100 PROCclear(3,4)
1110 PRINTTAB(0,3)CHR#136;TAB(0,4)CHR#136
1120 PROCdisplay(131,129,9,3,"S N A P " by "+CHR#key)
1130 PROCdelay(3)
1140 PROCclear(3,4)
1150 PROCcheck(cards)
1160 IF check=1 THEN PROCright ELSE PROCwrong
1170 PROCdelay(3)
1180 PROCclear(8,22)
1190 ENDPROC
1200 :-----
1210 DEFPROCright
1220 SOUND 1,-15,149,10
1230 PROCdisplay(135,132,10,3,"1 point to "+CHR#key)

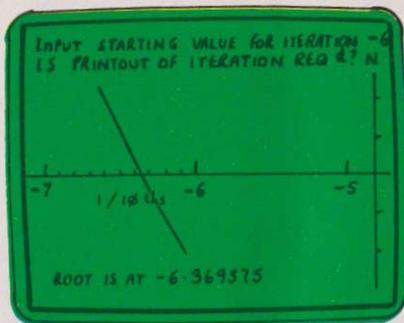
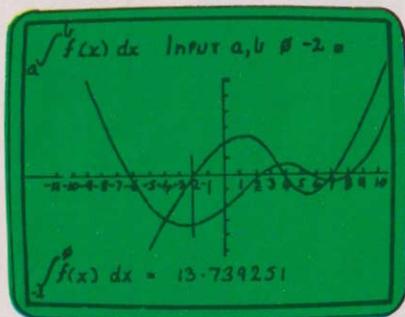
```

```

1240 correct$=STR$correct1+" "+STR$correct2+" "+STR$total
1250 PROCdisplay(135,132,16-LEN(correct$)/2,6,correct$)
1260 IF key=left THEN leftscore=leftscore+1 ELSE rightscore=rightscore+1
1270 ENDPROC
1280 :-----
1290 DEFPROCwrong
1300 SOUND 0,-15,50,20
1310 IF key=left THEN name$=CHR#right;rightscore=rightscore+1;ELSE name$=CHR#le
ft:leftscore=leftscore+1
1320 PROCdisplay(135,132,10,3,"1 point to "+name$)
1330 PROCdisplay(135,129,3,6,"No two numbers add up to "+STR$(total))
1340 ENDPROC
1350 :-----
1360 DEFPROCcheck(PX)
1370 check=0
1380 FOR AX=1 TO PX-1
1390 FOR BX=AX+1 TO PX
1400 IF number(AX)+number(BX)=total THEN check=1;correct1=number(AX);correct2=n
umber(BX)
1410 NEXT;NEXT
1420 ENDPROC
1430 :-----
1440 DEFPROCscore(line)
1450 PROCdisplay(134,132,12,line," SCORE ")
1460 PROCdisplay(131,132,1,line,CHR#left+" "+STR$(leftscore))
1470 PROCdisplay(131,132,28,line,CHR#right+" "+STR$(rightscore))
1480 ENDPROC
1490 :-----
1500 DEFPROCdisplay(background,foreground,X,Y,text$)
1510 display$=CHR#141+CHR#background+CHR#157+CHR#foreground+text$+" "+CHR#156
1520 PRINTTAB(X,Y)display$;TAB(X,Y+1)display$
1530 ENDPROC
1540 :-----
1550 DEFPROCdimarrays
1560 DIM number(cards),X(cards),Y(cards)
1570 RESTORE cards;10+1590
1580 FOR pos=1 TO cards
1590 READ X(pos),Y(pos)
1600 NEXT
1610 DATA 9,15,21,15
1620 DATA 15,10,20,15,10,15
1630 DATA 15,10,21,15,15,20,9,15
1640 DATA 15,11,23,15,21,20,9,20,7,15
1650 DATA 15,10,22,13,22,17,15,20,8,17,8,13
1660 DATA 15,10,23,13,23,17,21,21,9,21,7,17,7,13
1670 DATA 10,9,21,9,23,13,23,17,21,21,10,21,8,17,8,13
1680 ENDPROC
1690 :-----
1700 DEFPROCclear(upper,lower)
1710 FOR line=upper TO lower
1720 PRINTTAB(0,line)SPC40
1730 NEXT
1740 ENDPROC
1750 :-----
1760 DEFPROCquiet
1770 *FX210,1
1780 ENDPROC
1790 :-----
1800 DEFPROCsound
1810 *FX210,0
1820 ENDPROC
1830 :-----
1840 DEFPROCdelay(seconds)
1850 TIME=0;REPEAT;UNTIL TIME>seconds+100
1860 ENDPROC

```

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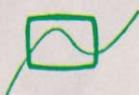


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Cumana Drive In

Simon Rockman

Cumana have released their new range of disc drives into the popular market place. They look good and carry consumer packaging for the high street shelves. We consider what sort of reception they will get



Cumana are launching two product lines, the single and dual slimline disc drives with a range of different storage capacities. The slimline drives are designed to meet approval with the home user in the same way as the earlier drives have done in schools.

Both the 40 and 60 track and double sided 80 track drives are assembled and tested before packaging, and have a 12 month warranty. Dual slimline drives are already under development. They will be slimline drives placed side-by-side or 'piggy-back' in a single casing.

STRIKING LOOKS

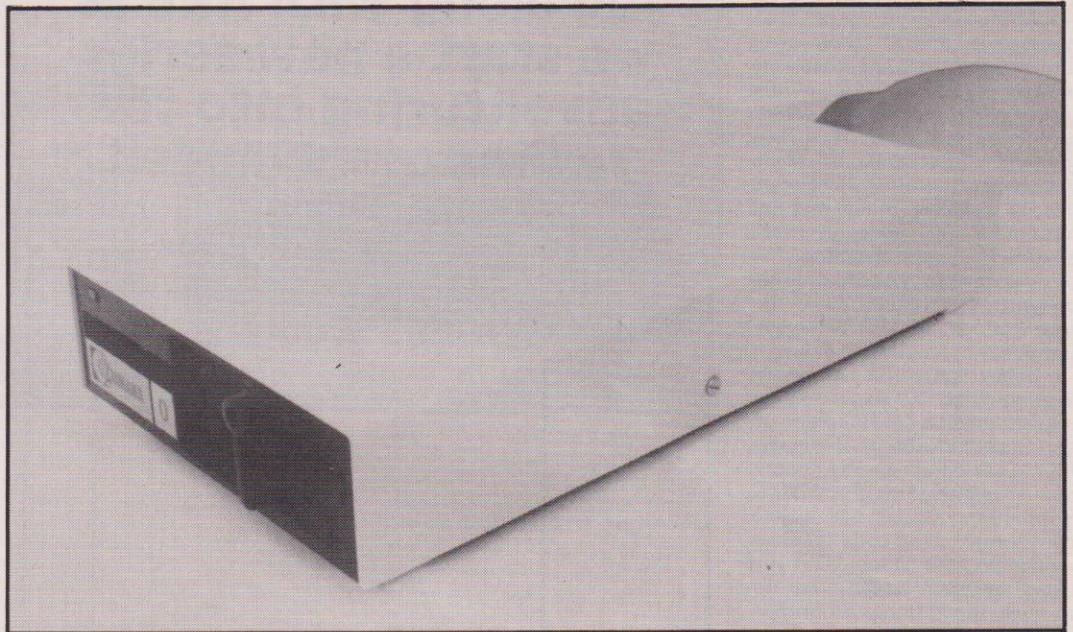
The one thing which struck me on reviewing the Cumana disc drive is how little there is to choose between disc drives. Different

drives are all very similar, very often coming out of the same factory in Japan, and it is unlikely that you will buy a bad make of drive. The Cumana is nicer than a lot of the drives that I have come across.

The particular model under review is the half height, 40 track,

single drive which is actually made by TEAC. It came with a nice long data cable with a plug on the cable for a second drive. It is a matter of taste whether you like the case colour to match your BBC but clearly many people do and so Cumana conform.

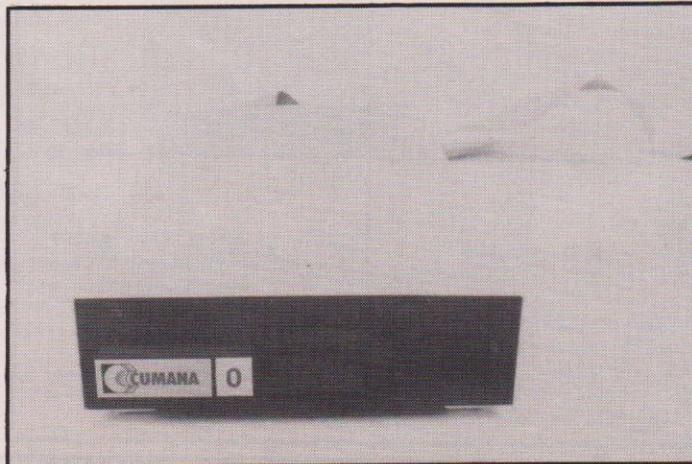
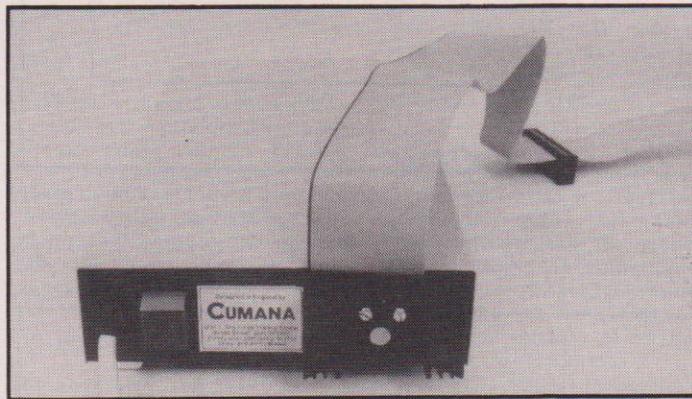
All Cumana drives have a built in power supply, particularly useful if you have an early Beeb because although Acorn dealers will upgrade the power supply and operating system, if necessary, on fitting a disc filing system (DFS), finding an approved dealer who will supply and fit a DFS on its own can prove difficult. However, the BBC does come with a power outlet, so if you are not going to add any other power consuming peripherals it is nice to have one less mains lead trailing around.



EXCELLENTLY DOCUMENTED

The manual, by Keith Davis, is very good. It is clear accurate, and well laid out as well as being nicely printed and bound. It is very difficult to write a manual to cater for all possible users, to be understood by those who don't really know what a disc drive is and to still have the detail for programmers who want to use the tricks that only discs will allow such as direct access and hidden programs. This manual falls somewhere between these two goals. Whilst being very detailed on the hardware that makes up the various drives, telling you which links to make or break on both the discs and computers pcb's, Mr. Davis then fails to go into a similar amount of detail on the software side. He does not mention the file handling differences between BASIC 1 and 2, nor does he mention using the disc from machine code.

What is interesting is the detail on switchable 80 track drives, how they work and a caution not to use an 80 track formatter in 40 track mode. The disc formatter supplied is excellent with clear prompts and is easy to use. This is very much a hardware guide telling you a lot



about the kit but only a little about the software and really not how to use it. It would benefit from an alphabetical index.

DISC ENVIRONMENT

The book emphasises the importance of going to a good dealer with technical backup who knows both the computer and the drives. With the BBC given its various version of BASIC, operating systems, PCB's and DFS's there are many pitfalls which do not involve the drive itself but only come to light when you have disc drive fitted. Do not expect the latest DFS Acornsoft seem to go through spates of upgrading version number but the differences are so minor that they will not affect the user. The latest I have heard of is 0.9m but anything greater than 0.90 is fine although 0.98 seems to be quite common and 0.9f is necessary for the Z80 second processor.

To sum up, the Cumana drive is beautifully made, quiet and works well. It comes from a large well reputed manufacturer; the manual is pretty good. The only reason I could see for buying anything else is financial.

Advanced Graphics

Bruce Smith

When the Editor asked me if I would like to do a series of articles on advanced graphics my first thoughts were just what is advanced graphics and indeed where does elementary graphics end if indeed there is such a thing! The question is a bit subjective, simply because what some people find easy others will find hard. As my guideline I will assume that most of you reading this will have progressed onto the contents of Chapter 29 of the User Guide titled, 'Advanced Graphics'.

In this first article we shall be looking at various aspects of the implementation of graphics on the Beeb including coordinates, MODEs and the new PLOT command available on the 1.20.S. Subsequent articles will include items on machine code graphics, animation, the video ULA and using the 6845 screen controller to really move things around!

SCREEN COORDINATES ABSOLUTELY RELATIVE

Before writing any graphics programs it is necessary to have a good understanding of the coordinate geometry used by the Beeb to display lines and shapes on the screen. In fact the Beeb can use two different systems these are termed absolute and relative.

The absolute system treats the screen rather like a piece of graph paper with the horizontal and vertical axis labelled X and Y respectively. Each axis is divided into a number of equispaced points; 1280 for the X axis and 1024 for the Y axis (see Figure 1). The bottom left hand corner of the screen has a special name, the origin, and this always has the coordinates 0,0 and all screen positions can be measured absolute to this. Any particular point on the screen has a location corresponding to the intersection of vertical and horizontal lines drawn parallel to each axis X and Y points along from the origin. It is quite legitimate to plot points off the screen either by specifying coordinates greater than 1280

Tag along with A&B as we start a new series adventuring into the realms of advanced graphics.

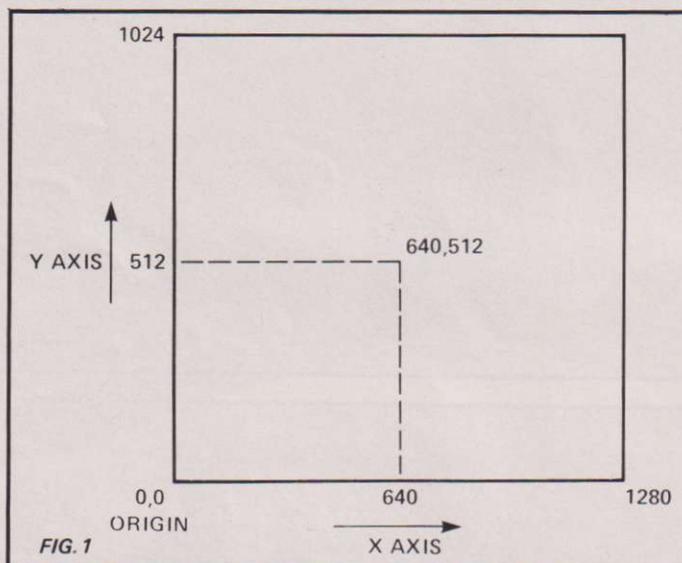


FIG. 1

and 1024 or by preceding the coordinate with a minus sign. Figure 2 shows the four quadrants of the graphics area of which normally only one

quadrant is visible, though as we shall see at a later date it is possible to reposition the origin anywhere on the screen using the VDU29 command and move

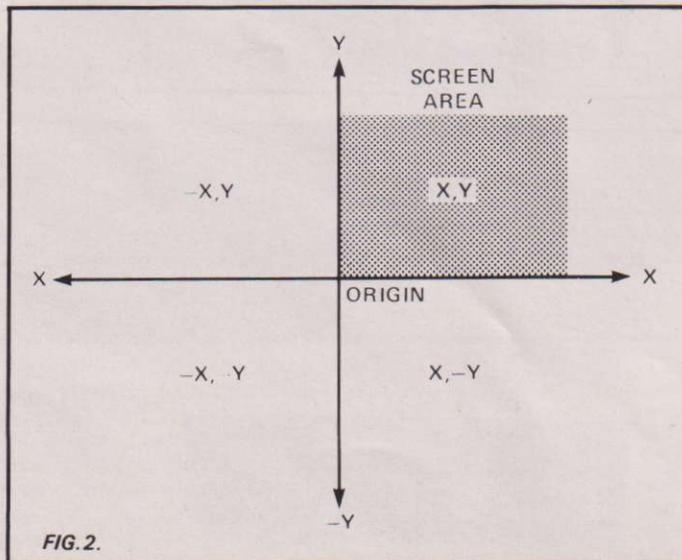


FIG. 2.

segments of all four quadrants on the screen.

MOVE and DRAW both use the absolute coordinate system. For example a line can be drawn diagonally to the middle of the screen from left to right using;

```
10 MODE 5
20 MOVE 0,0 : REM set
  graphics cursor at origin
30 DRAW 640,512 : REM and
  draw to top left
```

The PLOT commands numbers 4 to 7 will also work in the absolute mode thus the same diagonal line can be drawn using;

```
10 MODE 5
20 PLOT 4,0,0 : REM move
  cursor to origin
30 PLOT 6,640,512 :
  REM draw to top left
```

In both instances the graphics cursor's current position is at the centre of the screen, any further plotting will result in a line being drawn from this current position to the specified one which will then become the 'new' current graphic cursor position. To draw to the top middle of the screen we need only add a single line (Figure 3).

```
30 DRAW 640,1024
or
30 PLOT 6,640,1024
```

The relative coordinate system is perhaps more difficult to comprehend, but once mastered much easier to use. Here all coordinates are measured as a displacement from the last plotted position. A positive coordinate value (X or Y) indicates a move in a positive direction namely right (X) or upwards (Y). A negative value on the other hand moves the graphics cursor in a negative direction, that is left (X) or down (Y) (see Figure 2 again). A zero indicates no movement in that particular coordinates position.

An example will make things much clearer. Suppose we wish



to draw a square 100 points long on each side roughly central on the screen. Using relative plotting the process is simple:

```
10 MODE 5
20 MOVE 600,500 : REM move Graphics cursor
30 REM Plot square using relative coordinates
40 PLOT 1,0,100 : REM side one - draw up
50 PLOT 1,100,0 : REM side two - draw across
60 PLOT 1,0,-100 : REM side three - draw down
70 PLOT 1,-100,0 : REM side four - and back to start
```

In most instances when using relative plotting an absolute argument will normally be given at the onset to set the position from which lines will be plotted, thus the MOVE statement in line 10. Figure 4 illustrates the effect of each PLOT.

If you still think this method seems rather complicated try drawing the same square using absolute coordinates only. As an exercise try using relative coordinates to draw and fill the same square using two triangles.

The great advantage of using relative coordinates is that a PROCEDURE library of shapes can be built up and the relevant values passed into it on call. A general purpose square drawing PROCEDURE might look like this:

```
1000 DEF PROCsquare (absx, absy, side)
1010 MOVE absx, absy
1020 PLOT 1, 0, side
1030 PLOT 1, side, 0
1040 PLOT 1, 0, -side
1050 PLOT 1, -side, 0
1060 ENDPROC
```

The same square drawn earlier could now be produced by calling the procedure with:

```
PROCsquare (600, 500, 100)
```

By incorporating the procedural call inside a FOR...NEXT loop several squares can be drawn across the screen.

```
10 MODE 5
20 absx=0 : absy=0 : side=100
30 FOR loop=1 to 20
40 PROCsquare (absx, absy, side)
50 absx=absx+50 : absy=absy+50
60 NEXT loop
```

Using the same method squares of decreasing size can be drawn within one another.

```
10 MODE 5
20 absx=400 : absy=300 : side=700
30 FOR loop=1 TO 30
```

```
40 PROCsquare (absx, absy, side)
50 absy=absy+10 : absx=absx+10
60 NEXT loop
```

If you have any good short graphics routines written in the form of a PROCEDURE why not send them in to me. The best ones will be included in a future article.

MODES

The Beeb has eight screen modes in all, however, only five of these can be used for graphics. The graphics mode selected will determine three things, they are:

- i. The amount of memory left for programs
- ii. The size or resolution of each point plotted on the screen
- iii. The number of colours available for use.

The values for each of these points per mode are as follows:

MODE	Resolution	Colours	Memory
0	640x256	2	20K
1	320x256	4	20K
2	160x256	16	20K
4	320x256	2	10K
5	160x256	4	10K

The MODE 0 screen provides the highest resolution graphics, which simply means that finer detail can be displayed in this mode, as opposed to MODE 5 which has a lower resolution

screen and therefore displays rather chunkier graphics. There is a price to pay for using high resolution graphics — memory, it gobbles it up! This is because the Beeb's screen is memory mapped, this means that each point on it is directly addressable by writing data into the memory location corresponding to that particular point. Figure 5 shows the memory layout for each graphics screen. This fact of life will affect all Model A owners. Only MODEs 4 and 5 are available to you due to the reduced amount of internal memory.

To illustrate this memory mapping technique the following program will draw a line across the top of the screen by poking successive bytes with 255.

```
10 MODE 4
20 FOR byte=&5802 TO &593A STEP 8
30 ?byte=255
40 NEXT byte
```

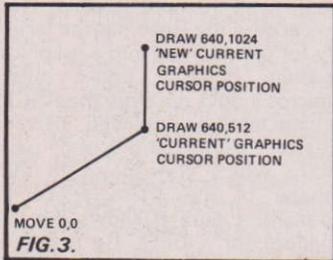
Note that the memory map extends down and across the screen rather than straight as is the norm with most memory screens. This is because the Beeb has the facility for printing text into a graphics screen, however unlike other micros it does not store the ASCII character to be displayed, instead it stores eight columns of bit patterns which correspond to the shape of the character being printed. Figure 6 shows the bit pattern for a UFO. By poking the number relating to the bit pattern of each byte into memory the craft can be displayed on the screen as if it has just been printed there:

```
20 FOR byte=&5800 TO &5807
30 READ Pattern
40 ?byte=Pattern
50 NEXT byte
60 DATA &18,&18,&7E,&DB
70 DATA &99,&FF,&7E,&3C
```

CONTINUED OVER

Using this method it is a simple matter to design and display 'characters' be they letters or the infamous 'Space Invader'. A special VDU code (VDU 23) is provided in the BASIC vocabulary to allow such characters to be placed on the screen using the PRINT command. Chapter 29 of the User Guide shows how the technique is performed.

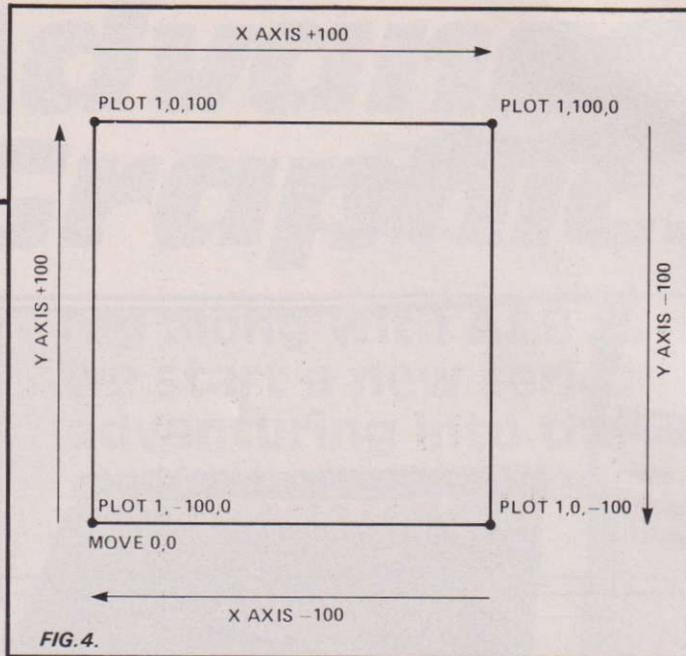
You may have noticed that the graphic resolutions listed in the table above do not correspond to the screen coordinate system values for the X and Y axis discussed earlier, this is because it is simply a notational system and is absolutely independent of the current screen MODE. In fact this is a tremendous advantage simply because it allows programs to be written for a fixed 'size' screen of any MODE. In fact this is a tremendous advantage simply because it allows programs to be written for a fixed 'size' screen of any MODE, allowing the internal graphics software to convert the coordinates into a set of 'internal coordinates' derived at by scaling them so that they are measured in 'pixels' both vertically and horizontally (we shall come back to this subject in a later issue).



Another advantage of this fixed coordinate system is that programs can be run in a variety of graphics modes with the knowledge that the shape and size of the object will remain the same.

PIXELS

Any shape drawn into a graphics screen is composed of individual points known as 'pixels'. The size of each pixel can be expressed in terms of the number of XY coordinate points it uses; these will vary between modes. Figure 7 illustrates the pixel configuration

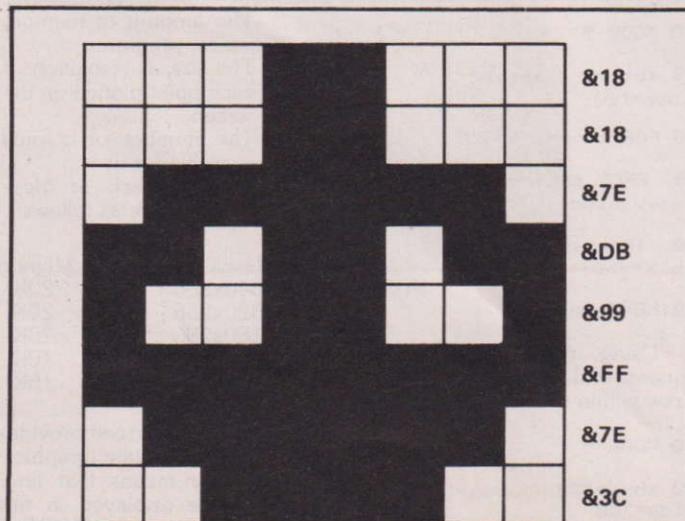


for each graphics MODE. Plotting a point at any one of the coordinates contained within a pixel will result in 'all' of the points within the particular pixel being set. For example the following program plots eight individual points at the bottom left hand corner of the screen but only a single pixel is illuminated. The same pixel can be illuminated simply by plotting any one of these points.

```

10 MODE 5
20 PLOT 69,0,0 PLOT 69,1,0
30 PLOT 69,0,1 PLOT 69,1,1
40 PLOT 69,2,0 PLOT 69,2,1
50 PLOT 69,0,2 PLOT 69,1,2
    
```

The next program



demonstrates this changing pixel size configuration by plotting a point at the centre of each graphics MODE.

```

10 FOR mode=0 TO 2
20 REM use 4 TO 5
   on mode 1 A
30 MODE mode
40 PRINT "MODE ":mode
50 PLOT 69,640,512
60 TIME=0
70 REPEAT UNTIL TIME=500
80 NEXT mode
    
```

This program should make it clear that the smaller the pixel size the smoother more accurate the line or shape being drawn is.

FILLING & BLANKING ON 1.2

If you have a 1.20S ROM (enter *FX0 to print your OS version number if you are not sure which one you have) then several new PLOT commands are available not detailed in the User Guide.

PLOT numbers 72 to 79 can be used to 'horizontally' fill all types of shapes, simple or complex, in a similar manner to that used by the plot and fill triangle codes (PLOT 80-87). When using these commands the graphics cursor is moved to the specified X and Y coordinates. It then searches left until it encounters a 'set' pixel, that is one that is not in the current background colour (black if you are using monochromatic plots!), or until it reaches the edge of the current graphics window. It remembers this point and then sets of towards the right hand side of the screen repeating the process. If the PLOT code is 73 or 77 a line in the current foreground colour is drawn between these two points. To see this filling process in action, try the following (sorry 1.20S owners only!):

```

20 MOVE 100,100
30 REM draw a square
40 PLOT 1,0,900
50 PLOT 1,900,0
60 PLOT 1,0,-900
70 PLOT 1,-900,0
80 REM fill entire square
90 FOR fill%=100 TO 1000
100 PLOT 77,550,fill%
110 NEXT fill%
    
```

The filling PLOT has been incorporated into a FOR...NEXT loop to increment the Y axis coordinate such that each line within the square is encountered and duly filled.

If PLOT numbers 72 or 76 are used no line is drawn 'but' the cursor movements are made and can be read using an OSWORD call with the accumulator containing 13:

Wordgrid

Mike Berry

Word puzzles seem as popular as ever, to judge from the numbers seen on the bookstalls. Computer versions have been around for a long time, too — but they usually require a printer to enable you to solve the puzzle. This program, for a 32K BBC micro, enables the player to locate the hidden words with the cursor, and solve the puzzle actually on the screen. The game can be played with or without a displayed word list.

TWO STAGES

The program is in two stages. At the first stage, you give a title for the puzzle, and enter your 20 different words. You are not allowed to enter duplicates, and no word may be a sub-set of another word. Once all words have been entered, the program fits them into a square, using the eight possible directions. You are given the opportunity of seeing the square before the random letters are inserted, and can choose whether you want the word list displayed. If you don't want to see the word list, each word will be replaced, letter for letter, with dots.

The second stage is when you indicate to the computer where you think each word is. This you do by moving the cursor (using the cursor keys), then press 'L'

Wrack your brain with this BBC word grid generator. No need to puzzle over the clearly structured BASIC program.

(confirm Letter). Then, move to the next letter and press 'L', and so on. Each time you confirm a letter, the program checks that there is a word in the word list which starts with the string built so far, and that the letters are in a straight line. If all is O.K., the colour of the letter which has been confirmed is changed — so you can see what you have done.

When you are happy that you have a complete word, press 'W' (confirm Word). If it is a valid word, the word in the word list changes colour, to show that it has been used. If you start to build a word, but then realise it isn't going to work out, you can press 'A' (for Abandon), and everything will be restored to the state it was in before you started that word.

At any stage, for example, when you have located all the words, pressing 'S' (for Stop) will give you the opportunity of leaving the current puzzle and starting a new one.

The program runs entirely in Mode 7, and uses teletext coloured characters. It has been developed in a structured way (see Figure 1), using procedures as described below.

PROCINIT

Initialises the arrays WORD\$, containing the word list, GRID\$, the stored version of the word square, and COORD, used to store the co-ordinates of each letter of a word as it is confirmed by the player. X% and Y% are the co-ordinates of the start position of each word, and D%

represents its direction. X1% and Y1% are the variables used to store the calculated co-ordinates of each subsequent letter in the word being fitted.

W% is the word count. LLETTERCOUNT% is the count of how many letters have been confirmed in the current word. A— is a string used for validating alphabetic characters.

PROCTITLE

Displays the title screen, and calls PROCINSTRUCT if playing instructions are requested.

PROCLIST

Entry of word list. Calls PROCEDITWORD to validate each word.

PROCEDITWORD

Checks each word for length, whether it is alphabetic, and whether it clashes with another word.

PROCERRROR

Called by PROCEDITWORD to report on an input error.

PROCGRID

For each word in the word list, generates a random starting position and a random direction, repeating this until a combination is found which will fit within the

PROGRAM LISTING

```

10REM*****
20REM* *
30REM* WORDGRID *
40REM* ----- *
50REM* *
60REM* The program generates a *
70REM* grid of letters, with your *
80REM* words hidden in it. *
90REM* You can then try to solve *
100REM* the puzzle on the screen. *
110REM* *
120REM*****
130
140REM++++Main Loop+++++
150 MODE7
160 ON ERROR GOTO 220
170 PROCINIT
180 PROCTITLE
190 PROCLIST
200 PROCGRID
210 PROCPLAY
220 *FX 4,0
230 MODE7
240 END
250
260REM+++Initialise Variables+++++
270 DEF PROCINIT
280 PROCORSORDEL(1)
290 X%=0:Y%=0:X1%=0:Y1%=0:D%=0:W%=0:LLETTERCOUNT%=0:word$=""
300 DIM WORD$(20), GRID$(15,15),COORD(17,2)
310 A$="ABCDEFGHIJKLMNPOQRSTUVWXYZ"
320 ENDPROC
330
340REM+++++Instructions+++++
350 DEF PROCINSTRUCT
360 FOR IX=1 TO 2
370 PRINTCHR$(83)CHR$(141)"WORDGRID"
380 NEXT
390 PRINT"CHR$(130):"This program is in two stages. At the"CHR$(130):"first
stage, you give a title for your"CHR$(130):"word list."
400 PRINTCHR$(131):"You then enter twenty different words."CHR$(131):"No word
must contain or be contained"CHR$(131):"in another word."
410 PRINTCHR$(132):"After you have entered all 20 words,"CHR$(132):"the pro
gram will fit them into a grid,"CHR$(132):"using all 8 possible orientations."
420 PRINT"CHR$(133):"At the second stage, you try to find"CHR$(133):"the hid
den words. You locate them with"CHR$(133):"the cursor control keys, and instruct
"CHR$(133):"the program as under:"
430 PRINT"CHR$(134):"L - Confirm letter where cursor is"CHR$(134):"W - Confir
m word"CHR$(134):"A - Abandon word"CHR$(134):"S - Give up"
440 PRINT"CHR$(136):"Press any key to continue";
450 A=GET
460 ENDPROC
470
480REM+++++Enter Word List+++++
490 DEF PROCLIST
500 CLS
510 PROCORSORDEL(2)
520 PRINTCHR$(83)"WORDGRID"CHR$(83)"-----" "Now enter your words as prom
pted." "The grid will be generated fastest if"-----"you enter your longest words fir
st."
530 EDERRX=0
540 INPUTTAB(0,6) " Please enter title: " W$:PROCEDITWORD:IF EDERRX=1 THEN GOTO
530 ELSE WORD$(0)=W$:PRINTTAB(0,8);STRING$(20," ")
550 FOR WX=1 TO 20
560 EDERRX=0
570 PRINTTAB(0,10) " Now enter word "WX:INPUTTAB(18,10) " : " W$:PROCEDITWORD:
IFEDERRX=1 THEN GOTO 560 ELSE WORD$(WX)=W$:PRINTTAB(21,10);STRING$(10," ");TAB(0
,12);STRING$(20," ")
580 NEXT WX
590 PRINTTAB(0,15);CHR$(136):"FITTING WORDS - Please wait"
600 ENDPROC
610
620REM+++++Edit Word+++++
630 DEF PROCEDITWORD
640 IF LEN(W$)10 THEN PROCERRROR(1)
650 F1X=1
660 FOR HX=1 TO LEN(W$)
670 F2X=1
680 FOR IX=1 TO 26
690 IF MID$(W$,HX,1)=MID$(A$,IX,1) THEN F2X=0

```



square. It then checks that the place it wishes to put each letter is either unoccupied or contains the required letter already. Again, if the word cannot be fitted, a new random position and direction are chosen. Although this process is not particularly elegant, it does work, and is pretty nifty, too.

PROCCOORD

Called by PROCGRID to calculate the co-ordinates of a letter position, based on the position of the previous letter and the direction of the word.

PROCprintlist

Called by PROCGRID to print the word list, either as words, or as dots.

PROCPLAY

The main loop controlling the second (solving) stage of the game.

PROCCURSORMVE

Checks whether a cursor control key has been pressed, and moves the cursor appropriately, provided it remains within the square. Also checks for keys 'L', 'W' and 'A'.

PROCCONFIRMLETTER

Called by PROCCURSORMVE

when a letter is confirmed. After calling PROCEDITLETTER to validate the letter, it re-writes it in the 'confirmed' colour, and updates a record of the letter positions for the current word-so-far in COORD.

PROCEDITLETTER

Checks that the new letter is adjacent, in the chosen direction, to the previous confirmed letter, and also that there is a word in the word list which begins with the string-so-far.

PROCBANDONWORD

Called by PROCCURSORMVE when a word is abandoned. It resets the appropriate variables, and re-prints all the letters confirmed in the word (identified in

COORD) back to their original colour.

PROCONFIRMWORD

Called by PROCCURSORMVE when a word is confirmed. After calling PROCEDITWORD to check that the word exists in the word list, it re-sets the variables used to store the word and its length.

PROCCeditword

Scans the word list to check that the confirmed word exists in it. If it does, it calls PROCWORD-DONE.

PROCWORDDONE

Locates the word (or dots) in the displayed word list, and re-prints it in a new colour, to show that it

has been found.

PROCCURSORDEL

Called at various points in the program to either delete or re-establish the displayed cursor.

FNL

A function which returns the ASCII value of the character being displayed at the current cursor position.

TECHNICAL NOTES

The array COORD is very extravagant on space — by starting each subscript at 1, rather than zero, the program grabs far more storage than necessary. There is no reason, if you decide to add function to this program, why you should not change it to COORD(15,1).

The program is, however, very well structured. In conjunction with this documentation, it should be easy to enhance it if you feel the urge. This is why structured design and programming is so useful.

The program has been designed to be extremely use-friendly; most awkward situations that the player can find his/herself in are accommodated by the program.

```

700 NEXT IX
710 IF F2X=1 THEN F1X=0
720 NEXT HX
730 IF F1X=0 THEN PROCERR(2)
740 IF WX=0 THEN ENDPROC
750 FOR IX=0 TO WX-1
760 IF WORD$(IX)=W$ THEN PROCERR(3)
770 IF LEN(WORD$(IX))<LEN(W$) THEN IF INSTR(WORD$(IX),W$)>0 THEN PROCERR(3)
780 IF LEN(WORD$(IX))>LEN(W$) THEN IF INSTR(W$,WORD$(IX))>0 THEN PROCERR(3)
790 NEXT IX
800 ENDPROC
810
820REM*****Construct Grid*****
830REM   XX,YX  Start Coordinates
840REM   DX      Direction
850
860 DEF PROCGRID
870 FOR WX=1 TO 20
880 X=RND(15):Y=RND(15):DX=RND(8)
890 IF DX=1 OR DX=3 OR DX=4 THEN IF X+LEN(WORD$(WX))>16 THEN GOTOB80
900 IF DX=2 OR DX=7 OR DX=8 THEN IF X-LEN(WORD$(WX))<0 THEN GOTOB80
910 IF DX=3 OR DX=5 OR DX=7 THEN IF Y+LEN(WORD$(WX))>16 THEN GOTOB80
920 IF DX=4 OR DX=6 OR DX=8 THEN IF Y-LEN(WORD$(WX))<0 THEN GOTOB80
930 FLAGX=0
940 FOR IX=1 TO LEN(WORD$(WX))
950 PROCCOORD
960 IF GRID$(IX,YX)="" THEN IF GRID$(IX,YX)=MID$(WORD$(WX),IX,1) THEN FL
970 NEXT IX
980 IF FLAGX=1 THEN GOTOB80
990 FOR IX=1 TO LEN(WORD$(WX))
1000 PROCCOORD
1010 GRID$(IX,YX)=MID$(WORD$(WX),IX,1)
1020 NEXT IX
1030 NEXT WX
1040 PRINTTAB(0,15):"I've fitted in your words.  "!"Would you like to see them
before I hidethem";:INPUT YN$:YN$=LEFT$(YN$,1):IF YN$()="Y" AND YN$()="N" THEN VD
GOTO 1040
1050 PRINTTAB(0,19):"Do you want the word list displayed";:INPUT WN$:WN$=LEFT$(
WN$,1):IF WN$()="Y" AND WN$()="N" THEN VDU7:GOTO1050

```

```

1060 IF YN$="Y" THEN GOSUB 1140:PRINTTAB(0,19):"Press any key to see the puzzle
":IX=GET
1070 FOR YX=1TO15:FOR YX=1TO15
1080 IF GRID$(YX,YX)="" THEN GRID$(YX,YX)=MID$(RND(26),1)
1090 NEXT:YX
1100 GOSUB 1140
1110 PRINTTAB(0,16):CHR$(131):WORD$(0)
1120 PROCprintlist(0,0):PROCCprintlist(13,7):PROCCprintlist(26,14)
1130 ENDPROC
1140 CLS
1150 PROCCURSORDEL(1)
1160 FOR YX=1TO15:FOR YX=1TO15
1170 PRINTTAB(YX*2,YX-1):GRID$(YX,YX)
1180 NEXT:YX
1190 PROCCURSORDEL(2):RETURN
1200
1210REM*****Loop for solving puzzle***
1220 DEF PROCPLAY
1230 PROCCURSORDEL(2)
1240 VDU31,2,14
1250 *FX 4,1
1260 REPEAT
1270 PROCCURSORMVE
1280 UNTIL MVE=83
1290 *FX 4,0
1300 PROCCURSORDEL(2)
1310 CLS:PRINTTAB(10,15);
1320 INPUT"ANOTHER GAME",Q$:Q$=LEFT$(Q$,1)
1330 IF Q$="Y" THEN RUN
1340 ENDPROC
1350
1360REM***Find next coordinates*****
1370 DEF PROCCOORD
1380IF DX=1 THEN X1=X+IX-1:Y1=Y
1390IF DX=2 THEN X1=X-IX-1:Y1=Y
1400IF DX=3 THEN X1=X+IX-1:Y1=Y+IX-1
1410IF DX=4 THEN X1=X+IX-1:Y1=Y-IX-1

```

CONTINUED OVER

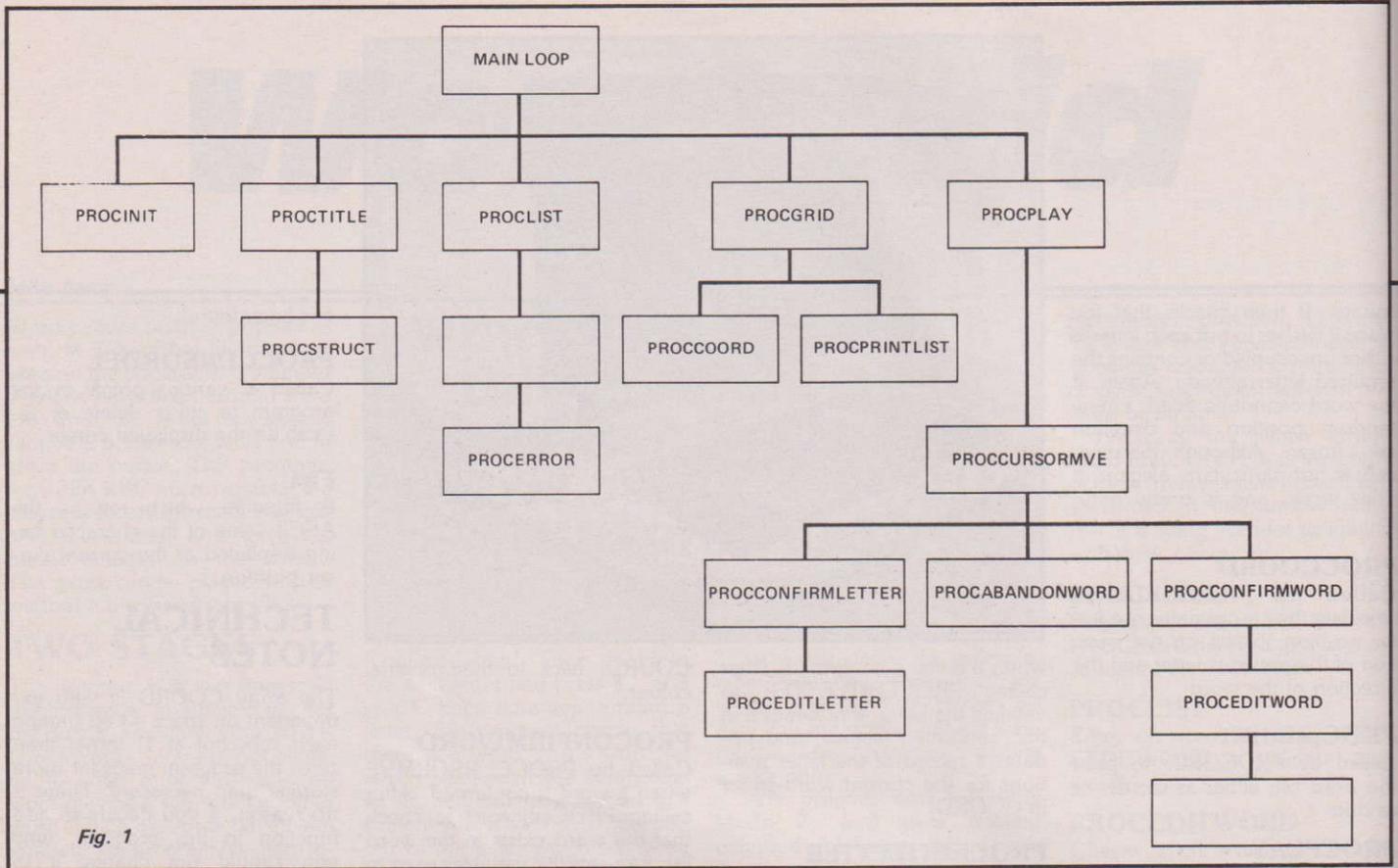


Fig. 1

```

1420IF DX=5 THEN X1X=XX:Y1X=YX-IX-1
1430IF DX=6 THEN X1X=XX:Y1X=YX-IX+1
1440IF DX=7 THEN X1X=XX-IX+1:Y1X=YX-IX-1
1450IF DX=8 THEN X1X=XX-IX+1:Y1X=YX-IX+1
1460 ENDPROC
1470
1480REM+++Error message/Delete word+++
1490 DEF PROCERRR(MX)
1500 ON MX GOTO 1510,1520,1530
1510 PRINT" TOO LONG           ":GOTO 1540
1520 PRINT" NOT ALPHABETIC      ":GOTO 1540
1530 PRINT" ALREADY USED       ":GOTO 1540
1540 VDU7
1550 EDERRX=1
1560 IF WX=0 THEN TX=6 ELSE TX=10
1570PRINTTAB(21,TX);STRING$(30," ");TAB(21,TX)
1580 ENDPROC
1590
1600REM+++++Display Title Screen+++++
1610 DEF PROCTITLE
1620 CLS
1630 PRINTTAB(0,7);
1640 FOR IX=1 TO 2
1650 PRINTCHR$(141)"WORDGRID"
1660 NEXT
1670 PRINTTAB(15,20);"by Mike Berry"
1680 T=TIME+500:REPEATUNTIL TIME>T
1690 CLS
1700 INPUT"DO YOU WANT INSTRUCTIONS",YN$
1710 IF LEFT$(YN$,1)="Y" THEN PROCINSTRUCT
1720 ENDPROC
1730
1740REM+++++Display Word List+++++
1750 DEF PROCprintlist(XX,WX)
1760 FOR IX=1 TO 7
1770 IF WX+IX>20 THEN GOTO 1790
1780 IF WNS="N" THEN PRINTTAB(XX,IX+17);CHR$(135);STRING$(LEN(WORD$(WX+IX))," "
: ELSE PRINTTAB(XX,IX+17);CHR$(135);WORD$(WX+IX);
1790 NEXT
1800 ENDPROC
1810
1820REM+++Delete/Reestablish Cursor+++
1830 DEF PROCORSORDEL(DEL)
1840 ON DEL GOTO 1850,1860
1850 VDU23;8202;0;0;0;:ENDPROC
1860 VDU23;29194;0;0;0;:ENDPROC
1870
1880REM+++++Move Cursor+++++
1890 DEF PROCORSORMVE
1900 MVE=GET
1910 IF MVE=136 AND POS(2) THEN VDU8,B
1920 IF MVE=137 AND POS(30) THEN VDU9,9
1930 IF MVE=138 AND VPOS(14) THEN VDU10
1940 IF MVE=139 AND VPOS(0) THEN VDU11
1950 IF MVE=76 THEN PROCCONFIRMLETTER
1960 IF MVE=65 THEN PROCABANDONWORD
1970 IF MVE=87 THEN PROCCONFIRMWORD
1980 ENDPROC
1990
2000REM+++Confirm Letter+++++
2010 DEF PROCCONFIRMLETTER
2020 AX=135:LLETTERX=FNL
2030 INVALIDX=1:PROCEDITLETTER
2040 IF INVALIDX=1 THEN ENDPROC
2050 LLETTERCOUNTX=LLETTERCOUNTX+1:COORD(LLETTERCOUNTX,1)=POS:COORD(LLETTERCOUN
TX,2)=VPOS
2060 LLETTERX=CHR$(130)+CHR$(LLETTERX)
2070 VDU9:AX=135:CHECKCOLX=FNL
2080 IF CHECKCOLX=130 THEN LLETTER=LLETTER+CHR$(130) ELSE LLETTER=LLETTER+C
HR$(135)
2090 VDU8
2100 PRINTTAB(POS-1,VPOS);LLETTER$:VDU8,B
2110 ENDPROC
2120
2130REM+++Confirm Word+++++
2140 DEF PROCCONFIRMWORD
2150 INVALIDX=1:PROCEDITWORD
2160 IF INVALIDX=1 THEN ENDPROC
2170 word$="" :LLETTERCOUNTX=0
2180 ENDPROC
2190
2200REM+++Edit Letter+++++
2210 DEF PROCEDITLETTER
2220 word$=word$+CHR$(LLETTERX)
2230 IF LEFT$(word$,1)=" " THEN word$=RIGHT$(word$,LEN(word$)-1):COORD(LLETTERC
OUNTX,1)=POS:COORD(LLETTERCOUNTX,2)=VPOS
2240 DIFFPOSX=POS-COORD(LLETTERCOUNTX,1):DIFFVPOSX=VPOS-COORD(LLETTERCOUNTX,2)
2250 IF DIFFPOSX<-2 OR DIFFPOSX>2 OR DIFFVPOSX<-1 OR DIFFVPOSX>1 OR VPOS(14) THE
N GOTO 2290
2260 FOR I=1 TO 20
2270 IF word$=LEFT$(WORD$(I),LEN(word$)) THEN INVALIDX=0
2280 NEXT I
2290 IF INVALIDX=1 THEN VDU7:word$=LEFT$(word$,LEN(word$)-1)
2300 ENDPROC
2310
2320REM+++Edit Word+++++
2330 DEF PROCEDITWORD
2340 FOR I=1 TO 20
2350 IF word$=WORD$(I) THEN INVALIDX=0:PROCWORDDONE
2360 NEXT
2370 IF INVALIDX=1 THEN VDU7
2380 ENDPROC
2390
2400REM+++Word done-mark off on list+++
2410 DEF PROCWORDDONE
2420 IF I(8) THEN PRINTTAB(0,I+17);
2430 IF I(7) AND I(15) THEN PRINTTAB(13,I+10);
2440 IF I(14) THEN PRINTTAB(26,I+3);
2450 PRINTCHR$(130)+WORD$(I)+CHR$(135);VDU31,2,14
2460 DONE=DONE+1
2470 ENDPROC
2480
2490REM+++Word abandoned-back off+++++
2500 DEF PROCABANDONWORD
2510 FOR I=1 TO LLETTERCOUNTX
2520 VDU31,COORD(I,1),COORD(I,2)
2530 AX=135:LLETTERX=FNL
2540 PRINTTAB(COORD(I,1)-1,COORD(I,2));CHR$(135)+CHR$(LLETTERX)
2550 NEXT I
2560 VDU31,2,14
2570 word$="" :LLETTERCOUNTX=0
2580 ENDPROC
2590
2600REM+++Get character at cursor pos+++
2610 DEF FNL=(USR(&FF4) AND &F00)/&100
  
```


Software Reviews

Title: Snowball
Publisher: Level 9
Machine: Model B
Price: £9.90

Level 9's latest adventure is called Snowball. It is, to say the least, rather large; there are 7000 locations. The game has a realistically planned layout and, according to the author, would actually work in real life.

It is a new idea in adventures. There are no treasures as such and you don't score points by finding things hiding them at a hut, a cross roads or a road by a forest...instead you score points if you do things that help you in your task. This is to get to the main control-room and to rescue your ship. You will lose points if you are caught by the Nightingales (this part is rather easy) or if you die.

In order to give you a hand, Level 9 have provided an envelope (but no stamp like they used to) so you may ask questions. Answers are truthful and straight to the point.

The program is written in 'a-code', a very compact language with text messages at around half size normal memory requirements; ie 'the' takes up one byte. All this data compression means that a game can be crammed into less memory than usual.

The program loading has various parts. The first resets PAGE to &1900. The second is a title page. The third plays five and a half minutes of superb



music to avoid total boredom while 65 blocks of code are loaded on board. Finally a short anonymous section is loaded in. The game itself is simple to play but difficult to solve. For example, what's the bank of ten buttons for? Answers on a postcard please. It has taken a mere nine months to perfect this masterpiece and I envisage my taking a similar length of time to complete it.

The documentation is absolutely first class. There is a 12 page manual of background notes and hints.

Ratings Table:

SOUND	90%
GRAPHICS	N/A
DOCUMENTATION	95%
VALUE FOR MONEY	90%
OVERALL	90%

Title: Lunar Rescue
Publisher: Alligata
Machine: Model B
Price: £7.95

Lunar Rescue, as the name rather suggests, is a conventional game involving spaceships, aliens and asteroids in varying combination. It turned out to be fairly well realised by this new BBC software company. The title and theme music (Thunderbirds sound-alike are repeated before each and every game and this proves the overwhelming incentive to win and therefore avoid the dreaded 'game over' and a repeat performance.

At first sight the graphics look a bit thin but they serve their purpose. I'm sure the block graphics which represent the lunar surface could be improved. However, the keys employed (Z-left, X-right) responded swiftly and movement on the screen was quick and smooth. On leaving the mother ship, the idea is to negotiate the regular (and therefore predictable) passage of the asteroids and to land squarely on a pad on the moon's surface. This part of the game proved quite easy.

Now you take on board the stick figure which sprints over to your ship and re-launch into the midst of the asteroids which now metamorphose into alien ships



doing their utmost to shoot you down. It is very difficult to destroy the missiles which come at you and for the best results it is a good idea to dodge all-comers, destroying the odd spaceship only when absolutely necessary.

The game proved highly enjoyable to play with nice use of user-defined graphics and with the space and destructive noises usually employed in such games.

Ratings Table:

SOUND	65%
GRAPHICS	55%
DOCUMENTATION	75%
VALUE FOR MONEY	60%
OVERALL	65%

Title: Disassembler
Publishers: Simonsoft
Machine: Models A/B
Price: £6.95

This extensive utility program should give some enjoyable sessions to the patient enthusiasts.

The main program comes on a cassette with full user instructions in a separate program, "Help", found on the reverse side.

The program is operated by a set of commands controlled by the function keys. Once a program has been disassembled, the source code can be examined and probed at will.

Some of the very basic options available on the disassembled mode are:

Mode Choice — this controls the interpretation of the source

code and data; in the AUTO mode, branches and data will be labelled; and a MAP of the code and data will be generated.

List — A full listing of the program of any specified block of memory can be obtained onto either the screen, printer or tape. The latter option generates a BASIC program format, thus enabling the user to incorporate certain routines into his own programs; a very useful feature.

Label — back and forward branches; indirect and absolute jumps; and subroutines will be appropriately labelled.

Map — This gives a representation of which areas of memory contain data and which contain code. This can also be used to insert defined codeblocks or datablocks.

There are many more minor options and commands available; any outstanding points can be cleared by telephoning Simonsoft.

This is a very powerful 6502 disassembler which enables the user to manipulate Machine code and Assembly source code in a most flexible way. The instructions are occasionally slightly vague but are generally very thorough. Also error messages produced whilst carrying out a procedure are a little confusing.

Overall, the impression is that this is a high-quality utility of great use to a wide range of users which I recommend as a good example of this type of program.

Ratings Table:

SOUND	85%
GRAPHICS	N/A
DOCUMENTATION	75%
VALUE FOR MONEY	80%
OVERALL	80%

Title: Index
Publishers: Microwave nw
Machine: Model B
Price: £6.95

This program, known as 'INDEX', is a database program, with one alphabetical, and one numerical part per entry. The inputted data is then alphabetically sorted and displayed to the VDU, and if required, to any printer that is connected.

On loading, a menu is

displayed, showing the available options which include the loading of previously saved files, the initialisation of a new file, a save file option, and a print/display option, and finally an exit option, which will remind you if you haven't saved the file you have been working on yet.

To actually use the program is simplicity itself, it is very self-explanatory, and comes with a well written guide-book.

Initially the program only allows up to four digit numbers between 1 (not 0001) & 9999, but this may be changed to accept either smaller, or larger numbers, although I still could not store names with relevant telephone numbers.

To use this program as an index proved very successful, I indexed all my magazines in rack-location numbers. It will also store any duplicate entries by name, then printing all references on the same line, just separated by commas. Thus the entry 'A&B COMPUTING, 401,402,403'. Also each different initial letter will be printed as a block, and each block is separated by a blank line, so as to aid visual impact. A sample index is also supplied and gives a good idea of its capabilities.

Altering the entries is easy, and can be immediately appreciated by reading the file again, and at any point in the usage, you can return to the main menu by keying Escape. Other uses would be possible, indeed for any situation where these two types of entry would be required.

All in all a worth while program for educational establishments, or for others who would require such a program.

Ratings Table:

SOUND	N/A
GRAPHICS	N/A
DOCUMENTATION	85%
VALUE FOR MONEY	75%
OVERALL	80%

Title: Spacefighter
Publishers: Superior Software
Machine: Model B
Price: £7.95

This game is based on the arcade

game 'Defender', but has a few differences. For instance, you are only defending yourself; there are fuel dumps; also there is no scanner nor a reverse facility (neither is really necessary).

Superior Software's little title page is presented first; this loads the code for the game. (Why does the relay click like it does in Superior Software's games?)

The player is greeted by a strange sound and an option to choose instructions. These are very good, very explicit and straightforward, and are to be commended.

Next you are invited to choose which skill level you wish to start playing the game on. 1 is easy, 6 ...well...! You may change skill level after a game by pressing "Escape", but this has the unfortunate effect of resetting all the high-scores (there is a top 5 table).

There are six types of alien: mutants which move around randomly; swarms which move away from you; trimorts which move randomly and need three hits to be destroyed; baiters and baryons move towards you; asteroids also appear to test your skill. All "living" types fire only when horizontally level with you. The last two types mentioned can only be destroyed using a smart-bomb (you are supplied with three of these).

You have a spaceship equipped with a laser, as well as the bombs. "A" and "Z" control vertical movement, "Copy" fires the laser, "Delete" thrusts (burning fuel at an amazing rate), and "Return" fires a smart-bomb. The rapid-fire really is rapid, and the game is enjoyable to play in the main.

However, there are one or two major drawbacks. The graphic quality is poor, the landscape is rather flat, and I have seen some of the other characters before. Defender perhaps? Still, it is based on it. The ship is good, though, and even has flames at the back.

Another niggle is the quality, or lack of it, in the sound department. A little more effort here would have been in order.

Summary: fairly good, but does not take advantage of the

Beeb's facilities. Better suited to a (cringe!) Spectrum.

Ratings Table:

SOUND	45%
GRAPHICS	50%
DOCUMENTATION	85%
VALUE FOR MONEY	55%
OVERALL	55%

Title: Attack on Alpha Centauri
Publishers: Software Invasion
Machine: Model B
Price: £7.95

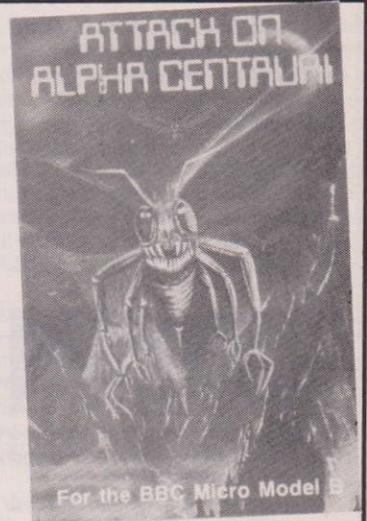
After a loading time of almost six minutes, and no less than four programs being chained, I hoped that "Attack on Alpha Centauri" would be worth the wait. It was. If you imagine a type of Galaxians with '3-D' graphics, then you have some idea of what this game is like.

Alpha Centauri is apparently being attacked by "Giant bug-eyed wasps", who not only peel off from the fleet and swoop down to attack your base, but also zoom towards you in 3-D manner as they near the bottom of the screen. The graphics involved in this feat are pretty impressive, and very fast.

The sound in the game is of a high standard, but I couldn't help feeling that the programmers had overdone it a little. Having three sound channels tends to make programmers think that they should put masses of sound into their software. In this particular game, I thought that if some of the screams and explosions had been cut, it would have a little more clarity in what was already there.

The controls for the game include the obvious left/right/fire, plus some nice additions: sound on/off and game pause, allowing you to message your tiring trigger finger during a long game: A real sanity saver!

On the first screen, the aliens swoop down one at a time, but as you clear more screens they come down in clusters. Each cleared screen adds another alien



to the number that come and attack you. I managed to clear six screens before being blown to oblivion.

This program is one of the longest loaders I have ever seen. First it runs the normal title page that is present on most commercial software these days. This is followed by an instruction page, which relieves the boredom while the next program, the background, is loaded. This program simply draws the background and scenery of a rather desolate planet with the odd volcano scattered here and there, and while you admire the high resolution graphics present here, the game loads. This method is all very well, and provides a very good quality backcloth for the rest of the game, but it means that the screen cannot be cleared for things such as high-score tables, level selection, etc. without the background being reloaded from tape. So the only "user selection" in the game is that of pressing space to start! This lack of variation tends to make the game quite boring.

One complaint that I have is that on black & white television, the background makes the bombs hard to see, thus making quite a difficult game even more difficult.

To sum up, I think that this game is worth buying for the graphics alone. The lack of level variations and high-score table is

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a set-back, but these have necessarily been sacrificed for the quality of the graphics.

Ratings Table:

SOUND	70%
GRAPHICS	90%
DOCUMENTATION	85%
VALUE FOR MONEY	80%
OVERALL	85%

Title: Sealord
Publishers: Bugbyte
Machine: Model B
Price: £7.50

Move out to the left, duck behind that large rock, emerge... and fire!

That's the bill of fare served up in this new release from the Merseyside Software House. Basically, it's a version of the old "Zap The Alien" game but with a twist or two in the tail.

You find yourself stranded in the mighty underwater world of the sealord armed only with your laser; and attacking you are the scouts, miners, shells and other allies of the Sealord.

Rather like Asteroids, your submarine is controlled by clockwise and anticlockwise rotation, at any point, the movement being in the direction it faces. However, as so often before the keys are poorly chosen (TAB and Q for rotation — these are not even the same size). In addition to this, fine degrees of precision are quite out of the question using these methods; hence motion tends to be rather random.

I eventually realised in fact that this is also partly true for the movement of the aliens for one can frequently cower in the corner and reside in this haven without fear of being captured. Really, therefore, death results from misadventure rather than any heroics from the aliens.

Various rectangular shapes representing rocks on the seabed are scattered about; there is a 3-D effect allowing aliens and your submarines to travel behind the rocks.

Graphics are moderate — your submarine has no real shape to it — the highlights being

smooth motion and bright explosions. Sound, although not outstanding, in most cases seems adequate whereas error-proofing is nothing short of sound.

My final verdict is therefore that this fair but unoriginal game should appeal to all those Space Invader freaks as a change from the standard game.

Ratings Table:

SOUND	50%
GRAPHICS	55%
DOCUMENTATION	55%
VALUE FOR MONEY	55%
OVERALL	55%

Title: Allen Dropout
Publishers: Superior Software
Machine: Model B
Price: £7.95

This game is a novel variation of the old "Invaders" theme. You are greeted by instructions. Killer moths are threatening earth. There are ten "boxes" at the top of the screen. Between the 5th and 6th is a large moth. Small moths fly into their boxes in sequence. When a box is full, one moth is released, and it will fly down and try to destroy your laser. This is controlled using "Z", "X" and "Copy" to fire. Joysticks may also be used. The large moth at the centre of the screen cannot normally be killed, but each time you manage to kill 200 small moths, it will be released. It must be destroyed before it lands or else you lose a life. Once it has been destroyed a set of more powerful moths will attack as before.

Bonus laser-bases are awarded if you score 10,000 and 20,000 points.

There are six skill-levels. Pressing "Escape" at the end of a game gives you the chance to change the skill-level but also resets the high-scores. You may start at any of the six skill-levels.

Graphically the game is good. The moths are realistic, the central one particularly so. All movement is very smooth — a lot has been done in the preparation of the game to ensure this. I have examined the code, and the game is very well written.

The sounds are also good. It

is quite amusing just to listen to the game, as the moths will fill their boxes, each makes a different sound. The other sounds are fairly complex and the envelope facility of the Beeb has been used well.

The game is fairly fast and needs quick diving from side to side to avoid the falling bombs from the large moth, so you need to have a fast reaction time. Yes, your children will beat you! The various elements fall together very well to provide an enjoyable game.

Summary: Good game, interesting variation on well-used theme.

Ratings Table:

SOUND	75%
GRAPHICS	80%
DOCUMENTATION	75%
VALUE FOR MONEY	70%
OVERALL	75%

Title: Invaders
Publishers: Superior Software
Machine: Model B
Price: £7.95

Invaders is the poorest program that I have seen from Superior Software, a company usually linked with good software for the Beeb. The idea is to kill the rows of aliens before they land. You have three bases, and bonus bases are earned at 1,000 and 2,000 points. The controls are 'Z' and 'X' for movement and 'Copy' to fire. I presume that the choice of fire key is to reduce wear on the 'Return' key.

Each time you clear a board of invaders, a new set appears. These are faster, start lower down and fire more bombs. There are two types of 'mother ship', one worth a mystery value and one worth 600 points. Both drop fast bombs which simply blast straight through the bases.

There is a top-10 high-score table in various colours. This is the best feature.

Unfortunately the game is nowhere near as good as some Invader games. There are only three types of invader and, even though these characters are multi-coloured, good use has not been made of the graphics facilities. Mode 5 has been used

and the characters are all rather chunky. Their movement across the screen is rather poor.

The sound quality is also low. There is a very persistent, single-tone Beep for invader movement, and this is very annoying. The other sounds offered leave little to be desired.

The "instructions" given are the bare minimum possible, and this is poor; this should have been remedied.

Altogether the game is not up to Invader standards. At £7.95 it is overpriced.

Summary: Overpriced and poor. More thought is needed. Other invader games leave this one standing.

Ratings Table:

SOUND	30%
GRAPHICS	35%
DOCUMENTATION	30%
VALUE FOR MONEY	35%
OVERALL	35%

Title: Pass Go
Publishers: Kaydee
Machine: Model B
Price: £9.95

Pass Go, which "resembles another well-known property buying game", comes in some colourful plastic packaging the size of a navy's lunchbox. It contains a single cassette and a couple of lines of loading instructions.

The title sequence proclaims what we have all guessed: "Computer Monopoly". In this game each player drives around the "board" in a teletext car, eyeing up the property he/she might wish to purchase. The Mode 7 graphics are colourful but crude. The music which accompanies the journey is excellent — to begin with. However, as you head off on yet another jaunt in your car (with appropriate name sprayed on the side) this jolly tune can become irritating. The lucky discovery that pressing the Return key instead of the space bar (as instructed) resulted in a move being taken as normal but without all the graphics and sound, came as some relief.

At the end of each random move the player is offered the

chance to buy a hotel or store if available. Otherwise the appropriate bill is levied. Chance, Salary and Jail are self-explanatory. You can also take advantage of the Market to buy or sell shares, land and gold. This ability to spread your assets does not yield any apparent extra advantage. Choosing fractional amounts of land can cause numbers to run into each other on the display.

As with Monopoly, things hot up as the game progresses and property is taken up. If a player lands on his/her own possession then an offer is made for the sale of the hotel or store for the current market price. The alternative is to develop the property at the offered price. This is a simple yes or no situation. If you land on opponents' property then the inevitable debt is grabbed.

Bank loans are available to pay for the various Chance occurrences like tax, shares, school fees, gas man, general repairs, lawyers, drunk in charge (again) and doctor's fees. The hotel bills and store bills amount to more than the combined spending of an Arab sheik's entourage on a spree in London.

All these details are displayed for each individual turn along with a linear view (down the left hand edge of the screen) of the board and players' positions. A bird's eye view would have been more helpful but this works well enough.

Unfortunately all the sales (and therefore the action) congregated in one section of the board and only spread out at a later stage of the game. This meant that the players were waiting for the exciting bit to come round. When in debt (cash reserves below zero) then it is possible to take out a loan. If you refuse to do so, then the debt collector makes off with some of your other assets. Extravagance on the market does not appear to pay.

Like the old Monopoly this game brings out the worst in everybody. So watch your opponents' fingers. It's all too easy for them to press Y when you require N. There are nice aural prompts for 'yes', 'no' and 'not that key'.

Ratings Table:

SOUND	80%
GRAPHICS	70%
DOCUMENTATION	50%
VALUE FOR MONEY	70%
OVERALL	70%

Title:	One Hundred and Eighty
Publishers:	A&F
Machine:	Model B
Price:	£8.00

"Jockey, you require one hundred and twenty-seven!"

This Darts game, written completely in Basic, is an interesting version of what originally appeared as an Atari program.

Possible variations on the standard game are 'Clock' in which a player must score in turn one to twenty followed by 25 and a bull; and 'Shanghai' where each player aims at a certain segment, points only being scored if he or she hits that segment; each player throws three darts successively at segments one to twelve and adds up his score after thirty-six darts.

The Dart board is nicely created using MOVE, DRAW and PLOT commands in Mode One. However, being in BASIC, this routine is painfully slow and waiting can be quite tiresome.

The view of proceedings is in two sections. Firstly, a front view of the Dart board which indicates

the finishing position of each dart; and secondly a cross-sectional view. As the dart travels through the air, it can be moved up or down. Its left to right position is determined by the manoeuvring of an agitating cross over the large board prior to the throwing of the Dart. There are ten skill levels, the level controlling the degree of agitation of the cross.

The screen is well laid-out but Graphics are rather limited; two figures are displayed on the screen, representing the players but neither of these is particularly impressive. Sound has not been utilised apart from a token thud as the dart hits the board.

The finish of the game is unspectacular and really deserves a musical tune.

Overall, this is a difficult and challenging game with a definite novelty value but it tends to become rather monotonous after a while.

Ratings Table:

SOUND	5%
GRAPHICS	60%
DOCUMENTATION	70%
VALUE FOR MONEY	55%
OVERALL	55%

Title:	Wordsworth
Publishers:	Ian Copestate
Machine:	Model B
Price:	£17.25

This is a disc based Word-processing package for the BBC model B, which is also available on cassette.

The package consists of a disc (or cassette), a function key strip, and a comprehensive manual. On the disc version, there is also a Help program which provides 'on screen' information, in addition to the book.

I suggest that any one who purchases Wordsworth, reads the manual totally, before even 'Powering-up' their computer, as it is a complex and comprehensive program, which needs to be understood before the full appreciation of the package can be achieved.

The red function keys play an important role in this program, and as such all their uses are listed on the bottom two lines of

the screen, while at the top, two lines tell you the 'status', displaying current line, the number of lines in store, the number of the top of the current display, and the position of the text markers.

Once entered the program automatically turns off the 'caps lock' so lower case letters are printed. To start typing you must press the appropriate function key and the bottom of the display shows you your current mode.

In the 'Type' mode, the options seem almost daunting, there are numerous ones from embedding in printer codes, to centralising text lines, to counting the words, to a keyboard lock, to lock the keyboard when you away for any reason, (great if you've got young kids). It can even clear the Display and any key pressed, except the specified unlock key prints "Don't be nosey"! In this program it is very difficult to select the wrong option, as there are lots of built in error-traps, to prevent this and one can at any time press a key to return you to the menu.

The printing option is superb. And if you've got a Epson printer this package provides you with all the necessary options that you could want; and all directly accessible on any number of words or lines anywhere that you want; and all from embedded codes within the text! And for those without Epson, you can define any code you want and again call it at any time. Dare I say this but, these print options are streets ahead of anything that Acorn-soft's View gives its users. (Wash my mouth out!)

One thing I did not like about the program was the use of Mode 7. Although very, very clear, being only 40 columns across, and most printers printing at 80 characters per line, I found it very difficult to get used to getting my address in the correct place when composing a letter. Although there is a 80 column view option, the text must first be saved and then loaded into this option to view it.

This aside, it is an exceptionally good program, providing many useful features at a low

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cost. And even given the constraints of using the Mode 7 display, it proves to be a very powerful word-processing tool, providing an excellent quality print out with the minimum of fuss, ideal for reports although very long pieces would need to be saved as more than one document, due to the memory restrictions.

Ratings Table:

SOUND	N/A
GRAPHICS	N/A
DOCUMENTATION	85%
VALUE FOR MONEY	90%
OVERALL	90%

Title: Owzat
Publishers: Virgin Games
Machine: Model B
Price: £7.95

I bet Charlie Withall, Virgin Games' oldest programmer, had to use his Find utility a few times while he was writing this BASIC cricket international. There are certainly plenty of PROCs and countless variables. It's not all foolproof either. My first set of entries resulted in 'No such FN/PROC at line 10085' but since it's in BASIC nothing crashed irretrievably and the problem did not reoccur while play was going on.

The method of inputting the current state of play doesn't display too much common sense but I suppose it's all documented on those colourful Virgin card inserts. Still I wouldn't call it user friendly.

When play commences, it's more like a one day game than a test match with either a wicket or scoring of some kind off every ball. This is during the automatic play option. If you choose to control the batsman then things can be slowed down just a bit with some defensive shots but this level of skill takes some time to perfect. On the delivery of each ball the wicket is drawn in more detail (which still means stick figures) and the batsman's stance and bat position controlled using the N, M, and. keys.

If you choose to control the bowler individually then the options are only to choose which bowler and to change the field. The keys for doing this are rather strange (D, R, V, G).

The actual screen display suffers, as any cricket game is sure to do, from characters which are too small. The fielders chase after the ball as it spoons in slow motion off the bat and fling it back with such force that I feel for the wicketkeeper figure. The figures are made up of single VDU23 definitions and there is a crude form of animation employed as they move about. The batsmen for some reason do not run. The bowler (be he fast or slow) runs back to his mark nearly as fast as he comes in.

The total score is kept up in the top right hand corner and there is full information about the current batsmen and the bowlers used below the playing area. Automatic play has a certain fascination as it merrily plays away to itself in the corner of the room but it does come up with some strange events. England all out for 57 in the first five overs of a test match against Australia, I hope never to see in a live contest. They lost the game by a mile but that might have been due to the fact that Bob Taylor came on as first change bowler even though he was categorised as slow and poor quality, not to mention the fact that he is a wicketkeeper.

Ratings Table:

SOUND	65%
GRAPHICS	10%
DOCUMENTATION	90%
VALUE FOR MONEY	40%
OVERALL	40%

Title: Dodg'em
Publishers: Microgame Simulations
Machine: Model B
Price: £5.95

This BBC version of the popular arcade game sadly does not come anywhere near the same standard as the original. It involves two small cars racing around a rather pallid looking grid. Your car has to pick up as many dots as possible, whilst the computer controlled jam car sets out to try and destroy your vehicle.

Your small car unfortunately does not respond to its controls very well. When changing lanes the car moves two lanes instead of one. This makes playing the game more difficult than it should be. The computer controlled jam car, on the other hand, always seems to know where you are going.

The sound and graphics employed in Dodg'em are not as good as one expects to get on a micro with the capabilities of the BBC. There is also a much cheaper and better version on the fun games pack published by the BBC software label.

Ratings Table:

SOUND	40%
GRAPHICS	30%
DOCUMENTATION	45%
VALUE FOR MONEY	20%
OVERALL	Keep your money in your pocket

Title: White Knight II
Publishers: BBC Publications
Machine: Model B
Price: £11.50

This program is subtitled "The BBC Chess Master". Certainly, compared with other Microcomputer Chess programs, that's not far short of the truth. The game is based on a program which performed extremely well in PCW World Microcomputer Chess Championship and is probably the best of the Chess games available for the BBC Micro.

The board display is very clear and the pieces are very similar in appearance to those found in standard chess diagrams. Black and cyan are us-

ed for the square colours but these can easily be changed if required.

Four modes of play are available: In mode one, the computer will adjust its rate of play to match the user's; mode two is used for problem solving; mode three is the so called "Tournament" mode — here the computer can be set a time in which to make a minimum number of moves e.g. 30 moves in an hour; it will adhere fairly rigidly to this limit; and mode four is similar to mode three except the time limit per move is stimulated.

In general, the standard of play is above that found on other chess programs; in mode three, presumably playing to a standard time limit, the program has been given a chess grade of over 1750 (ELO scale). This corresponds to the standard of a fairly good club player. Playing at this level, most people will be comprehensively beaten — in fact even on the instant response level, the program will account for most non-serious players.

Assessing the program's strengths and weaknesses is not all that easy. As I see it, the most impressive aspect of it is its Middle game performance. On no level will it make elementary mistakes such as leaving pieces en prise. Its tactical play is particularly good for a computer: it strings good combinations together and is quite prepared to sacrifice pieces. Its positional play and strategic manoeuvres are generally sound but occasionally lack purpose. Its Endgame display is less impressive; it has difficulty converting standard positions to its advantage. As for the Opening, most of its moves are according to well-known theory, the odd surprise can provoke complacency from the user — a fatal mistake.

Several variations on the standard game are available: positions can be set up with reasonable facility, one can step forward or backwards during a game (this allows analysis of new variations or correction of blunders) and one can change sides with the program at any stage of the game. In addition, as the computer thinks, it prints an

analysis of the best line it has found so far — this sometimes extends four of five moves ahead. This is very useful as it can provide good advice for the player.

Overall, this is an impressive package which has obviously been very carefully designed. I recommend it to anyone regardless of their own standard of play.

Ratings Table:

SOUND	75%
GRAPHICS	N/A
DOCUMENTATION	80%
VALUE FOR MONEY	80%
OVERALL	85%

Title: Microbe
Publishers: Virgin Games
Machine: Model B
Price: £7.95

Microbe is colourful, quick and noisy. The packaging is up to the normal Virgin Games high standard, with a full explanation of the program and a bit of biography on the programmer. In this case it is young Simon Birrel who wrote Bug Bombs, an earlier Virgin release.

The 'bug' or 'microbe' is a strange creature resembling a moth. The key response is superb and the creature shoots about very quickly and involuntary collision is a problem when you first get started.

The 'microbe' fires from the tips of each wing and it is therefore necessary to guard against the vulnerable spot between the two cannons. The attackers take the form of multicoloured shapes which come in waves of varying speeds and density. It proves sensible to destroy the objects which pour down the screen, blasting a hole and getting at the higher scoring characters. These character values are given at the start of the game.

Now and again the screen action pauses for an instant to allow a quick score check and then on with the hectic action. The destruction of objects, including the 'microbe' are particularly good, with colourful debris spraying all over the place.

The actual objects range from things looking like chewed bits of bubbly-gum to what appears to be a line of snooker balls rolling chaotically around the screen. These are explained in the card insert as deadly organisms but this bit of imagination is not important for the enjoyment of the game. The initial impact of the game was very exciting but I can imagine that the rather limited format could prove tiresome after a number of attempts.

Ratings Table:

SOUND	70%
GRAPHICS	70%
DOCUMENTATION	85%
VALUE FOR MONEY	75%
OVERALL	75%



Title: Horror Castle
Publishers: A&F Software
Machine: Model B
Price: £8.00

"You should have followed the instructions more closely. You have fallen in the moat and drowned." Thus ended my first attempt at discovering the secrets of Horror Castle. Subsequent attempts met similar fates.

Adventure games fall clearly into 2 groups, those with graphics and those with only text. This game is one of the latter. It accepts commands consisting of two words, a verb and a noun. It insists on two words, except when

receiving directions, which the instructions tell you are limited to the four cardinal points, up, down, in and out. With only 8 options at each location the variations are limited.

The game matrix is fairly small with only 61 locations, but movement between these still holds some surprises. The locations are static but there are some random variables which change from game to game.

The object of the game is to rescue the princess from the castle tower and take her to a secret clearing outside the castle grounds. As usual in these games, a number of objects are distributed around the locations, and can be used to help you in your quest. Objects are used fairly conventionally, and there are no logical inconsistencies.

The goal of the game is not too difficult to obtain. The main handicap to progress is the need to restart from scratch each time you die, as there is no facility for saving a situation on tape. Use of a map is important as much for a time saver for getting back to a known location as for anything.

With the number of adventure games currently on the market, to be successful a new entry must offer something that has not gone before. Unfortunately Horror Castle does not.

Ratings Table:

SOUND	50%
GRAPHICS	N/A
DOCUMENTATION	60%
VALUE FOR MONEY	65%
OVERALL	60%

Title: Four Classic arcade games for the BBC B
Publishers: Ganymede Systems Ltd.
Machine: Model B
Price: Disc £11.95
Cassette £9.95

The title could not sum up this package better if it tried. Four classic arcade type games are supplied to give more hours of fun and frustration to all the family.

'Classic', in this case does not necessarily mean 'the best of', it does in fact mean the 'originals',

or good versions of, the pub games you now no longer see, such as Tennis, the very first of the video games, being very simple to understand, and compared with other more recent arcade games, very tame and plain!

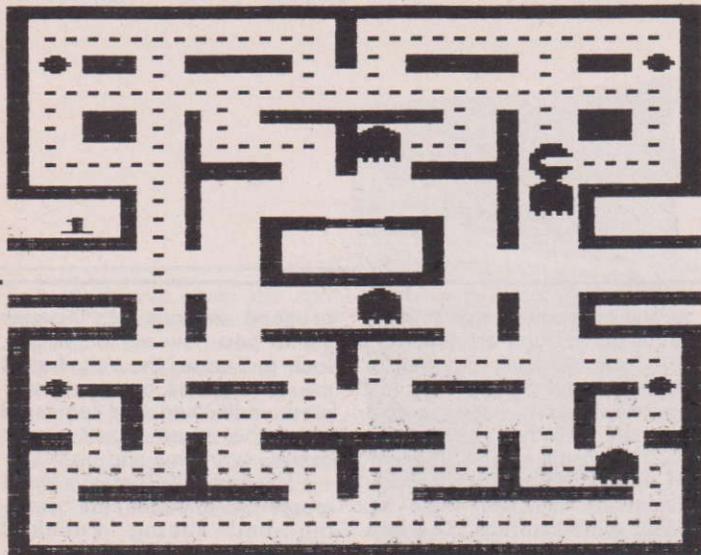
The game of 'Tennis' is based around the principle of a 'bouncing ball' being knocked backwards and forwards between either you and your beeb or you and a friend. If you choose the computer as a partner then you have five levels of its skill to choose from, ranked from 1-easy to 5-hard, and once you have chosen that you also have the choice of ball speed, again 1-5 with 5 being the fastest. The choice of using joysticks is an added advantage, and very useful. On screen scoring and the addition of a little colour add to what is otherwise a rather mundane sort of game, as I said, a close approximation to the original!!!

'Break-out' is another one of the old original type of arcade game, the idea being to move your bat across the bottom of the screen deflecting back a bouncing ball, which in turn 'knocks out' one of the multicoloured bricks, that dominate the top part of the screen. The more bricks you knock out, the more points you get, and the higher the level of bricks again, the greater number of points. One of the most unique features of this game, and the most gratifying, is when you manage to knock one of the top row of bricks out and the ball goes crazy demolishing the wall from the top, it also helps your score a lot! When you have managed to dispose of one wall, another wall will appear, but lower down the screen, until you have used up all of your three lives through missing the ball. This has to rate as one of the most addictive games ever written, and this particular version is definitely no exception.

The Ganymede version of that all time best seller, 'Invaders' is a very fast action one indeed. Written in machine code it is one of the fastest games I have ever come across. With the sacrifice of

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Score 2180 Max 5055



a multicoloured display, a very high resolution single coloured screen mode is used, with great effect, the Marsians relentlessly stomping their way across your screen, to the accompaniment of those dreaded sound-effects used, if slightly too loud, to great effect. The usual three protective bases are there, shielding you from the mass of dropping bombs, and as the original, the space-ships randomly scream across, with a varying score for those who manage to actually hit them. After one wave has been defeated, yet another screenful appear, will earth ever be safe from aliens? Three lives are given, and together with 'On-screen' scoring and the high score being displayed at the top of the screen, makes the overall presentation very good.

Ganymede again provides many options with this game, with the ability to use either the keyboard or joysticks, and a choice of the speed of both your firing rate, and the bomb dropping rate of the aliens, and the ability to have machine gun firing to help you annihilate the little green monsters.

Finally on this package we come to, what in my opinion, is one of the best games ever written, a version of that great game 'Pacman', called on this package the rather peculiar title of 'POC-MAN' (It sounds more like a bad case of acne than a game.)

Accompanied by some great sound effects, you must eat your way around a maze, munching little spots as you go, avoiding like the plague the four ghosts that pursue you at all times, that is until you manage to eat a power-pill, when the ghosts are said to turn blue with fright, and if

you can guide your snapping mouth, using either the joysticks or the keyboard, to actually catch up with one you can see your score increase by leaps and bound.

This highly colourful machine code game is very smooth in its operation, providing a challenging game for even the arcade connoisseurs of this world.

In conclusion, all the games supplied with this package, are of a high standard in comparison with the originals, I do feel however, that the Tennis game especially, could have been left out in favour of a more recent high speed type game, however, you do get very good value for money for the type of games provided, and so would be, a worth while addition to anyones software library.

Ratings Table:

SOUND	75%
GRAPHICS	85%
DOCUMENTATION	70%
VALUE FOR MONEY	80%
OVERALL	75%

Title: Cylon Attack
Publishers: A&F Software
Machine: Model B
Price: £8.00

The tape begins by supplying very comprehensive instructions. An excellent display contains a window into which scroll the chunks of scenario and game playing instructions.

The main program is accessed from this predecessor and doesn't just sit there waiting for some human to press a key. Instead it automatically runs through the score table (with 50 entries — excellent), introduces the alien ships which are to take part in the coming game, and asks you to press a key while the

title credits skate around the screen. The high score table can be loaded from tape if required.

By now you are really looking forward to playing because the whole package has the feel of the real arcade game. The enemy craft dodge around on the radar screen above the cockpit and you manoeuvre into range. As you lock on to them, the alien ships soar into view firing as they come. You have to get them in your sights and blast away (spacebar). The three dimensional effect is excellent. The objects and craft approach and vere smoothly and quickly.

Your ship is protected by shields which the enemy blasts wear away on each hit. There are no extra shields available. The laser under your control replenishes itself when not in use. Fuel fairly rapidly becomes diminished and it is then necessary to locate your mother ship, fix it in your sights and start the automatic docking procedure. There are three extra fuel cells available to prolong your mission.

Ratings Table:

SOUND	75%
GRAPHICS	90%
DOCUMENTATION	90%
VALUE FOR MONEY	80%
OVERALL	85%

Title: Beebtrek
Publishers: Software For All
Machine: Model B
Price: £7.95

Star Trek, being essentially a text game, was really intended for PETS or TRS-80 Model ones. Therefore, one really expects some sort of enhanced format once conversion of the game for the BBC Micro takes place. However, this version seems to be a faithful copy of the original; hence I suspect that most of its buyers will be those addicts who caught the disease on other computers.

Having accepted the obvious limitations of this type of game I can find no real fault with this program: the old navigate, blast the klingons, replenish your supplies menu is still served up. All "action" takes place in Mode 7 which is surely a waste of the BBC's graphics facilities. However, the descriptions are usually fairly concise and accurate and the game is well-described on an accompanying leaflet.

Below are a list of features which I feel would have made the program more enjoyable and a refreshing improvement on that old Stark Trek format:

- 1) More graphical detail. Despiction of important items such as "Enterprise", Klingons, starbases etc. with meaningful characters rather than colourless letters.
- 2) Improved playability: at present, when a Klingon fires a torpedo, your short range scan shows it approaching you but you cannot move out of the way of its path of destruction.
- 3) Better and more helpful damage reports.
- 4) Generally, more action and quick-fire incidents to the game. Perhaps the Enterprise could have been shown moving through the Galaxy with the Klingons advancing:..the sky (and the programmer's ability) are the limit.



The instrumentation is pretty good, with shield and laser power, fuel status, climb and turn, all displayed. There is also a choice of the four movement keys to be used and some suitable outer space noises. In general this is a very impressive game and great fun to play.



Overall, if you are an old fanatic of this type of game, there's no reason why this program shouldn't keep you occupied in lethal combat for hours. If, on the other hand, you prefer more exciting arcade games, save your cash.

Ratings Table:

SOUND	35%
GRAPHICS	10%
DOCUMENTATION	65%
VALUE FOR MONEY	40%
OVERALL	45%

Title: Bug Blaster
Publishers: Alligata Software
Machine: Model B
Price: £7.95

Bug Blaster is a new release from Alligata, and is based on the "Centipede" arcade game. The object of the game is to blast a centipede, which snakes its way down the screen, using a little gun at the bottom. There are many mushrooms on the screen; they may be shot for just one point; if a centipede or part of one was to hit one, it would drop a level and change direction. If you hit a centipede in the middle it splits into two, and both "halves" go off in different directions, depending on where they are hit.

From time to time a "bug" (which drops mushrooms) falls rapidly from the top of the screen; he is worth 200 points. If you do not hit him he will continue distributing mushrooms until he reaches the bottom. In addition spiders worth many hundreds of points appear and they bounce across the screen and generally cause problems. On rare occasions a snail hurries (!) across the screen; he is worth a lot if you can destroy him.

The sound quality of the game is fairly high. There is a wide selection of sounds, which includes a fanfare when you gain a life every 10,000 points.

The game's graphics are above average, with good use of multi-coloured characters and a wide variety of colour changes between screens. All the characters are better than usual and all movement is smooth.

There is a top-8 high score table which changes colour rapidly, but not in usual mode 7 style.

My only reservation is about the choice of controls: Z and X are all right, but, £ and Shift to fire are hard to use, being rather awkward for one hand. I am not aware of an option to use joysticks.

I was pleased to note that you could move up and down, unlike some centipede games.

Ratings Table:

SOUND	75%
GRAPHICS	75%
DOCUMENTATION	70%
VALUE FOR MONEY	65%
OVERALL	70%

Title: City Defence
Publishers: Bug-Byte
Machine: Model B
Price: £7.50

I can safely say that City Defence is one of the most boring games I have ever had the misfortune to come across.

You are asked to defend five cities from a missile attack by firing rockets from one of three bases. You can have up to five rockets in the air at any one time, and you can control the last

rocket that you fired, moving it left and right with the "TAB" and "Q" keys. The game is split up into rounds, at the end of which you get bonus points for each missile left, and each city remaining intact. You get thirty missiles per round (three per base), and the game finishes when all your cities are destroyed. You get a bonus city at every 1500 points (if you manage to stay at the keyboard for that long. One (should I say only) nice touch in this game is that it is BREAK-blocked, in other words only CTRL-BREAK or switching off will remove the game from memory (this is probably the only way they can get people to play it!).

The graphics and sound in this game are barely adequate. I doubt if it would be worthy of publishing in a magazine, let alone trying to market it from such a reputable company as Bug-Byte. To sum up this piece of software, it would make good fire-fodder for Winter: a waste of tape!

Ratings Table:

SOUND	50%
GRAPHICS	45%
DOCUMENTATION	65%
VALUE FOR MONEY	55%
OVERALL	50%

Title: Space Kingdom
Publishers: Software For All
Machine: Model B
Price: £7.95

The idea of Space Kingdom is to capture all the systems in the galaxy other than Sol, where you are based. There are several commands available. "Attack" is used to capture a planet in order to expand your empire. You must, of course, have enough fighters and sufficient full transports if your attack is to be effective.

You have a powerful computer which is used to obtain information on planets which you have successfully scouted. A new list of commands is displayed on choosing the "computer" option: there is a map, a director or status reports. The map also has a distance calculator.

"Embark" sets you off on a journey to your chosen planet. You must have told the navigator where you wish to travel first. You may order scouts to other planets to estimate your chances if you were to attack, or you can buy more fighters and call up conscripts so your forces are strong enough. Finally, you may order Dr. Everest to put you in suspended animation so you may sleep until scouts have returned or fighters built.

The game itself is great fun to play, and you will gain a lot from experience, for example how many fighters and transports you are likely to need to attack a planet successfully. I am now in a position to attack Xyess, a powerful planet, as I have learned how much force to employ. Once you have a fair experience, you will find attacks more fruitful.

You will need a good strategy to play the game well. You must, for instance, collect taxes from the planets that you control in order to pay for your supplies, and this should be done whenever possible.

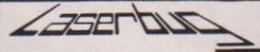
Ratings Table:

SOUND	75%
GRAPHICS	60%
DOCUMENTATION	80%
VALUE FOR MONEY	75%
OVERALL	80%

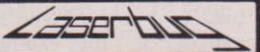


IF YOU HAVE A BBC MICRO
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Data Store

N. W. S. Dundas

This program sets out to create a "user friendly" data storage system, electronic filing system, database — call it what you will. Most databases are aimed at a broad spectrum of users and often fail to cater for the individual's personal requirements. Due to the inevitable software protection within commercial programs and the use of strange variables, it can be very difficult to alter these to suit personal needs.

Try out this flexible, user-definable program for your own personal filing-system requirements.



ADAPTABLE

Here then is a program that can be altered to suit the type of filing system normally used and the manner in which the information

is handled once loaded. The program is carefully structured to enable procedures to be easily altered, added to or removed.

The programme can cope with loading and saving of files,

printing and listing records in a file, searching for an entry, and sorting records into alphabetical order. It is also possible to catalogue a tape or disc, add to the number of records, delete a

record and modify a record to update or change an entry.

The "on error" statement is utilised to distinguish between errors. It is a good idea to insert this line from the start so that any unexpected error can be reported (without line number) and the program returned to the main menu with data still intact. To find the fault (e.g. typing error) press "Q" and "Y" and then type 'PRINTERL'.

FILE CREATION

When run for the first time no data file will exist to load so it will be necessary to create one. First of all you must define the headings which you wish to use on all your records. This will depend on which kind of data you wish to store (e.g. telephone list, address book, train numbers). You do this by going first into edit mode and selecting "Headings". You then enter the number of headings required and the text (e.g. if you were keeping a collection of C.B. handles, you might have five heading lines: 1-Handle, 2-Home Add, 3-Location, 4-Signal, 5-Date). Headings are not necessary but you must define how many entries you wish to have per record.

DATA ENTRY

Once this is set up, you may then start entering your data into the records by using the ADD RECORDS option in the edit menu. You may save a file at any time without loss of the file from memory (providing you have a file to save). If you do not enter a file name on the save or load option but simply press RETURN then the filename "DATA" will be inserted.

All the options are self-explanatory but a word of warning about the ORDER/SORT option: if a lot of data is present (more than 100 records at 10 lines with an average string length of 30 characters per line) then the computer can run out of memory and the program will crash. All other safeguards, where possible, have been used to ensure that data is not lost if an error is met.

CONTINUED OVER

PROGRAM DESCRIPTION

LINE NO	DESCRIPTION
70>120	Sets up variables and arrays, sets error to deal with channel errors on loading from disk.
130>220	Gives option list for load, save, print, edit, find, catalogue and quit.
230>Quit	— ends program.
240>320	DEFPROCL Loads file from tape or disk.
330>410	DEFPROCS Saves file from tape or disk.
410>500	DEFPROCP Prints/Displays records on file.
510	DEFPROCED Selects edit mode and resets error to return to the edit menu if an error is detected (eg. ESCAPE).
520>540	Prints edit menu options.
550>620	Selects which edit option is required.
630	Runs program again to zero all records and enable a new file to be loaded or created.
640>700	Deletes a record entry.
710>830	Changes a record entry (note part of this procedure is used in other options to add to records and print records).
840>880	Adds new records to file.
890>960	Sets prompt headings to each file.
970>1040	Finds a record entry.
1050>1100	Sorts records into alphabetic order.
1110>1170	Prints up main menu and options.
1180>1220	DEFPROC PRINT Displays entries onto screen.
1230>1240	DEFPROC TITLE Prints program title (a prime part to be changed once the program has been changed to put your own titles on the screen).
1250>1290	DEFPROC CAT Catalogues contents of disk or tape (this takes a long time on tape but as with all options can be aborted at any time by pressing <ESCAPE>).
1300>1310	Handles file error.

OPTIONS LIST

LOAD FILE	Will load a previously saved file onto tape or disk. (If no file name is entered it will default to a filename of "DATA").
SAVE FILE	Will save a file to tape or disk. (If no file name is entered it will default to a filename of "DATA").
PRINT RECORD	Will give a listing of records asked for to the screen and/or printer.
FIND RECORD	Will find any occurrence of searchstring in all records and display to screen and/or printer.
ORDER/SORT	Will sort all records on file into alphabetical order.
*CATALOGUE	Will catalogue all files on disk or tape. This maybe one of the most useful procedures with a disc system for finding file names (tape will take a lot longer than disc but can be aborted by using the <ESCAPE> key).
QUIT!	End program run.

SOME OF THE VARIABLES USED

A\$(X)	—Array for contents of records.
B\$(X)	—Array for contents of headings.
N	—Number of records on file.
G	—Selection for main menu.
F\$	—File name of loaded file.
FS\$	—File name of saved file.
C	—Used as a counter for loading files.
A	—Used as a counter for saving files.
R	—Contains lowest record number requested.
R1	—Contains highest record number requested.
E\$	—Enables pageing mode when displaying contents of records.
Q\$	—Selects printer ON/OFF.
P\$	—Contains selection for edit menu.
RE & RS	—Used to delete records from file.

I have also included (below but not in the main listing) a few procedures which the user may like to substitute for a procedure that they regard as unnecessary.

DEFPROCBYTES counts the bytes per record used and averages them out to give an estimate of how many more records can be used. This would be a useful procedure if a lot of information is to be stored on one file to prevent the memory from

being used up and a "No room" error occurring. See Program Listing 1.

DEFPROCSAVE can be altered if on a disc system to stop "can't extend" file errors. What it does is to save a file as "DATA", unlock the loaded file, delete the "DATA" file and rename the saved file as "DATA". It then locks the file again to stop accidental wiping. This would only be of use to update an existing file.

PROGRAM LISTING 1

```

350 VDU$1,10,20:INPUT"Save as what file ".FS$:IFFS$=""
    FS1$="D.DATA" ELSE FS1$=FS$
360 PRINT:FS1=OPENDUD(FS1$)
370 PRINT#FS1,J:A=LEN(STR$(J)):FORR=1TOJ
    :PRINT#FS1,C$(R):A=A+LEN(C$(R)):NEXT :PRINT#FS1,L$
    :A=A+LEN(L$)
380 FORR=1TON:PRINT#FS1,A$(R):A=A+LEN(A$(R)):NEXT:IFA
    MOD256=OPRINT#FS1,""
390 CLOSE#FS1:IFFS$="" GOTO292 ELSE FS$=FS1:GOTO400
392 *A.DATA
393 *DEL.DATA
394 *RENA.D.DATA DATA
395 *A.DATA L
396 FS$="DATA"
400 PRINT"CHR$(7):FS$ File saved." :A=INKEY:ENDPROC
    
```

PROGRAM LISTING 2

```

90 DIMA$(500),B$(10),C$(10):N=0:BT=TRUE
940 IFMAX%:1CLS:PRINTTAB(4,10)CHR$(131)"You have not enough
    memory left"CHR$(131)" Save this file and start
    another."CHR$(136)CHR$(129)" Press any key":X=GET
    :ENDPROC ELSEPRINTTAB(10,11)CHR$(136"A ---- Add records"
960 BT=FALSE:PROCBYTES:IFMAX%<3 W$="Warning you have very
    little memory left." ELSE W$="Type <RETURN> to add another
    record."
980 PRINTTAB(2,20)"You have enough memory for approx. "IMAX%:"
    more records":TAB(1,18)"ENTER another record ? ":X=GET
    :IFMAX%=1 OR X=29 ENDFROC ELSE GOTO860
1050 DEFPROCBYTES:N1=N
1060 LR%=0:FORX=1TON:LR%=LEN(A$(X))*3:LR%=LR%+LR%:NEXT:IFLR%=0
    LR%=1:L%=1:N1=1
1070 M%=INT((HIMEM-(2 AND MFFF))):MAX%=M%/(LR%/N1)-10:IFN=0
    MAX%=350
1080 IFBT=TRUE CLS:PRINTTAB(0,10)CHR$(131)"You have "IN" records
    on "IF$"CHR$(130)" with enough room for "CHR$(131)
    " (approx) "IMAX% more records.":X=GET
1090 BT=TRUE:ENDPROC
1100 (remove)
    
```

PROGRAM LISTING 3

```

611
10REM(C) BY N.W.S. DUNDAS 1985
15REM Database—Storage
25REM Program designed to be
35REM converted by user for their
45REM own applications.
55REM Remove VDU2$,1,1:0:0:0:0:VDU2$,1,0:0:0:0:0: for U.S. 0:1 replace with VDU2
3:8:0:2:0:0:0
70MODE7:PROCTITLE:L$=CHR$(131):J=1:F$="( )":FIL$="DISC":REM IF FILE SYSTEM
15 TAPE CHANGE FIL$="TAPE"
80:5:70=M$669204B:5:74=M$606B:5:21A=5:70:5:21B=0
90DIMA$(500),B$(10),C$(10):N=0
100CLS
110IFN=0 F$="( )"
120CLS:ONERRORIFERR=222GOTO130ELSEVDU3:GOTO130
130PROCPTION:G=GET
140IFG=76 PRDCL
150IFG=83 PROCS
160IFG=80 PROCP
170IFG=69 PROCED
180IFG=70 PROCF
190IFG=79 PROCO
    
```

```

200IFG=67 PROCAT
210IFG=81 GOT0230
220VDU23,1,0:0:0:0:GOT0120
230VDU7:PRINTTAB(10,17)CHR#136:"D ___ Quit":X=INKEY100:PRINTTAB(10,19):CHR#13
1:"Are You Sure?":TAB(6,21):CHR#131:CHR#136:"Please confirm Y/N":IFGET=89 THENM
0DE7:END ELSEGOTO120
240DEFPROCL:PRINTTAB(10,10):CHR#136:"L ___ Load file"
250IFN>0 VDU7:PRINTTAB(4,20)"You already have a file loaded!":X=INKEY200:GOTO1
260VDU3,10,20:INPUT"Load what file ",F$
270C=1:IFF$="" F$="DATA"
280F=OPENIN(F$):PRINT""Loading ":F$:
290INPUT#F,J:FORR=1TOJ:INPUT#F,C$(R):NEXT:INPUT#F,L$
300REPEATINPUT#F,A$(C):C=C+1:UNTILEOF#F:CLOSE#F
310IFA$(C-1)="?"THENA$(C-1)=""C=C-1
320C=1:ENDPROC
330DEFPROCS:IFN<1 VDU7:PRINTTAB(4,20)"You have no file to save!":X=INKEY200:END
PROC
340PRINTTAB(10,11)CHR#136:"S ___ Save file"
350VDU3,10,20:INPUT"Save as what file ",F$:IFFS="" F$="DATA"
360PRINT:F$=OPENDUT(F$)
370PRINT#FS,J:A=LEN(STR$(J)):FORR=1TOJ:PRINT#FS,C$(R):A=A+LEN(C$(R)):NEXT:PRIN
T#FS,L$:A=A+LEN(L$)
380FORR=1TON:PRINT#FS,A$(R):A=A+LEN(A$(R)):NEXT:IFA MOD256=0PRINT#FS,"?"
390CLOSE#FS
400PRINT"CHR#7:F$:" File saved.":A=INKEY100:ENDPROC
410DEFPROCP:PRINTTAB(3,0)CHR#136:"( USE <RETURN> FOR ALL RECORDS)":PRINTTAB(1
0,12)CHR#136:"P ___ Print records":VDU3,0,20:INPUT"Print from what record numbe
r ",R
420IFR<1 R=1:R1=N:E$="Y":O$="N":GOT0440
430VDU3,0,22:INPUT"To what record number ",R1
440PRINT" Send records to printer":O$=GET:E$="Y":IFQ$="" O$="N"
440FORR=R TOR1:IFY>N PRINT""Empty record - record number too high.":A=INKEY30
0:Y=YR1+1:GOT0500
470CLS
480IFQ$="Y"VDU2
490PROCRCPRINT(Y):VDU3:IFQ<>"Y"ANDE$="Y"PRINT"":A=GET
500NEXT:PRINT"CHR#136:CHR#129:" Press any key for menu.":A=GET:ENDPROC
510DEFPROCD:ONERRORGOT0520
520VDU23,1,0:0:0:0:CLS:PRINT"":CHR#141:TAB(14)"EDIT MENU":CHR#141:TAB(14)
"EDIT MENU"
530PRINT"TAB(10)CHR#131:"A ---- Add Records"TAB(10)CHR#131:"D ---- Delete Rec
ord"TAB(10)CHR#131:"C ---- Change Record"
540PRINTTAB(10)CHR#131:"H ---- Headings"TAB(10)CHR#131:"M ---- Main Menu"TAB
(10)CHR#134:"Z ---- Zero ALL files"
550P$=GET$:FLAG=FALSE:F1=FALSE
560IFP$="H"GOT0890
570IFP$="A"GOT0840
580IFP$="D"GOT0640
590IFP$="C"GOT0710
600IFP$="M"GOT0120
610IFP$="Z"PRINTTAB(10,16)CHR#136:"Z ---- Zero ALL files":GOT0630 ELSEGOT0550
620GOT0550
630VDU7:PRINTTAB(7,20)"Are You Sure?":X=GET:IFX=89 RUN ELSEGOT0520
640PRINTTAB(9,12)CHR#133:CHR#136:"D ---- Delete record":VDU3,1,20:INPUT"Delet
e from what record number ",R
650INPUTSPC(5)"To what record number ",R1
660IFR>R1 VDU7:VDU3,8,22:PRINT"Invalid command!":SPC(10):A=INKEY99:GOT0520
670IFR<1 VDU7,31,7,22:PRINT"Record number too small!":SPC(10):A=INKEY200:GOT052
0
680IFR1>N VDU7,31,7,22:PRINT"Record number too large.":SPC(10):A=INKEY200:GOT0
520
690RS=R:RE=R1:FORX=RS TO RE:PROCRCPRINT(X):NEXT:PRINT"Delete Yes or No?":IF
GET<89 GOT0520
700FORC=RS TON:A$(C)=A$(C+RE-RS+1):NEXT:N=N-(RE-RS+1):PRINT"Records ":RS" to "
RE" Deleted.":A=INKEY99:GOT0520
710PRINTTAB(9,13)CHR#133:CHR#136:"C ---- Change record":VDU3,1,20:INPUT"Chang
e what record number ",R:T=R:IFA$(R)=""VDU7:PRINT"Record empty - wrong record n
umber":A=INKEY200:GOT0520
720O$="Press <RETURN> to accept current line,"+CHR#13+CHR#10+CHR#10+" or
type the new version."
730CLS:VDU23,1,1:0:0:0:PROCRCPRINT(R)
740PRINT""O$:TAB(0,3)

```

```

750C=1
760PRINTTAB(9-LEN(C$(C)))(C$(C)):"":INPUTLINETAB(10)R$:IFR$<>" "THENB$(C)=R$:PRI
NTCHR#11TAB(10,VPDS)R$:TAB(39)
770VDU11:IFR$=""PRINT:R$=""
780IFR$=""ANDFLAG=TRUE F1=FALSE COM=C-1:GOT0800
790C=C+1:IFC<=COM GOT0760
800A$(T)=""F0RC=1TOCOM:A$(T)=A$(T)+B$(C)+"":NEXT:A$(T)=LEFT$(A$(T),LEN(A$(T)
)-1):CLS:PROCRCPRINT(T)
810INPUT""Is this correct ",R$:IFLEFT$(R$,1)=""N"R=T:F1=TRUE:GOT0720 ELSEF1=F
ALSE
820IFFLAG=TRUE N=N+1:GOT0880
830ENDPROC
840PRINTTAB(10,11)CHR#136:"A ---- Add records"
850IFL$=CHR#1PRINTTAB(10,20)CHR#7:"Headings undefined.":A=INKEY300:GOT0520
860O$="Type <RETURN> to return to Append mode."
870A$(N+1)=L$:FLAG=TRUE:R=N+1:T=R:GOT0730
880VDU11:PRINT"Enter another record? ":AR=GET:IFAR=78 ENDPROC ELSE GOT0860
890PRINTTAB(8,14)CHR#133:CHR#136:" H ---- Headings":VDU3,1,20:INPUT"How many
heading lines per record",R:J=R
900IFR>10PRINTCHR#7"Too many prompt lines -> Maximum of ten.":A=INKEY300:GOT
0890
910IFR<1 PRINT""Negative numbers not allowed.":A=INKEY300:GOT0520
920FORT=1TO10:C$(T)=""NEXT
930L$=STRING$(R-1,""):PRINT""Type your prompt lines in order:"
940FORR=1TOR:PRINT"Line ":R1:INPUTC$(R1):IFLEN(C$(R1))>9PRINT"Line too long,
""length not to exceed 9 letters":A=INKEY300:R1=R1-1:VDU1,11:PRINTTAB(80):VDU1
1,11,11,11
950PRINTTAB(39)CHR#11
960NEXT:GOT0520
970DEFPROCF:PRINTTAB(10,14)CHR#136:"F ___ Find record":VDU3,0,20:INPUTLINE"F1
nd what character string ",R$
980IFR$=""ENDPROC
990PRINT"Send records to printer?":O$=GET$
1000CLS:FORR=1TON:IFLEN(R$)>LEN(A$(Y)) THENI030
1010IFQ$="Y"VDU2
1020IFINSTR(A$(Y),R$)<0PROCRCPRINT(Y):VDU3:IFQ<>"Y"PRINT":A=GET
1030NEXT:VDU3:PRINT"CHR#136:CHR#129:"No Further Occurrence Of Serch String.":A=
INKEY300
1040ENDPROC
1050DEFPROCO:PRINTTAB(10,15)CHR#136:"O ___ Order/Sort":PRINTTAB(1,20)"Sorting t
he "IN" records""into alphabetical order.":X=INKEY200
1060PRINT"SORTING.":IFN=1THEN1100
1070FORR=1TON-1:IFA$(R)>A$(R+1)THENR$=A$(R):A$(R)=A$(R+1):A$(R+1)=R$:R=R-2
1080IFR<0R=0
1090NEXT
1100PRINT"Sorting completed.":CHR#7:A=INKEY200:ENDPROC
1110DEFPROCOPTION:CLS:PRINT":CHR#141:TAB(15)"MENU":CHR#141:TAB(15)"MENU"
1120PRINTTAB(0,5):CHR#129:"File Name":SPC(12)"Number of records"
1130PRINTTAB(1):F$:TAB(30)IN
1140PRINT""TAB(10):CHR#134:"L ___ Load file"TAB(10):CHR#134:"S ___ Save file"
TAB(10):CHR#134:"P ___ Print records"
1150PRINTTAB(10):CHR#134:"E ___ Edit menu"TAB(10):CHR#134:"F ___ Find record"
TAB(10):CHR#134:"O ___ Order/Sort"TAB(10):CHR#134:"C ___ *Catalogue"TAB(10):CH
R#133:"D ___ Quit":
1170ENDPROC
1180DEFPROCRCPRINT(X):C=1:S=1:REPEAT
1190IFLEN(A$(X))>1THENZ=0:GOT01210
1200Z=INSTR(A$(X),"",S):IFZ=0THENB$(C)=MID$(A$(X),S,Z-1):C=C+1:S=Z+1
1210UNTILZ=0:B$(C)=RIGHT$(A$(X),LEN(A$(X))-S+1)
1220PRINT"TAB(10)"RECORD NUMBER "X":FORR=1TOC:PRINTTAB(9-LEN(C$(R)))(C$(R)):"B
$(R):NEXT:COM=C:ENDPROC
1230DEFPROCTITLE:VDU23,1,0:0:0:0:PRINT""TAB(10)CHR#141:"DATA STORAGE"TAB(1
0)CHR#141:"DATA STORAGE"TAB(5,15)CHR#133"(C) N.W.S. DUNDAS 1983"
1240A=INKEY300:ENDPROC
1250DEFPROCAT:PRINTTAB(10,16)CHR#136:"C ___ *Catalogue":X=INKEY100:CLS:PRINT"TA
B(3)"Catalogue of files on ":FIL$
1260CAT
1270PRINT"SPC(10):CHR#136:CHR#130:"PRESS SPACE"
1280REPEAT:OS=GET:UNTIL OS=32
1290ENDPROC
1300VDU7:PRINTTAB(3,20)"No such file as ":F$:SPC(8):TAB(3,22)"Please try again
":TAB(0,24)SPC(10):X=INKEY600
1310GOT0110

```

Colour Dump

R C Jozefowski

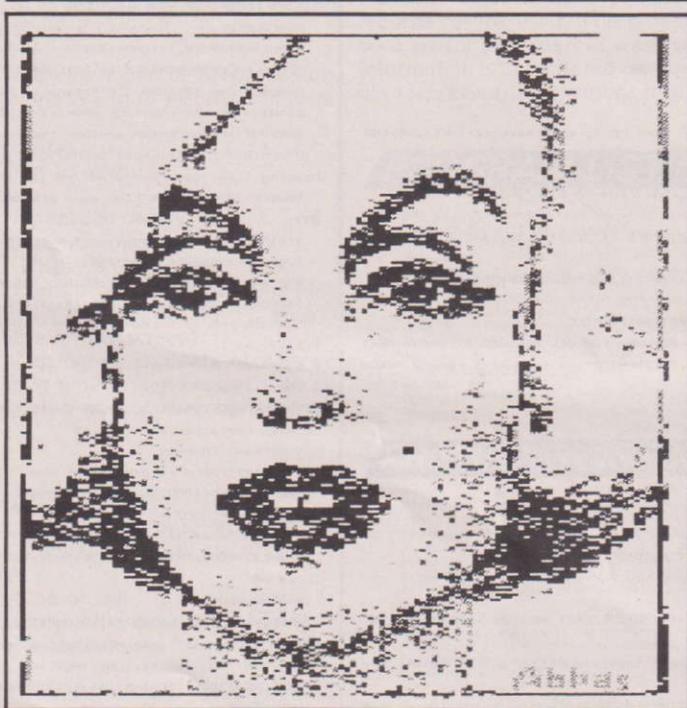
The chances are that if you own a BBC micro and have an Epson printer you will have contemplated producing a hard copy representation of a high resolution colour graphics display. You may well have spent some time entering and debugging one of the several programs around, only to be disappointed with the results. This article describes a short and efficient machine code program which produces a high quality grey scale pattern dump. The main features of this programs are:

- 1) Grey scale or hash patterns are used to represent the sixteen colours available on the BBC micro.
- 2) The grey scale patterns are programmed in BASIC as user defined characters. This allows you to define patterns according to application, e.g. colour printer or bar charts,
- 3) Selection of grey scale pattern is made on the basis of physical colour, not logical colour. This allows the user to change grey tones quickly by means of the VDU19 command.
- 4) A large (approx 8.9" by 7.5") high resolution (640 by 896 points) true aspect ration print is obtained in all graphics modes, i.e. the ratio of the width of the height of the screen dump is the same as that of the display on an average TV screen. Fine adjustments can also be made to the height of the image.
- 5) The compact machine codes can be easily accessed from BASIC with either cassette or disc filing systems.

ENTERING THE PROGRAM

We are publishing two forms of program — the full BASIC assembler source code, and a much shorter BASIC program which directly pokes numbers into the computer's memory. The two versions produce identical machine code files. If you intend modifying the program you should enter the assembler

State of the art dumping of spectacular colour graphics from your BBC Micro to Epson printers



source code, otherwise you will probably find it much quicker to type in the 15 lines of obscure numbers.

The 194 line BASIC assembler program is written for a disc system with BASIC 1. The program can be simplified for BASIC 2 and cassette based systems. Although the text can be compressed considerably by the compaction of lines and the removal of comments and spaces, this is probably not a good idea as it will make the program much more difficult to check and change in the future. Unless you are familiar with the use of the 6502 assembler built into BBC BASIC it is advisable to enter the program exactly as listed. Make sure that you save the BASIC program before running as typing mistakes could cause program corruption when run.

If you choose the easy way out and enter the short program make sure that it is the correct version for your system. There is one listing for use with discs and one for cassettes.

DISC SYSTEMS

Once you have entered your BASIC program, be it the long or short version, save it before running. Don't save it under the file name SDUMP in the current directory as the machine code file will take this name. Now run the program. Provided you haven't made any typing errors the machine code generated by your program will be automatically saved to disc.

If you have entered the long version and have a BASIC 2 ROM in your machine (pressing BREAK followed by REPORT

gives ACORN copyright 1982 not 1981) the program can be simplified as follows:

Delete lines 150,1840-1870, 1920-1940
Add the following lines:

```
330 P% = relocate%
335 O% = HIMEM
1910 OSCLI "SAVE SDUMP
"+STR$HIMEM+"
"STR$ 0%+"
"STR$ relocate%+"
"STR$ relocate%
```

CASSETTE SYSTEMS

Before starting to type in the program check that you have the 1.20 operating system ROM installed in your machine by typing *FX0. The machine code program uses several system calls not implemented on the 0.10 operating system. If you still have the old operating system consult your local BBC micro dealer.

Enter the long or short program. If you enter the long version you must make the following changes to the program:

Delete lines 150, 1840-1940
Add the following lines:

```
330 P% = &D02
1840 *SAVE SDUMP D02+F0
```

Save the program to tape before running — avoid calling the program SDUMP as this will be used for the machine code file. Wind the tape to a blank section and run. Provided you haven't made any typing errors the screen should come up with the familiar 'Record then return' message. Follow this instruction and the machine code program will be saved to tape.

USING THE SCREEN DUMP

It is advisable to test your screen dump program by entering the short demonstration program. If this produces unexpected results go back and check the assembler program for typing errors.

Now decide on the grey scale

patterns you require. These are programmed as user defined screen characters on an 8 x 8 matrix using the VDU 23 command. Screen character codes 240 through to 255 are used to represent the 16 physical screen colours. Thus character code 240 is used for printing black pixels, 241 for red, 255 for flashing white-black etc. Setting a bit in the character definition causes the printer to plot a point.

You may decide that the example of grey scale character definitions given in the demonstration program is adequate. However, you may well be able to improve on these for your own particular application. These characters were designed to generate a fairly homogeneous texture taking into account adjacent colour effects. Note that a black screen will set all points on the print-out and that white will set none. You may wish to reverse the sequences of the characters to produce a negative print-out, i.e. white on the screen = black on the printer, as obtained on a normal listing.

In the demonstration program, point densities gradually decrease from black to white in the following order:

Black, blue, red, magenta, green, cyan, yellow, white.

This sequence corresponds to the grey scale obtained on a good black and white monitor plugged into the video output socket. Black and white televisions will probably have a slightly different grey scale sequence owing to the presence of the colour sub-carrier in the UHF output signal.

DISC SYSTEMS

The machine code file SDUMP should be in the current library directory. The screen dump can then be activated at any time by the statement

```
*SDUMP
```

This has the effect of loading the screen dump into the computer's memory from location &600 upwards. This area of memory is us-

ed by BASIC as a temporary work space but is not required for the duration of the screen and will not upset its operation. The program automatically runs and returns to BASIC in the same way as other disc utilities. Note that the user defined characters are not destroyed by pressing BREAK or CHAINing other programs. You may therefore find it convenient to define the grey scale characters in disc! BOOT program.

CASSETTE SYSTEMS

With a cassette system you should now load the short machine code screen dump program which you created by the statement

```
*LOAD SDUMP
```

This loads into the computer's memory from location &D02. This area is normally not used in BASIC systems with the cassette filing system.

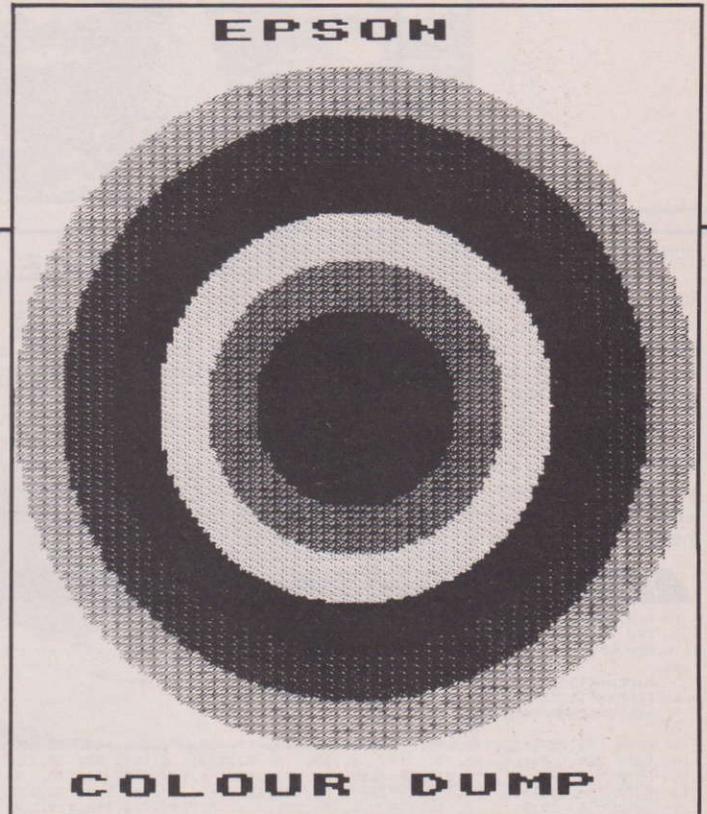
You may now run your program which draws the required graphics picture. The screen dump is then activated by the statement

```
CALL &D02
```

Note that the grey scale definitions and the screen dump machine code are not affected by use of the BREAK key or CHAINing of other programs. You may therefore find it convenient to load these in an initial setup program.

GENERAL POINTS

Before running the screen dump program ensure that the default parallel printer port is selected, otherwise your daisy wheel on the serial port might have trouble recognising some of the strange characters sent to it! It should be noted that the printer is disabled on exit from the screen dump even if it was enabled before entry.



Example dump

PROGRAM DETAILS

In order to keep the machine code program compact, occupying just 234 bytes in memory, Acorn documented operating system calls have been utilised wherever possible. The reader is directed to the BBC user guide for details of these and to the Epson printer manual for details on the bit image printing modes.

PICTURE DIMENSIONS

Regardless of graphics screen mode the printer is set up for dual density bit image printing. This gives a resolution of 120 points per inch in the horizontal direction and 72 points per inch vertically. In order to obtain the largest print size on a single sheet of paper it was decided to be slightly unconventional and print the image sideways. Thus the top right hand corner of the screen is printed first in the top left hand corner of the paper. 640 points are read from the screen in the X direction at every other pixel position. This is the full resolution available in graphics mode 0. Because these points are printed

vertically on the paper the image width is always $640/72 = 8.89$ inches. In the Y direction 256 points are read from the screen at every fourth pixel position, this being the vertical resolution in all graphics modes. Each vertical point determines the setting of three, sometimes four, horizontal columns on the printer. The height of the printed image can be adjusted by varying the frequency at which four columns as opposed to three are used to represent a point taken from the picture. This parameter is set by the variable ycomp in line 300. In the listing ycomp is set to 2. This means that four columns are printed on every other point read from the screen. This gives a total of 896 columns across the screen which at 120 points to the inch gives a picture height of 7.47 inches. This produces a printed image well proportioned with respect to the picture on a typical TV screen. Changing the value of ycomp to 3 gives a total of 853 columns across the screen. This gives a picture height of 7.11 inches which is exactly that required to produce square areas for individual pixels on the BBC

CONTINUED OVER

screen.

This can be extremely useful when printing geometric forms and was used to generate true circles with the demonstration program. Finally, for some scaled applications the occasional fourth column may become an embarrassment, in which case setting ycomp to 256 will always produce just three columns for each of the 256 points, giving a height of 6.4 inches.

ACKNOWLEDGEMENTS

Thanks are due to Abbas, a graphics designer specialising in computer graphics, for his comments and permission to publish examples of his work. For further details of creative computer graphics on the BBC micro contact Abbas on Cambridge (0223) 277302.

```

180 VDU23,241,&6F,&BD,&DB,&7D,&D6,&6B,&BE,&8C
190 REM Blue
200 VDU23,244,&EF,&BD,&FB,&7F,&D6,&7B,&FF,&BF
210 REM Black
220 VDU23,240,&FF,&FF,&FF,&FF,&FF,&FF,&FF,&FF
230
240 REM Draw a test picture
250 MODE2:REM replace by MODE 5 on 16k BBC micro
260 COLOUR135:CLS
270 COLOUR0
280 PRINTTAB(7,0)"EPSON"
290 PRINTTAB(4,31)"COLOUR DUMP":
300 inc=0.02:REM angular increment for circle
310 FORcolour%=6TOSTEP-1
320 GCOL0,colour%
330 radius%=64*(colour%+1)
340 MOVE640=radius%,512
350 MOVE640+radius%,512
360 FORangle=inc TO PI+inc STEPinc
370 xoff%=radius%*COSangle:yoff%=radius%*SINangle
380 PLOTB5,640-xoff%,512-yoff%
390 PLOTB5,640+xoff%,512+yoff%
400 NEXT
410 NEXT
420 *SDUMP:REM Replace this line by CALL &D02 with cassette system
    
```

PROGRAM LISTING 1

```

10 REM Epson Screen Dump machine code program
20 REM Version for disc systems
30 REM Written by Richard C. Jozefowski, Cambridge
40
50 HIMEM=&4000
60 FORP%=0TO233:READbyte%:P%?HIMEM=byte%:NEXT
70 *SAVE SDUMF 4000+EA 600
80
90 DATA 169,255,133,114,169, 4,133,113,169, 2, 32,238,255,169, 27, 32
100 DATA 210, 6,169, 65, 32,210, 6,169, 8, 32,210, 6,169, 27, 32,210
110 DATA 6,169, 76, 32,210, 6,169,128, 32,210, 6,169, 3, 32,210, 6
120 DATA 169,255,133,114,133,127,169, 3,133,115,169, 2,133,129, 32,139
130 DATA 6, 32,221, 6, 32,139, 6, 32,221, 6, 32,139, 6,198,129,208
140 DATA 10, 32,221, 6, 32,139, 6, 169, 2,133,129, 56,165,114,233, 4
150 DATA 133,114,176, 4,198,115, 48, 5, 32,221, 6,144,209,169, 10, 32
160 DATA 210, 6, 36,113, 16,151,169, 12, 32,210, 6,169, 27, 32,210, 6
170 DATA 169, 64, 32,210, 6,169, 3, 32,238,255, 96,169, 7,133,126,169
180 DATA 9,162,112,160, 0, 32,241,255,169, 11,162,116,160, 0, 32,241
190 DATA 255,165,117, 9,240,133,117,169, 10,162,117,160, 0, 32,241,255
200 DATA 165,127, 41, 7,170,181,118,166,126, 10,202, 16,252, 38,128,165
210 DATA 112, 56,233, 2,133,112,176, 2,198,113,198,126, 16,193,198,127
220 DATA 165,128, 72,169, 1, 32,238,255,104, 32,238,255, 96, 24,169, 16
230 DATA 101,112,133,112,144, 3,230,113, 24, 96
    
```

PROGRAM LISTING 2

```

10 REM Epson Screen Dump machine code program
20 REM Version for cassette systems
30 REM Written by Richard C. Jozefowski, Cambridge
40
50 FORP%=0TO233:READbyte%:P%?D02=byte%:NEXT
60 *SAVE SDUMF D02+EA
70
80 DATA 169,255,133,112,169, 4,133,113,169, 2, 32,238,255,169, 27, 32
90 DATA 212, 13,169, 65, 32,212, 13,169, 8, 32,212, 13,169, 27, 32,212
100 DATA 13,169, 76, 32,212, 13,169,128, 32,212, 13,169, 3, 32,212, 13
110 DATA 169,255,133,114,133,127,169, 3,133,115,169, 2,133,129, 32,141
120 DATA 13, 32,223, 13, 32,141, 13, 32,223, 13, 32,141, 13,198,129,208
130 DATA 10, 32,223, 13, 32,141, 13,169, 2,133,129, 56,165,114,233, 4
140 DATA 133,114,176, 4,198,115, 48, 5, 32,223, 13,144,209,169, 10, 32
150 DATA 212, 13, 36,113, 16,151,169, 12, 32,212, 13,169, 27, 32,212, 13
160 DATA 169, 64, 32,212, 13,169, 3, 32,238,255, 96,169, 7,133,126,169
170 DATA 9,162,112,160, 0, 32,241,255,169, 11,162,116,160, 0, 32,241
180 DATA 255,165,117, 9,240,133,117,169, 10,162,117,160, 0, 32,241,255
190 DATA 165,127, 41, 7,170,181,118,166,126, 10,202, 16,252, 38,128,165
200 DATA 112, 56,233, 2,133,112,176, 2,198,113,198,126, 16,193,198,127
210 DATA 165,128, 72,169, 1, 32,238,255,104, 32,238,255, 96, 24,169, 16
220 DATA 101,112,133,112,144, 3,230,113, 24, 96
    
```

PROGRAM LISTING 3

```

10 REM Positive Epson screen dump test program.
20 REM *LOAD SDUMF before running this program with cassette system.
30
40 REM Define a grey scale according to screen colours
50 REM Note that only colours 0 to 7 are defined in this demonstration.
60
70 REM White
80 VDU23,247,0,0,0,0,0,0,0,0
90 REM Yellow
100 VDU23,243,&22,&80,&08,&20,&80,&01,&04,&10
110 REM Cyan
120 VDU23,246,&22,&91,&48,&24,&92,&49,&24,&10
130 REM Green
140 VDU23,242,&22,&95,&59,&64,&92,&6B,&2C,&92
150 REM Magenta
160 VDU23,245,&6E,&85,&5B,&6C,&92,&6B,&8C,&93
170 REM Red
    
```

PROGRAM LISTING 4

```

10 REM Epson Screen Dump Assembler program
20 REM Written by Richard C. Jozefowski, Cambridge
30 REM Version for disc systems
40 REM Requires OS 1.20, BASIC 1 or BASIC 2.
50 REM Program can be simplified for cassette or BASIC 2.
60
70 REM Program is assembled at &4000 and references relocated to &600.
80 HIMEM=&4000
90 relocate%=&600
100 DIMcomline%30:REM reserve space for command line with BASIC 1
110
120 REM OS entry points
130 OSWRCH=&FFEE
140 OSWORD=&FFFF1
150 OSCL1=&FFFF7
160
170 REM zero page usage
180 xpoint=&70
190 ypoint=xpoint+2
200 pxval=xpoint+4
210 colour=xpoint+5
220 count=xpoint+14
230 ycount=xpoint+15
240 colbyte=xpoint+16
250 yextra=xpoint+17
260
270 REM define size of screen
280 xmax=1279
290 ymax=1023
300 ycomp=2:REM aspect ratio compensation (can be between 2 and 256)
310
320 FORpass%=4TO6STEP2
330 P%=HIMEM
340 DOPTpass%
350 \set up x pointer
360 .sdump LDA #xmax:MOD256
370 STA xpoint
380 LDA #xmax:DIV256
390 STA xpoint+1
400
410 \enable printer
420 LDA #2
430 JSR OSWRCH
440
450 \set printer to double density mode
460 .newline LDA #27
470 JSR printer
480 LDA #65
490 JSR printer
500 LDA #8
510 JSR printer
520 LDA #27
530 JSR printer
540 LDA #76
550 JSR printer
560 LDA #((ymax+1)*3+(ymax+1):DIVycomp)/4:MOD256
570 JSR printer
580 LDA #((ymax+1)*3+(ymax+1):DIVycomp)/4:DIV256
590 JSR printer
600
610 \set up y pointer
620 LDA #ymax:MOD256
630 STA ypoint
640 STA ycount
650 LDA #ymax:DIV256
660 STA ypoint+1
670 LDA #ycomp:MOD256
680 STA yextra
    
```



Colour dump in action

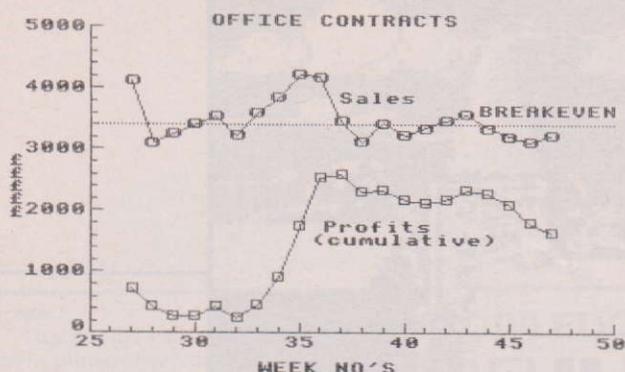
```

690
700 \print three/four columns
710 .newcol JSR princol
720 JSR xadd
730 JSR princol
740 JSR xadd
750 JSR princol
760 DEC yextra
770 BNE nexty
780 JSR xadd
790 JSR princol
800 LDA #ycomp MOD256
810 STA yextra
820
830 \adjust y pointer for next column
840 .nexty SEC
850 LDA ypoint
860 SBC #4
870 STA ypoint
880 BCS nextcol
890 DEC ypoint+1
900 BMI endlne \branch if end of print line
910
920 \reset x pointer to the top of next column
930 .nextcol JSR xadd
940 BCC newcol \branch always taken
950
960 \start new line
970 .endlne LDA #10
980 JSR printer
990 BIT xpoint+1 \test for end of picture
1000 BPL newline \branch if more
1010
1020 \advance paper, reset printer and exit with printer disabled
1030 LDA #12
1040 JSR printer
1050 LDA #27
1060 JSR printer
1070 LDA #64
1080 JSR printer
1090 LDA #3
1100 JSR OSWRCH
1110 RTS
1120
1130
1140 \subroutine to calculate and print single 8 point column
1150
1160 \set column counter
1170 .princol LDA #7
1180 STA count
1190
1200 \read pixel value from screen
1210 .getpix LDA #9
1220 LDX #xpoint
1230 LDY #0
1240 JSR OSWORD
1250
1260 \convert to physical screen colour
1270 LDA #11
1280 LDX #pixval
1290 LDY #0
1300 JSR OSWORD
1310
1320 \set carry if point set in pixel colour character definition
1330 LDA colour
1340 ORA #F0 \set base of character definitions to 240
1350 STA colour
1360 LDA #10
1370 LDX #colour
1380 LDY #0
1390 JSR OSWORD \get character definition
1400 LDA ycount
1410 AND #7
1420 TAX
1430 LDA colour+1,X
1440 LDX count
1450 .shift ASL A
1460 DEX
1470 BPL shift
1480 ROL colbyte \set bit in column byte
1490
1500 \subtract 2 from x pointer
1510 LDA xpoint
1520 SEC
1530 SBC #2
1540 STA xpoint
1550 BCS nocarry
1560 DEC xpoint+1
1570 .nocarry DEC count
1580 BPL getpix
1590 DEC ycount
1600 LDA colbyte
1610
1620
1630 \subroutine to send character in A register to printer
1640 .printer PHA
1650 LDA #1
1660 JSR OSWRCH
1670 PLA
1680 JSR OSWRCH
1690 RTS
1700
1710
1720 \subroutine to add 16 pixels to x position for top pin of printer head
1730
1740 .xadd CLC
1750 LDA #16
1760 ADC xpoint
1770 STA xpoint
1780 BCC return
1790 INC xpoint+1
1800 CLC \always return with carry clear
1810 .return RTS
1820 ]
1830
1840 REM relocate references for BASIC 1
1850 princol=princol+relocate%-HIMEM
1860 printer=printer+relocate%-HIMEM
1870 xadd=xadd+relocate%-HIMEM
1880 NEXT
1890
1900 REM save as disc library routine loaded into page 6
1910 $comline%="SAVE SDUMP "+STR$~"HIMEM+" "+STR$~"FX+" "+STR$~"relocate%" "+STR$
relocate%
1920 X%=comline%
1930 Y%=comline%DIV256
1940 CALLOSLI

```

EASILOT

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Cambridge CB2 2HN.



W. A. Schreuder

As the name of the program suggests, the idea of this game is to guess a combination of colours. The computer generously awards ten turns to test out your logical thinking. If you succeed in this the computer will play Happy Birthday. If you still have not guessed the combination after 10 turns the computer will tell you the solution.

The colours are entered by pressing one of the function keys as follows:

- f0—red
- f1—yellow
- f2—green
- f3—blue
- f4—cyan
- f5—white
- f6—enter the sequence of colours as a guess.
- f7—mistake, last turn (only if you have not pressed f6) again.

Full instructions are given in the program.

HOW IT RUNS

In line one the mode for displaying information is selected. This can be any mode you wish.

Guess the correct colour combination and earn the applause of your BBC Micro.

In lines 2-6 the combination is made up randomly.

In line 6 the computer jumps to PROCinfo which is in lines 121

to 144. This procedure displays information about the game.

In lines 8 to 15 the function keys are defined so that they

have values from one to six to enable you to enter the colours by pressing one of them instead of using CTRL-A to CTRL-G. I advise you to put a note above the keys so that you can see which key represents which colour at a glance.

In line 16 the computer jumps to PROCboard which sets the screen up for displaying colours.

In line 17 a loop is started and run through ten times. WIM is the variable that determines at which height the squares and triangles are drawn. In line 18 the computer jumps to PROCguess. PROCguess reads your guess from the keyboard and checks if your answer makes sense. That is, if the numerics you enter are within the prescribed range.

The program now jumps to PROCcheck. The variables used in PROCcheck do the following: NOC1 to NOC7 is the number of ones to sevens that are in the computer's combination. So if the computer's combination is red, red, green, green (1,1,2,2,) then NOC1 is equal to 2 and NOC2 equals 2. NOR1 to NOR7 are the number of ones to sevens

PROGRAM LISTING

```

1MODE6
2REPEAT:color1=RND(7):UNTIL color1<>5
3REPEAT:color2=RND(7):UNTIL color2<>5
4REPEAT:color3=RND(7):UNTIL color3<>5
5REPEAT:color4=RND(7):UNTIL color4<>5
6PROCinfo
7MODE2
8*KEY0 1A
9*KEY1 1B
10*KEY2 1C
11*KEY3 1D
12*KEY4 1F
13*KEY5 1G
14*KEY6 1
15*KEY7 2
16PROCboard
17FOR WIM=50 TO 860 STEP 90
18PROCguess
19PROCcheck
20PROCtriangle
21NEXT WIM:P=INKEY(200)
22PROCend
23DEF PROCboard
24GCL 0,7
25MOVE10,10
26DRAW10,950
27DRAW850,950
28DRAW850,10
29DRAW10,10
30FOR X=60 TO 360 STEP 100
31FOR Y=50 TO 860 STEP 90
32MOVE X,Y
33DRAW X,Y+50
34DRAW X+50,Y+50
35DRAW X+50,Y
36DRAW X,Y
37NEXT Y
38NEXT X
39ENDPROC
40DEF PROCguess
41SOUND 1,-15,69,5
42REPEAT:color1=GET:UNTIL color1>0 AND color1<8 AND color1<>5
43PROCcolor1(WIM,color1)
44SOUND 1,-15,73,5
45REPEAT:color2=GET:UNTIL color2>0 AND color2<8 AND color2<>5
46PROCcolor2(WIM,color2)
47SOUND 1,-15,81,5
48REPEAT:color3=GET:UNTIL color3>0 AND color3<8 AND color3<>5
49PROCcolor3(WIM,color3)
50SOUND 1,-15,101,5
51REPEAT:color4=GET:UNTIL color4>0 AND color4<8 AND color4<>5
52PROCcolor4(WIM,color4)
53SOUND 1,-15,101,5:SOUND 1,-15,81,5:SOUND 1,-15,73,5:SOUND 1,-15,69,5
54P=GET
55IF P=49 THEN ENDPROC ELSE IF P=50 GOTO 41
56GOTO 54
57DEF PROCcheck
58NOC1=0:NOC2=0:NOC3=0:NOC4=0:NOC5=0:NOC6=0:NOC7=0
59NOR1=0:NOR2=0:NOR3=0:NOR4=0:NOR5=0:NOR6=0:NOR7=0
60NOM1=0:NOM2=0:NOM3=0:NOM4=0:NOM5=0:NOM6=0:NOM7=0
61BULLS=0:COWS=0
62NOC1=-1*(color1a=1)-1*(color2a=1)-1*(color3a=1)-1*(color4a=1)
63NOC2=-1*(color1a=2)-1*(color2a=2)-1*(color3a=2)-1*(color4a=2)
64NOC3=-1*(color1a=3)-1*(color2a=3)-1*(color3a=3)-1*(color4a=3)
65NOC4=-1*(color1a=4)-1*(color2a=4)-1*(color3a=4)-1*(color4a=4)
66NOC5=-1*(color1a=6)-1*(color2a=6)-1*(color3a=6)-1*(color4a=6)
67NOC7=-1*(color1a=7)-1*(color2a=7)-1*(color3a=7)-1*(color4a=7)
68NOR1=-1*(color1=1)-1*(color2=1)-1*(color3=1)-1*(color4=1)
69NOR2=-1*(color1=2)-1*(color2=2)-1*(color3=2)-1*(color4=2)
70NOR3=-1*(color1=3)-1*(color2=3)-1*(color3=3)-1*(color4=3)
71NOR4=-1*(color1=4)-1*(color2=4)-1*(color3=4)-1*(color4=4)
72NOR6=-1*(color1=6)-1*(color2=6)-1*(color3=6)-1*(color4=6)
73NOR7=-1*(color1=7)-1*(color2=7)-1*(color3=7)-1*(color4=7)
74IF NOC1>NOR1 NOM1=NOR1
75IF NOC2>NOR2 NOM2=NOR2
76IF NOC3>NOR3 NOM3=NOR3
77IF NOC4>NOR4 NOM4=NOR4
78IF NOC5>NOR5 NOM5=NOR5
79IF NOC7>NOR7 NOM7=NOR7
80IF NOC1<NOR1 ANDNOC1<>0 NOM1=NOC1
81IF NOC2<NOR2 ANDNOC2<>0 NOM2=NOC2
82IF NOC3<NOR3 ANDNOC3<>0 NOM3=NOC3
83IF NOC4<NOR4 ANDNOC4<>0 NOM4=NOC4
84IF NOC5<NOR5 ANDNOC5<>0 NOM5=NOC5
85IF NOC7<NOR7 ANDNOC7<>0 NOM7=NOC7
86COWS=NOM1+NOM2+NOM3+NOM4+NOM5+NOM7
87IF color1=color1a COWS=COWS-1:BULLS=BULLS+1
88IF color2=color2a COWS=COWS-1:BULLS=BULLS+1
89IF color3=color3a COWS=COWS-1:BULLS=BULLS+1
90IF color4=color4a COWS=COWS-1:BULLS=BULLS+1
91IF BULLS=4 PROCtriangle:PROCguessed
92ENDPROC
93DEF PROCcolor1(VE,color1)

```

CONTINUED OVER

that are in your guess.

In lines 74-85 NOM1 to NOM7 are calculated. If there are (for instance) 3 red squares in the combination and your guess contains 3 red squares or less, then all the reds from your combination are also in the computer's combination. In that case (a colour occurs more often than the number of the colour in your combination) the computer calculates NOM1 (equals the number of 1 to 7 that occur in any way) in the lines 74-79.

If the number of ones to sevens that you think are in the combination is larger than the actual number then the computer calculates nom 1 to nom7 in lines 80-85.

In line 86 everything is treated as cow (in the combination but not in the right place) and added giving a number of cows that might not be right. It might not be right because there also could be bulls (in the combination and in the right place).

Well, in the lines 87-91 your guess is tested for bulls. For every bull found the number of cows is

decreased by one and the number of bulls is increased by one.

Now the computer knows how many bulls and cows there are, it jumps to PROCtriangle. If the number of bulls is four then the jump is to PROCguessed.

When the program has completed the loop 10 times and the combination remains undiscovered then the game is lost and the correct solution displayed.

Now I will explain what happens in the lines 62 to 73. This method is easy to use and might be useful in many program operations.

If you want to test colour1a, colour2a, colour3a and colour 4a for the occurrence of ones then you could write: IF colour1a=1 NOC1 = NOC1 + 1 and the same for colours 3 to 4.

This works perfectly but there is an easier method: NOC1 = -1 * (colour1a=1) - 1 * (colour2a=1) - 1 * (colour3a=1) - 1 * (colour4a=1). (colour1a=1) is called a Boolean. A boolean can have two values. It is either FALSE or TRUE. In most computers FALSE returns a 0 and



TRUE returns a 1. In BBC BASIC however FALSE returns a 0 and TRUE returns a -1. If colour1a is one whose value between the brackets is -1 then multiply this by -1 and you get 1. I hope you enjoy the program. If it does not work first time then your mistake is probably in PROCcheck or in PROCtriangle.

PROGRAM LISTING

```

94GCOL 0,color1
95HD=60
96FOR SET=HD TO HD+50
97MOVE SET,VE:DRAW SET,VE+50
98NEXT SET
99ENDPROC
100DEF PROCcolor2(VE,color2)
101GCOL 0,color2
102HD=160
103FOR SET=HD TO HD+50
104MOVE SET,VE:DRAW SET,VE+50
105NEXT SET
106ENDPROC
107DEF PROCcolor3(VE,color3)
108GCOL 0,color3
109HD=260
110FOR SET=HD TO HD+50
111MOVE SET,VE:DRAW SET,VE+50
112NEXT SET
113ENDPROC
114DEF PROCcolor4(VE,color4)
115GCOL 0,color4
116HD=360
117FOR SET=HD TO HD+50
118MOVE SET,VE:DRAW SET,VE+50
119NEXT SET
120ENDPROC
121DEF PROCinfo
122CLS
123PRINT "Colour-combination BY Wim Schreuder"
124PRINTSTRING$(40,"*")
125PRINT "Your purpose is to guess the combination:"
126PRINT "of colours within ten turns."
127PRINT "There are six possible colours :""
128PRINT "Red, Yellow, Green, Blue, Cyan and White.""
129PRINT "A colour can occur more than once !""
130PRINT "" (C)W.A.Schreuder 21-5-83"" The Netherlands""
131PRINT "KEY.....":K=GET:CLS
132PRINT "You must use the function-keys to enter"
133PRINT "the colours as follows :""
134PRINT "F0 Red""F1 Yellow""F2 Green""F3 Blue""F4 Cyan""F5 White""
135PRINT "When you've entered the combination and"
136PRINT "You're sure about it, press F6 to enter"
137PRINT "Else press F7 and enter the"
138PRINT "combination again !""
139PRINT "A 'beep' tells you to enter the next""colour.""
140PRINT "The number of magenta triangles""tells you the number of right place
d""colours. The number of white triangles""tells you the number of colours th
at do""occur but aren't right placed.""
141PRINT "G O O D L U C K ! ! ! ""
142PRINT "Hit a key.....""
143Z=GET
144ENDPROC
145DEF PROCguessed
146PRINTTAB(2,2)"CORRECT !""
147VDU19,7,15,0,0,0
148DATA 101,5,101,5,109,5,101,5,121,5,117,5,101,5,101,5,109,5,101,5,129,5,121,
5,101,5,101,5,137,5,121,5,117,5,117,5,109,5,141,5,141,5,137,5,121,5,129,5,121,10
149RESTORE 148
150FOR K=1 TO 25
151READ M,N
152SOUND 1,-15,M,N
153NEXT K:M=GET:VDU20:M=GET:RUN
154ENDPROC
155DEF PROCend
156PRINTTAB(7,1)"WAS IT !""
157PROCcolor1(950,color1a):PROCcolor2(950,color2a):PROCcolor3(950,color3a):PRO
Color4(950,color4a)
158Z=GET:RUN
159DEF PROCtriangle
160H=40:GCOL 0,5
161IF BULLS=0 GOTO 168
162FOR XB=1 TO BULLS
163PLOT 69,H,WIM
164PLOT 69,H+50,WIM
165PLOT 85,H+25,WIM+50
166H=H+100
167NEXT XB
168GCOL 0,7
169IF COWS=0 ENDPROC
170FOR XC=1 TO COWS
171PLOT 69,H,WIM
172PLOT 69,H+50,WIM
173PLOT 85,H+25,WIM+50
174H=H+100
175NEXT XC
176ENDPROC

```

ROMS

SOFTWARE FOR THE BBC MICRO

WORDWISE

32K

WORDWISE
(C) Computer Concepts 1982

- 1) Save entire text
- 2) Load new text
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- 4) Load text to cursor
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ESC Edit Mode

Please enter choice

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GREMLIN

32K

```

A=FF X=FF Y=FF
S =01FF 88 10 E3 BF 92 93 DC 89
PC=FFFF DC FF FF 09 D0 00 00 FF
777
CF00 4B 4A 4A 4A 4A AA 8D 1F HJJJJ
CFFB C3 05 D2 45 D3 91 D8 98 E
M =D000 1B 69 08 AB 68 29 OF AA i h
D008 BD 1F C3 05 D2 45 D3 91 E
D010 DB 9B E9 08 AB 10 D7 60
D018 9B E9 21 30 FA AB 81 DE 10
-----
I START=D000
ID START START+9 S
D000 1B CLC
D001 69 08 i ADC #B
D003 AB TAY
D004 6B h PLA
D005 29 OF ) AND #F
D007 AA TAX
D008 BD 1F C3 LDA C31F,X
-----
!LVAR
START D000
!$M=START
I

```

The GREMLIN system is a powerful de-bugging tool for 6502 machine-code programs. It includes all the usual features found in good machine-code monitors, such as memory search, intelligent memory move routines, memory editors etc. These work at byte, word or string level. A built in help menu can also be displayed at any time.

This ROM contains many more unique features such as an assembler as well as a disassembler. An extremely powerful expression evaluator is included allowing complex expressions to be entered in a format that is only normally available in high level languages. Variables are also allowed (any length) and may be included into expressions.

GREMLIN allows single stepping through machine-code programs. It is also possible (on to a printer or disc) to single step through graphic routines without disturbing the screen.

Supplied with full manual, this 8k ROM has more features than any other de-bugging package for the BBC machine.

£28.00 + £1.00 p&p + VAT

DISC DOCTOR

32K

```

DISC DOCTOR 1.07
DIS <ata> <end> <ofa>
DISCTAPE <asp> <afap>
DOWNDAD <asp> <cadr>
DSEARCH <str> <trk> <trk> <act> <drv>
DZAP <trk> <trk> <act> <drv>
EDIT <key no. >
FIND <str>
FORM <drv> <no. trks> <act> <cs>
JOIN <asp> <afap> <afap>
MENU <drv>
MOVE <dest page> <src page>
RESEARCH <str> <adr>
RZAP <adr>
PARTDAD <asp> <ofa> <ext> <adr>
RECOVER <trk> <act> <act> <adr> <drv>
RESTORE <trk> <act> <act> <adr> <drv>
SHIFT <arc> <dest> <ext>
SWAP <drv>
TAPEDISC <isp>
VERIFY <drv> <no. trks> <act>
OS 1.20
Press any key

```

This utility package has many special features for use with discs but also contains many other utilities that everyone will find useful: Function key editing, powerful disassembler, recovery of any data from the disc, merging of files, complete disc editor. Compatible memory editor, String search in memory or on disc, automatic tape to disc and disc to tape routines, built in help menus, formatting of 35, 40 and 80 track discs, and also a special format that allows 60 files per disc.

£28.00 + £1.00 p&p + VAT

TERMI

32K

```

TERMI - BBC TERMINAL PROGRAM RELEASE 2.0
FROM COMPUTER CONCEPTS
(C) D.J.Martin and M.Riles 1983
-----
Function key definitions
-----
Key use Key with Key with
No. SHIFT CONTROL
f0 Printer start Stop
f1 Change Mode start 28 char
f2 Spool start Stop
f3 Transmit file start Abort
f4 Transmit file cause Continue
f5 emulate custom ESC
f6 get handshake ON/OFF None
f7 special funct'n ON/OFF Set Mask
f8 special Options |||/Half Parity
f9 Reset Soft Hard
-----
SHIFT/CONTROL FUNCTION KEYS
f0 Print Screen.
f1 Mode ?
f9 Reset XMIT block.

```

This program enables the BBC machine to act as an advanced terminal when connected to another computer or to a modem via the RS-423 (RS-232) interface. This provides facilities to transmit data from disc and the spooling of data from the 'line' to the disc or printer.

Termini has 3 modes of operation — dumb terminal, BBC graphics terminal and customised intelligent terminals including DEC VT52.

£28.00 + £1.00 p&p + VAT

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GRAPHICS ROM

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CONCEPTS



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Sounds Unlimited

Gary W. Collins

This program is a combined demonstration of the musical and graphics abilities of the BBC Micro. It plays the tune CAVATINA in two part harmony (based on the solo guitar arrangement by John Williams) using two different sound envelopes, while displaying the music on a stave on the screen.

I chose MODE 4 for the graphics, as it has a low memory requirement. However, if the user-defined character definitions and envelope definitions are saved in a separate program which then CHAIN'S the main program, it will run in MODE 1, which has the same resolution, but two extra colours. Coloured borders, flashing title, and other such effects may then be used.

In order to keep the notes printed reasonably synchronised with the notes sounding, a delay has been introduced. This causes slight hesitations in the sound in one or two places. A smaller value of delay may be used in line 730, but this will result in the notes being printed more quickly, I chose the value given as a compromise.

No flattened notes are drawn. Instead (for example) B flat appears on the stave as its enharmonic equivalent, A sharp. Since both of these notes appear in the music, and the value of the pitch in the sound data is the same for each, distinguishing between them would be somewhat tedious.

It should not prove too difficult to modify the program to play different tunes. Long procedure names have been used and they are in general, meaningful names, so the program should not be too hard to follow.

PROGRAM DESCRIPTION

Line 10 When ESCAPE is pressed, it restores default windows, separates text cursor, clears screen, reports and stops.

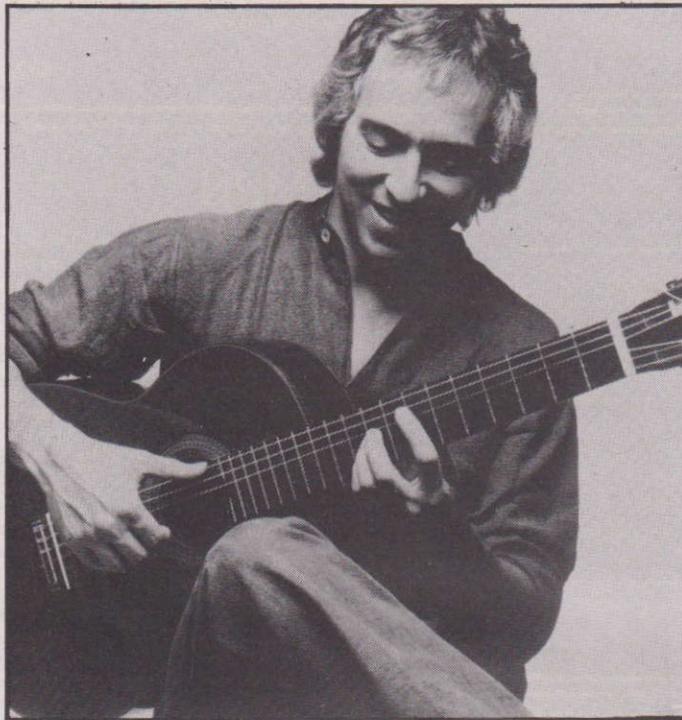
Line 20 Prints title

Line 30 Dimensions arrays

Line 40 Reads values from DATA into array A%

Line 50 Initialise variables

Lines 60-310 User-defined character definitions



Play Cavatina in two part harmony on your BBC. This program plays the tune and displays the musical score simultaneously.

Lines 320-330 Envelope definitions

Line 340 Sets up first graphic window, moves graphic origin, joins text and graphics cursors

Lines 350-360 Selects colours and clears graphics screen

Line 370 Calls procedure to draw stave

Lines 380-390 Prints treble clef

Lines 400-430 Prints key signature (E major)

Lines 440-450 Defines and prints time signature

Line 460 Prints barline

Line 470 Redefines graphics window and moves graphics origin

Lines 480-550 Main program - resets variables at the start of each

bar, reads data and sounds note, calls PROC note to print note, checks if end of bar has been reached.

Lines 560-590 PROC stave - redraws stave at start of each bar

Lines 600-650 PROC check - restores data pointer as necessary

Lines 660-790 PROC note - calls PROC leger, prints a natural sign (line 690% or a sharp sign (line 700) if required, calls procedures to print note on stave, updates H% and arrays BAR% and E%.

Lines 800-830 PROC leger - prints leger lines if required, above or below stave

Lines 840-980 PROC duration - sets value of variable Note ac-

cording to duration parameter
Lines 990-1120 PROC print - uses value of Note to print required note on screen
Lines 1130-1160 PROC wait - wait for specified time
Lines 1170-1780 DATA for SOUND statement
Lines 1790-1800 DATA for array A%

VARIABLES

A% Array containing data relating to pitch of note
H%,V% Horizontal and vertical co-ordinates to print note
D Determine whether or not to increment H%

NUM% Number of notes played
BAR% Array holding total duration of notes played on each channel since the start of the current bar

E% Array containing values used to initialise BAR% at the start of each bar

C,P,D Channel, Pitch and Duration of note played

Note Relates duration parameter to note printed

BARLENGTH% Duration of a bar (48 in this case)

HIGH% Highest row number of array A% (36 in this case)

Notes

VDU is used extensively to send characters to the screen
VDUX is equivalent to PRINT CHR\$,

Note that VDU 8 = backspace cursor
VDU 9 = forward space cursor
VDU 10 = cursor down
VDU 11 = cursor up
VDU 4/5 separate/join text and graphics cursors

VDU 23, X,a,b,c,d,e,f,g,h - defines ASCII character X (224 - 255)

XMODY = Remember after X is divided repeatedly by Y until the result is smaller than Y.

XDIVY = INT (X/Y)

HOW IT WORKS

A graphics window is defined, in which the music is to be printed. The stave is printed with the treble clef, key signature and time signature on the left, and a barline on the right. The graphics

window is then redefined so that the clef, key signature and barline are not subsequently erased. After each bar of music has been printed, the graphics screen is cleared and the stave redrawn before the next bar is started.

There are three beats to the bar, each chosen to have a duration of 16, so a bar is complete when notes have been played for a duration of 48 on each channel. Thus, BARLENGTH% is set to 48 in line 50. The array BAR% holds the sums of the durations of the notes that have been played on each channel during the current bar. If the duration on either channel exceeds BARLENGTH%, line 860 of PROC duration modifies the value (locally in that procedure) to ensure that the correct note is printed, and the excess is stored in the array E% (line 760 in PROC note) and used to initialise BAR% to the correct value at the start of the next bar (lines 530, 480).

As the last few notes are prolonged, the values of duration must be modified before being added to BAR% (they are halved in line 980 of PROC duration).

A channel number 0 in the data is used in places where it is necessary to restore the data pointer to a new position. When this is encountered, line 500 diverts the program to PROC-check.

It is necessary for the purpose of synchronisation to sound notes of zero amplitude in some bars. Since the amplitude is controlled by the ENVELOPE statements, a pitch parameter zero is used in places where a note of zero amplitude is required. This is checked by line 510, which sounds the note, or silence, for the duration given.

The array A% contains the following data on each note:

A% (X,0) gives the vertical position at which the note is to be printed on the screen. I found this to be the easiest way of relating the pitch parameter of the note to the vertical position. (Note in passing that the pitch parameter passed to PROCnote in line 520 is (P-21) DIV4. This is because the lowest note used is E with pitch 21, and there are four pitch units per semitone. The array elements to be accessed are 0 to 36).

A% (X,1) = 2 if a sharp sign is to precede the note
= 1 if a natural sign is to precede the note.

A% (X,2) gives the number of leger lines to be drawn. A positive value indicates leger lines above the stave; a negative value indicates leger lines below the stave.

A% (X,3) is rest to 0 at the start of each bar. It is set to one when a sharp or natural sign is printed, and is used to prevent repetition of accidentals on the stave line during any one bar. If notes are to be sounded simultaneously on both channels, then one must be printed directly above the other stave. The variable T is used to determine whether or not H% should be incremented in line 770, IF T is short for IF T = TRUE.

PROGRAM ALTERATION

The following alterations may be necessary if converting the program to play other tunes on two channels.

The program could be extended to play tunes on three channels, in which case additional changes will be required, but it would be better to redesign the program to print two staves, as the additional notes tend to make the stave overcrowded.

Line

20
30

Title

If the range of notes to be played is different, the dimensions of array A% may need to be altered, as will the data. As it stands, the program covers 37 notes, E to E octaves higher, arranged for the scale of E major.

40

HIGH% should be set to the number of the highest row of array A% BARLENGTH% should be set to indicate the duration of one bar. Make sure that the data pointer is restored to the right line.

50

Character Definitions

Some additional user-defined characters may be required. Note that once the clef has been drawn (line 390) characters 230 - 237 may be redefined. After the time signature, characters 250 - 253 are no longer required. Characters 254 - 255 are unused.

Character 244 is used for leger lines.

Characters 226 - 227 are the heads of the notes (open and closed).

Characters 225, 228, 229 and 238 are used for the upward pointing stems and tails.

Characters 247 - 249 are used for the downward pointing stems and tails.

Character 241 is a dot.

Characters 245 - 246 give a tie between two notes.

Characters 239 - 240 are used for the sharp sign.

Characters 242 - 244 are used for the natural sign.

Lines

320 - 330
400 - 430

Envelope definitions.

Key signature. If you change this, you will have to change the second number of each three in the data for A% as follows: 2 - print a sharp before the note; 1 - print a natural before the note; 0 - print the note alone.

440 - 450
570

Time signature.

Gives delay after last note is printed. Remove the line, or change value of NUM%.

600 - 650
730

PROCcheck, restores data pointer.

Conditions for, and length of delay, may be altered.

740
780

Delay for prolonged notes at the end.

Determines spacing of notes printed (semi-quavers closer together).

850 - 1120

PROCduration and PROCprint.

The notes printed, and the duration to which they correspond, may be changed.

1170 - 1780
1790 - 1800

Data for sound.

Data for array A%.

PROGRAM LISTING

```
10 DNERROVDUA,26:CLS:REPORT:END
20 MODE4:PRINTTAB(16,3):"CAVATINA"
30 DIMAX(56,3),BAR%(1),EX(1)
40 N=0:T=0:VZ=0:NUM%=0:EX(0)=0:EX(1)=0:BARLENGTH%=48:HIGH%=36
50 RESTORE1790:FORI%=0TOHIGH%:READA%(I,X,0),A%(I,X,1),A%(I,X,2):A%(I,X,3)=0:NEXT:
RESTORE
60 VDU23,224,0,0,0,0,0,0,0,127
70 VDU23,225,128,128,128,128,128,128,128,128,128
80 VDU23,226,60,68,129,129,129,68,60,0
90 VDU23,227,60,126,255,255,255,126,60,0
100 VDU23,228,224,248,152,140,128,128,128,128
110 VDU23,229,224,248,152,140,224,248,152,140
120 VDU23,230,48,80,136,136,136,144,144,144
130 VDU23,231,144,160,160,160,192,192,128,128
```

```
140 VDU23,232,1,2,4,4,8,8,16,16
150 VDU23,233,33,34,68,68,136,136,136,136
160 VDU23,234,240,136,132,130,130,129,129
170 VDU23,235,132,132,66,68,32,24,7,0
180 VDU23,236,129,129,129,130,130,140,240,128
190 VDU23,237,0,0,24,36,32,32,17,14
200 VDU23,238,128,128,128,128,128,128,0,0
210 VDU23,239,36,36,36,36,36,46,116,36
220 VDU23,240,36,36,36,36,36,36,0,0
230 VDU23,241,0,0,0,0,16,56,16,0
```

CONTINUED OVER

Graphics Like Greased Lightning

Peter R. Voke

This issue's Spacetime is mostly about speed, since graphics, though fast on the BBC micro, is still often the thing that seems to slow down a game more than anything else.

GETTING RID OF VDU23

First, however, some asides on other tropics related to graphics and animation. Take a look at the following line of Basic:

```
120VDU23,224,60,60,24,60,255,60,36,36
```

This is a perfectly ordinary VDU23 statement that defines character 224 as a small human figure. The effect it has when the program gets to it is that a string of eight bytes in page C (page C runs from &C00 to &CFF in memory) are set to the numbers 60,60, and so on. Every time character 224 is used subsequently, either by PRINT CHR\$224 or by VDU224, these bytes are taken out of page C and put into the screen memory in the appropriate place, possibly after being manipulated in various ways to make the figure appear in a particular colour.

If that makes you think it might be possible to bypass the VDU23 statement altogether, you are right: we shall come back to that idea later. For now, however, let us assume you do want to define character 224 as a human figure, and you are not going to redefine it any other way at any point in the program: in other words, character 224 is a small person and is going to stay that way.

In this case, the line 120 that defines character 224 is almost certainly going to be used only once in your program, right at the beginning. Yet the line is rather long in terms of bytes — no less than 35 bytes. If you wish to define all of the characters 224 to 255, the block of VDU23 statements can easily take up more than one kilobyte in all — a massive proportion of the eight or so kilobytes you have to play with when using modes 1 or 2.

Obviously the thing to do is to

No need to resort to machine code for rapid graphics. Speed up the action on your screen with Peter Voke's spacetime.



move the block of VDU23 statements into a different program that is run before the main game. A program such as this is known as a "loader" program. The important point to realise is that the user definable characters (224 to 255) will remain defined so long as the machine stays on, they are not redefined, and nothing else is done that might interfere with the contents of memory in page C.

The loader program might look something like this:

```
10VDU23,224,8,16,32,48,-48,...
20VDU23,245,...
```

```
...
320VDU23,255,15,127,12-7,255,20,20,48,31
330CHAIN "INVADE/1"
```

If you are familiar with the saving and loading machine code programs, using *SAVE and *LOAD or *RUN, there is an even simpler way. Just *SAVE CHAR C00 CFF, and reload the defined characters directly. The only disadvantage of this is that Acorn would not approve since it is not a "tube-compatible" method. Incidentally, if you have OS 1.0 or 1.2, it is better to "explode" the memory allocation for user-definable characters (see user guide pages 427-428) than

to keep redefining characters 224 to 255.

4 or 5?

Now let's turn to the question of speed. A surprising number of BBC micro owners believe that graphics of one sort or another are slow, and that little or nothing can be done about it. In fact there are many tricks that will help to speed up graphics, some of which are very dramatic.

Most micro users will notice quite soon after starting to program how much quicker CLS is than CLG. On my micro, CLG takes just over a third of a second, while CLS takes only 0.03 seconds — a tenth of the time. Fewer people realise that any printing or graphics done under VDU5 is far slower than under VDU4. The micro spends a lot of time calculating how and where in memory to construct the shape, working from the graphics coordinates, since it has to check graphics windows, the position of the origin, and whether GCOL0, GCOL1, or 2 or 3 is in use.

In case you are a newcomer to the BBC micro, a brief explanation is in order. Normally in BBC Basic letters are printed at the "text cursor", and graphics such as lines and triangles are constructed using the "graphics" cursor. If you wish to place letters or user-defined characters at any position on the screen, or to overprint on top of another, perhaps in a different colour, you have to use VDU5. This command makes all subsequent PRINT or VDU statements place characters at the graphics cursor instead of at the text cursor. The trouble is that calculating graphic positions takes the computer much longer, and so moving a spaceship round the screen (or pacman, or whatever) is likely to be slower.

For greater speed, consider using the normal VDU4 method rather than VDU5. You will only be able to have one-colour characters, but they are often more effective anyway. To delete a previous position before

CONTINUED OVER



redrawing in a new position, it is necessary to use character 127 (the DELETE character), since the well known GCOL3 method only works with VDU5 in action. Also you will only be able to put the characters at the normal text positions — 32 or 64 graphics coordinate units apart. However, you will find that the action is much faster. On my micro, it takes 0.83 seconds to fill the screen with copies of a user-defined character under VDU5, but only 0.15 seconds using VDU4 type printing.

FASTER YET

The method of the previous paragraph can only be considered half way to real speed and smoothness. Unless you write machine code programs yourself, you have probably long envied the rapid, gliding movement of arcade games from the professional software houses, and wished you could get the same effect without going through all the agony of writing and debugging difficult assembler code.

Well, there is a way. The key idea is the one explained in the first section: provided the right sequence of bytes is put into the screen memory in the right place, the desired character will appear on the screen. In the end this is what every PRINT, VDU or PLOT statement is doing — putting bytes into the screen memory.

First, there are a few obvious ways of doing this that are rather disappointing and slow in Basic. For instance, you might think of using the “byte indirection operator” indicated by 7. (The User Guide has a good explanation of the indirection operators ! ? and \$ starting on page 409). This turns out to be rather slow, though it is a good way of seeing how you might do graphics directly from machine codes which also works one byte at a time. The pling operator(!) which acts on 4 bytes at a time, is a lot better, but still a bit slower than the method I recommend.

STRANGE STRINGS

Using the string indirection operator \$ might seem a strange way to do graphics, since it is explained in the user guide as a way of moving strings around in memory. This is not something one often needs to do. However, the \$ operator actually works in a rather simple way: it starts at the memory location indicated, and takes all the bytes from there onwards up to the next byte with value 13 (&D in hex). This suggests it might be a good way of getting hold of a simple, non-nonsense routine for copying fairly large blocks of bytes from some store location into the screen memory. This is just what is needed for fast animation.

A simple program example will explain more than a thousand words. Type in program 1, try it out, and then see if you can understand how it works.

The VDU19 statement picks the colour red, and the string variables A\$ and B\$ are set up so that A\$ can be used to draw a simple, solid block of colour, and B\$ can be used to delete it by placing zero bytes (CHR\$0) in place of the non-zero bytes (CHR\$255). Line 60 starts a loop that takes the variable I% right through the screen memory in steps of 16 bytes. Line 70 puts the block of red onto the screen using the strange method I described in the last paragraph. It simply puts the string A\$ right into the screen memory — eight bytes with a value of 255, followed by one byte 13.

The next line is rather important, as *FX19 makes the computer wait till the next TV frame scan is about to begin, and gives a much smoother movement. (You might like to see what happens when you leave this out.) If you have OS 0.1 the *FX19 will not work, and you should use a delay loop such as

```
TIME = 0 : REPEAT UNTIL
TIME 5
```

instead.

Line 9 writes the blanking string B\$ into the same position in screen memory to remove the red block, but unfortunately leaves one single byte 13 that is not wanted. Remember that strings always end with a byte 13. This unwanted byte appears as a small red dot on the screen, and is removed by line 10. If you interrupt the program half way through you may also notice the same dot appears at the end of the red square, since A\$ also ends with a byte 13. This dot is the one big disadvantage of using the string indirection operator \$. But the red dot can always be removed by using a line similar to line 10.

THE MEMORY MAP

It is important to notice the way the “graphical string” A\$ appears to move across the screen as it is shifted up through memory. The reason for this is the way that the memory mapping of the screen works. One text line at a time is mapped (in mode 4 this takes 320 bytes), divided into 40 groups of 8 bytes. Each group of eight bytes forms a small vertical column, and is in fact one character. By using steps of 16 in the loop, the block is jumping two character widths, and hence appears to move faster. It is never worth using a step size less than 8. If you want vertical movement, use steps of plus or minus 320.

The great advantage of this type of method for animation is that strings of any length up to 255 bytes can be used, to give large characters. They tend to spread out sideways, of course, since the memory map works along one text line at a time. If

you want graphics characters that spread over more than one text line vertically, you will have to use more than one string and place them 320 bytes apart in memory.

This disadvantage of the method is that it is not “tube-compatible” and hence will not work with a second processor. In effect we are directly writing to screen memory, which is not recommended. However, the advantages of speed and smoothness may make you feel it is worth breaking the rules.

CHARACTER GENERATION

The other worry is how to get up the string corresponding to a complex, coloured shape. This is very tricky, especially for mode 2, the most useful mode for arcade games in full colour. My solution is to use a character generator program. This allows a character to be designed on a large grid, and then used in small scale.

If you decide to buy a commercial one, make sure it is one that simultaneously creates the character in its actual small size in one corner of the screen, and can cope with various modes. It should be possible to break out of the program and write the character, actual size, from its corner of the screen directly into some other location such as page D, using the ! indirection operator. All that is needed to turn it into a string is to put a byte 13 at the end of the block of bytes, and then the character, colour and all, can be moved anywhere else for storage using the string indirection operator \$. Next issue's spacetime will have some ideas on where to store data like this.

My character generator is a home-made one especially for coloured characters in modes 2 and 5, and it automatically draws the character real size in the bottom corner of the screen, puts in the byte 13, and copies the character as a string to location \$D00. As usual, I shall end with a challenge for the ambitious: to construct a character designer program that does this for you.

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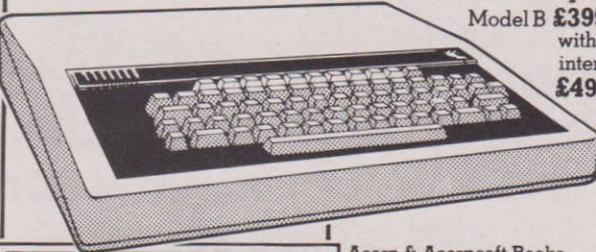
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Phonics

Mrs A L Lucas

One of the first concepts that young children encounter at school is PHONICS and in order to help children of 5-7 years old develop an ability to recognise words which sound alike, I decided to develop this program for the BBC micro.

The program is designed for use in a classroom situation, although by merely changing the messages regarding the number of pupils in the class, it can be made suitable for use at home.

Children are introduced to small letters at school before they are taught capital letters. This means that they find it difficult to use the BBC micro's keyboard. On computers like the ORIC and SPECTRUM this is easily rectified by using a keyboard overlay, but on the BBC micro a different technique has to be adopted. I decided therefore to make this program respond to the pressing of ANY key.

It is possible to change the program to cover other words by changing the DATA lines. I enclose a list of suggested lines to replace those from line 450.

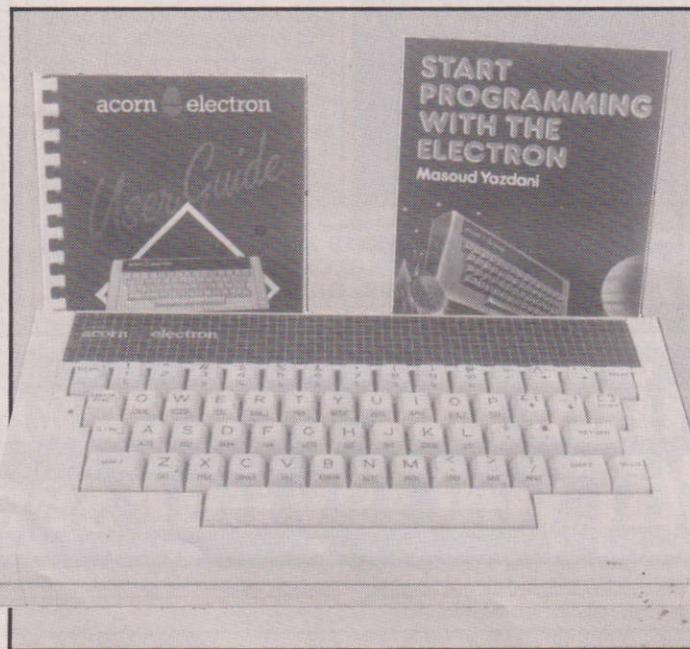
When the school took delivery of its BBC Micro recently, I really started to develop an interest in using it to help children in infant classes with their language work. Despite having had a BBC micro at home for over a year, I had not really tried to develop a 'useful' program and had spent most of my time playing 'monsters' and other such games.

AIMS

One of the first things that struck me about the software provided in the MEP's Primer Pack was that it was not really completely suitable for the youngest children because it required a degree of familiarity when the use of letters that they did not possess.

When children are first introduced to letters in school, they are taught to use lower case letters. This means that they are not capable of recognising the lettering on the BBC micro's keyboard until they are introduced to capital letters at the age of about 6/7, although they may come across some of them before that

A robust word recognition program designed by a teacher to initialise keyboard skills in the five to seven year old bracket.



age. This can be easily rectified on computers such as the SPECTRUM and ORIC, where a keyboard overlay may be used, but a different technique is necessary with the BBC micro.

Phonics is an area of language work dealing with sounds. In this program, I have tried to use the computer to help pupils to recognise words which will have similar sounds.

PROGRAM DESCRIPTIONS

Each pupil in the class will be presented with 10 questions chosen at random from 60 alternatives. After each pupil has taken their turn, they are asked to enter their name so that the computer can keep a record of each

pupils score for the teacher to examine later. If you intend to use the program at home, the messages for this routine will require changing.

In order to use this facility, the teacher must enter the number of pupils in the class at the start of the program. When all of the pupils have taken their turn, the results will be printed out to either printer or screen by the procedure PROCprintout. If no printer is available, the computer is put into paged mode to give the teacher time to copy the results from the screen.

Each question consists of four words held in DATA lines. Three of the words are similar and the pupil has to identify the odd one out. The pupil will be shown the four alternatives together with a

space rocket which moves across the screen pointing to each word in turn. When they think that the correct alternative is selected, they must hit ANY key. In this way it removes the need for them to have any great keyboard skill.

A different sound effect is produced for the correct response and incorrect response. I have only used simple sound effects and graphics because young children can be very easily distracted from the main point of the program if the graphics/sound is too entertaining. These may of course be easily altered.

STRUCTURE OF PROGRAM

The program makes extensive use of the resident integer variables and therefore all variables are set to zero at the beginning of the program in case an incorrect value is carried over from a previous program.

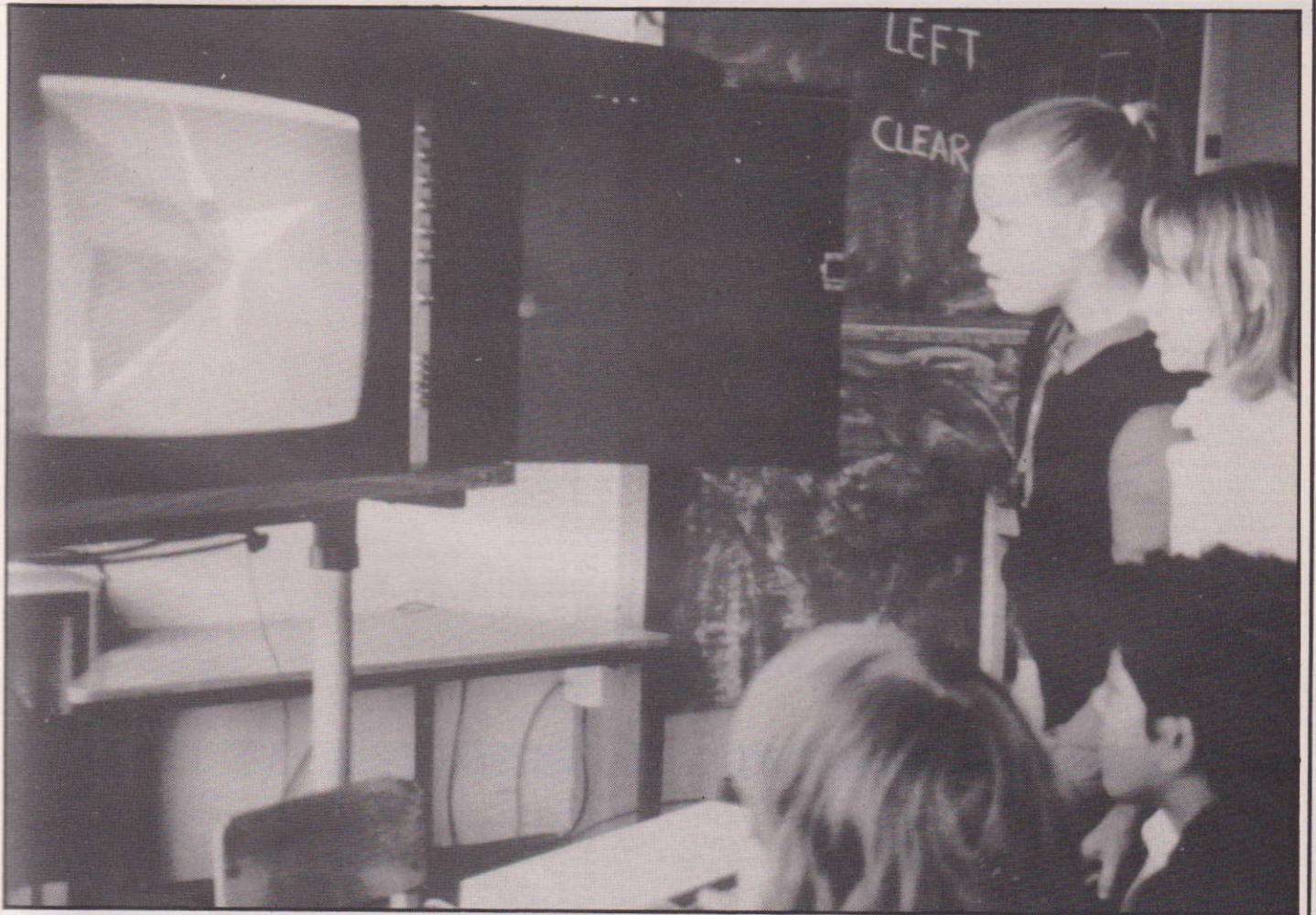
The main control section of the program occurs at the beginning. PROCsetup is used to set the program for the number of pupils in the class. It asks the teacher to enter the number of pupils in the class which is held in the variable Z%. Z% is used in the main control loop.

PROCread data is used to read the 60 different questions held in the DATA lines into the arrays A\$(X%,Y%) and B(X%).

Each data line contains the four alternative words followed by the number of the correct alternative. Thus to change the program for your own use requires only the changing of the appropriate data lines. I have included an alternative set of data lines which may be used in place of those in the program. In this way it is possible to test for words with similar beginnings or similar endings.

The main control loop is the FOR Z% = 1 to pupils loop which repeats the process for each pupil in the class.

PROCrandom is used to decide the random selection of questions. The number of the questions to be answered is selected and held in the array C%(X%).



PROCarrow is used to create the space rocket using VDU23 to create the user defined graphics.

PROCquestions is used to set the 10 questions to each pupil.

PROCprintout prints the results for the teacher/parent. The teacher is asked if a printer is available. If it is then VDU2 is used to switch the printer on and VDU3 to switch it off again.

NOTE some printers will require the addition of *FX6, to allow line feeds to occur. This can be added at the beginning of the program as:

```
6 *FX6,0
```

If a printer is not available, then VDU14 is used to select 'Paged' mode and VDU15 is used to switch it off again when all of the results have been displayed.

The program is written in

mode 4 and the colours are selected with VDU19 statements at the start of the program and the colours are changed again in PROCbox.

PROCbox draws the boxes into which the words fit and prints the message 'which is the odd one out?'. It also changes the colour of foreground/background.

PROCsetquestion is called from PROCquestions and is used to set each individual question.

PROCright is called when the pupils select the correct answer. A simple sound effect is heard. It would be possible to improve the sound effect and/or add a better graphics routine for correct results.

PROCwrong is called when they get the question wrong. The pupil is again given a simple

sound effect and is told what the correct response should have been.

PROCres this procedure sets the variable A\$ to "good" if the child gets more than 5 out of 10 and to "very good" if they get 8 or more right. I did not include messages if they get low scores so as not to discourage the children.

NOTE

Do not enter the ON ERROR RUN and *KEY 10 lines at the start of the program until you are sure that the program is fully debugged. These are used to prevent pupils from breaking out of the program once it is running.

The program was written with O.S. 0.1 and will work with all operating systems. If, however,

you have O.S. 1.2, you might try adding 5 *FX229,1 which causes the escape key to generate its ASCII code and effectively disables the escape key.

VARIABLES USED

A\$(X%,Y%) holds the questions
X% and Y% are used in FOR NEXT loops for READin data
B(X%) holds the number of the correct answer
score holds the pupils score
D% and E% are used as variables to ensure that the rocket is printed at the correct location on the screen
A% holds the number of the cur-

CONTINUED OVER

rent question
 G% holds the answer
 F% holds the number that the
 rocket is pointing to
 name%(Z%) holds the pupils

names
 marks(Z%) holds each pupils
 mark out of 10
 Z% counts the number of the
 pupil.

PROGRAM LISTING

```

10 REM PHONICS
20 REM MRS A.L.Lucas
30 REM <C> SEPTEMBER 1983
40 AX=0:BX=0:CX=0:DX=0:EX=0:FZ=0:GX=0:H%=0:IX=0:Y%=0
50 REM NOW DISABLE ESCAPE
60 *FX229,1
70 REM CHANGE THIS LINE TO ON ERROR RUN WHEN YOU ARE SURE THAT IT IS FULLY DE
BUGGED!
8:MODE4
90 VDU19,0,6,0,0,0
100 VDU19,1,1,0,0,0
110PRINTTAB(10,5):"Phonics program 2"
120PRINTTAB(17,15):"from"
130PRINTTAB(12,25):"© Mrs A.L. Lucas"
140 TIME=0
150 REPEAT UNTIL TIME=200
160PROCsetup
170 CLS
180DIM A$(60,4),B$(60),C(10),name$(pupils),marks(pupils)
190PROCread_data
200 FOR Z%= 1 TO pupils
210 PROCrandom
220 PROCarrow
230 PROCquestions
240 score=0
250NEXTZ%
260 PROCprintout
270 PRINT"PRESS ANY KEY TO CONTINUE"
280 Z%=GET$
290 CLS
300 PRINTTAB(2,19):"Do you want to run the program again ?"
310 h$=GET$
320 IF h$<"N" THEN RUN
330 MODE7:END
340DEF PROCread_data
350 REM This section reads the data
360 REM each question has 4 alternatives
370 REM followed by the number of the
380 REM correct answer
390 FORX%=1 TO 60
400 FORY%=1 TO 4
410 READ A$(X%,Y%)
420 NEXT Y%
430 READ B(X%)
440 NEXT X%
450DATA brush,bring,ball,brick,3
460DATA chick,clap,chin,chop,2
470DATA snap,small,snail,snake,2
480DATA tray,train,tree,then,4
490DATA glow,glue,glad,grab,4
500DATA slip,stay,stairs,strong,1
510DATA knee,now,now,knock,3
520DATA slip,shell,slide,slap,2
530DATA stay,swim,switch,swap,1
540DATA free,from,fresh,full,4
550DATA slow,slug,ship,sly,3
560DATA ghost,gray,green,grass,1
570DATA what,will,where,when,2
580DATA three,throw,then,ten,4
590DATA shell,ship,shop,smell,4
600DATA shed,swim,share,shade,2
610DATA small,slug,smack,smell,2
620DATA fly,flower,flow,full,4
630DATA chair,chain,climb,chin,3
640DATA straw,strap,swamp,slap,4
650DATA stand,sting,slip,stick,3
660DATA blue,black,bat,blank,3
670DATA plug,play,plant,pram,4
680DATA knot,crash,crumb,crane,1
690DATA drip,day,drop,drum,2
700DATA pram,plus,prick,press,2
710DATA dress,drink,draw,press,4
720DATA spin,slip,spell,spell,2
730DATA take,tree,trap,train,1
740DATA true,tall,trip,trot,2
750DATA glass,glide,grab,glue,3
760DATA clap,call,class,click,2
770DATA clip,chick,clue,climb,2
780DATA flop,flap,fry,fly,3
790DATA blot,blow,blow,brown,4
800DATA brown,bring,brush,black,4
810DATA chase,class,chain,chair,2
820DATA glass,grow,grass,grab,1
830DATA thin,there,tall,thick,3
840DATA score,score,shut,scarf,3
850DATA ship,sia,slow,slide,1
860DATA who,whip,wham,ham,4
870DATA small,shade,shut,shave,1
880DATA swim,swan,swap,scrap,4
890DATA free,fry,fly,from,3
900DATA scare,slow,school,scene,2
910DATA plan,plus,press,plug,3
920DATA crawl,call,crew,crow,2

```

```

930DATA slap,slot,slim,spend,4
940DATA spot,spend,spell,scene,4
950DATA grab,glad,glue,glum,1
960DATA pray,plus,pram,print,2
970DATA know,knit,knee,kiss,4
980DATA quiz,queen,quick,knit,4
990DATA quack,crane,crab,crawl,1
1000DATA shade,shawl,shut,spot,4
1010DATA chop,chip,ship,chap,3
1020DATA plate,pram,plant,plum,2
1030 DATA tap,trap,tramp,trot,1
1040 DATA great,glass,gravy,grown,2
1050ENDPROC
1060 DEF PROCchv
1070 REM SET THE COLOUR OF BOXES
1080 CLG
1090 VDU19 ,1,0,0,0,0
1100 VDU19 ,0,5,0,0,0
1110 REM PROCEDURE TO DRAW BOXES
1120 REM TO DISPLAY WORDS
1130 PRINTTAB(5,2)"Which is the odd one out?"
1140 MOVE 100,600
1150DRAW 100,800
1160DRAW 300,800
1170DRAW 300,600
1180DRAW 100,600
1190MOVE 400,800
1200DRAW 400,800
1210DRAW 600,800
1220DRAW 600,600
1230DRAW 400,600
1240MOVE 700,600
1250DRAW 700,800
1260DRAW 900,800
1270DRAW 900,600
1280DRAW 700,600
1290MOVE 1000,600
1300DRAW 1000,800
1310DRAW 1200,800
1320DRAW 1200,600
1330DRAW 1000,600
1340ENDPROC
1350DEFPROCrandom
1360 REM CHOOSES A RANDOM SET OF
1370 REM TEN QUESTIONS
1380 REM THE ARRAY C(X%) HOLDS THE
1390 REM NUMBER OF THE QUESTIONS TO
1400 REM BE ASKED
1410 FOR X%=1 TO 10
1420 C(X%)=RND(60)
1430 NEXT X%
1440ENDPROC
1450 DEF PROCquestions
1460 score=0
1470 REM SETS THE TEN QUESTIONS
1480 FOR X% = 1 TO 10
1490 VDU19 ,1,4,0,0,0
1500 PROCbox
1510 PROCsetquestion
1520 PROCscore
1530PROCans
1540 NEXT X%
1550 PROCres
1560 ENDPROC
1570 DEF PROCsetquestion
1580 REM SET THE TEXT TO THE GRAPHICS
1590 REM CURSOR
1600 VDU5
1610 REM AX = C(X%) :- HOLDS THE NUMBER
1620 REM OF THE CURRENT QUESTION
1630 REM B(A%) AND G% HOLD THE ANSWER
1640 REM TO THE QUESTION
1650 G%=B(A%)
1660 AX=C(X%)
1670 REM THE FOLLOWING SECTION PRINTS
1680 REM THE WORDS IN THE BOXES
1690 MOVE 120,700
1700 PRINT A$(AX,1)
1710 MOVE 420,700
1720 PRINT A$(AX,2)
1730 MOVE 720,700
1740 PRINT A$(AX,3)
1750 MOVE 1020,700
1760 PRINT A$(AX,4)
1770 ENDPROC
1780 DEF PROCarrow
1790 REM THIS PROCEDURE DEFINES THE
1800 REM THE CHARACTER OF THE ROCKET
1810 REM WHICH MOVES IN PROCscore
1820 VDU27,240,8,8,20,20,62,62,62,62
1830 VDU27,240,8,8,20,20,62,62,62,62
1840 VDU27,242,62,62,62,62,127,127,127,93,93
1850 ENDPROC
1860 DEF PROCscore
1870 VDU4 : REM CURSOR SET TO TEXT MODE
1880 DX=6:EX=16
1890 REM PROCEDURE TO MOVE ROCKET
1900 REM ACROSS THE 4 BOXES
1910 REM UNTIL ANY KEY IS PRESSED
1920 REPEAT
1930 REM FLUSH THE KEYBOARD BUFFER
1940 *FX 15,0
1950 REM TURN OFF KEYBOARD REPEAT
1960*FX11,0
1970 REM DX = X POSITION EX = Y POSITION
1980 REM OF THE PRINT POSITION OF THE
1990 VDU7 : REM BEEP SOUND
2000 REM ROCKET
2010 PRINT TAB(DX,EX) CHR$(240)
2020 PRINT TAB(DX,EX+1) CHR$(241)
2030 PRINT TAB(DX,EX+2) CHR$(242)

```

```

2040 TIME=0
2050 REPEAT UNTIL TIME=100
2060 REM ERASE ROCKET
2070 PRINT TAB(DX,EZ);" "
2080 PRINT TAB(DX,EZ+1);" "
2090 PRINT TAB(DX,EZ+2);" "
2100 DX=DX+9
2110 REM FX = POSITION ROCKET STOPS
2120 REM IF ROCKET GOES OFF SCREEN
2130 REM RESET IT TO FIRST OPTION
2140 IF DX>39 THEN DX=6
2150 REM RESET CHOICE WHEN ROCKET
2160 REM GOES OFF SCREEN
2170 UNTIL INKEY$(0)<>" "
2180 IF DX=6 THEN FX=4
2190 IF DX=15 THEN FX=1
2200 IF DX=24 THEN FX=2
2210 IF DX=33 THEN FX=3
2220 IF FX>4 THEN FX=4
2230 ENDPROC
2240 DEFPROCans
2250 CLS
2260 VDU 19,1,4,0,0,0
2270 VDU 19,0,7,0,0,0
2280 REM CHECK FOR CORRECT RESPONSE
2290 IF FX=B(AZ) THEN PROCright ELSE PROCwrong
2300 ENDPROC
2310 DEF PROCright
2320 score=score+1
2330 PRINT TAB(10,19)"right"
2340 FOR X= 1 TO 255
2350 SOUND 1,-15,X,0
2360 NEXT X
2370 FOR X= 255 TO 1 STEP -1
2380 SOUND 1,-15,X,0
2390 NEXT X
2400 ENDPROC
2410 DEF PROCwrong
2420 PRINT TAB(10,19)"wrong";
2430 PRINT "It was ";A$(AZ),B(AZ))
2440 FOR X= 100 TO 0 STEP -1
2450 SOUND 1,-15,X,0
2460 NEXT X
2470 TIME=0
2480 REPEAT UNTIL TIME = 100
2490 ENDPROC
2500DEF PROCres
2510 CLS
2520 LET a$=""
2530 IF score>5 THEN a$="good"
2540 IF score>7 THEN a$="very good"
2550PRINT TAB(10,5);a$
2560 PRINT TAB(2,10);"your score was ";score;" out of 10"
2570 marks(Z$)=score
2580 INPUT TAB(2,15);"What is your name",name$(Z$)
2590 PRINTTAB(2,20);"Thank you for playing ""SPC(10);name$(Z$)
2600 IF ZX<>pupils THEN PRINTTAB(2,28);"Please let the next pupil have a go" EL
SE PRINT"Please call your teacher to look at your marks"
2610 B$=GET$
2620CLS
2630 ENDPROC
2640 DEF PROCsetup
2650 CLS
2660 PRINTTAB(15,2);"PHONICS 2"
2670 PRINT""""How many pupils are there in the class """" ""::INPUT pupils
2680 CLS
2690 PRINT""Each pupil in the class will be given ten questions on phonics.
These questions are chosen at random."
2700 PRINT"After each child has had a turn, they will be asked to type their
name."
2710 PRINT""The computer will keep a record of the pupils marks out of ten an
d will print them out on a printer (if you have one connected
)"
2720 PRINT""PRESS ANY KEY TO CONTINUE"
2730 Z$=GET$:CLS
2740 ENDPROC
2750DEF PROCprintout
2760 CLS
2770 PRINT""DO YOU WANT A PRINTOUT OF THE RESULTS?"
2780 D$=GET$
2790 PRINTD$
2800 IF (D$="Y" OR D$="y") THEN2820
2810ENDPROC
2820 PRINT""Do you have a printer connected ?"
2830D$=GET$
2840 PRINTD$
2850 IF (D$="Y" OR D$="y") THEN VDU2 ELSE VDU3:PRINT"at the end of each screen
full of names.Press the <SHIFT> key to continue":VDU4
2860 PRINT"" PUPILS MARKS OUT OF 10"
2870 FOR Z=1 TO pupils
2880 PRINT name$(Z$),marks(Z$)
2890 NEXT Z$
2900VDU3
2910 VDU15
2920ENDPROC

```

PROGRAM LISTING 2

```

420DATA cat,sat,bat,let,4
430DATA eat,meat,rub,seat,3
440DATA cot,dot,not,set,4
450DATA hill,ball,call,fall,1
460DATA miss,put,nut,hut,1
470DATA hiss,miss,mat,kiss,3
480DATA can,pan,tin,ran,3
490DATA ham,put,Sam,Pam,2
500DATA tap,lap,map,bat,4
510DATA hid,rid,put,Sid,3
520DATA had,rid,mad,sad,2
530DATA rod,rat,cod,pod,2
540DATA bake,cake,rake,plate,4
550DATA late,ball,hate,gate,2
560DATA Jill,Bill,call,pill,3
570DATA shell,well,pull,bell,3
580DATA pull,bull,hull,all,4
590DATA hop,shut,shop,pop,2
600DATA shed,bed,red,hop,4
610DATA pop,lip,pip,rip,1
620DATA dad,bad,hop,lad,3
630DATA lad,hit,sit,pit,1
640DATA fan,sun,fun,bun,1
650DATA lid,hid,bun,kid,3
660DATA face,pace,plate,race,3
670DATA meat,heat,seat,sit,4
680DATA fair,hair,chair,chap,4
690DATA lid,bin,pin,tin,1
700DATA cut,fish,put,hut,2
710DATA take,lake,cake,hunt,4
720DATA car,far,call,bar,3
730DATA wake,pin,rake,make,2
740DATA pan,pen,hen,men,1
750DATA ant,pant,hen,rant,3
760DATA mast,last,fish,past,3
770DATA lock,tank,rock,sock,2
780DATA lamp,vest,ramp,camp,2
790DATA vest,rest,pest,lock,4
800DATA nine,mine,pine,kite,4
810DATA pram,ham,land,Sam,3
820DATA land,sand,hand,lit,4
830DATA hop,pin,pop,top,2
840DATA mark,park,lark,land,4
850DATA pond,jet,pet,met,1
860DATA ride,side,tide,land,4
870DATA play,clay,say,pet,4
880DATA can,pan,plug,ran,3
890DATA pad,mad,dad,cat,4
900DATA map,sap,cap,cat,4
910DATA late,kate,hate,cat,4
920DATA Tate,cap,gate,rate,2
930DATA car,far,bar,ball,4
940DATAcat,bike,like,mike,1
950DATA late,plank,ate,plate,2
960DATA bank,pull,plank,rank,2
970DATA shade,glade,blade,glad,4
980DATA chop,cop,cot,shop,3
990DATA wait,wake,bake,take,1
1000 DATA lake,full,make,rake,2

```

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Death In Poglovia

S W Lucas

Whilst on holiday on the tiny island of Poglovia, which is situated off the coast of mainland Zoblovia, I have experienced several disasters.

On the first day, the heavy rains caused extensive flooding and many areas of the island are still flooded.

I ran out of money two days ago and to cap it all, the mad Emperor of Zoblovia has invaded the island and killed most of its inhabitants. He is rumoured to be in hiding somewhere on the island and is demanding the famed DIAMOND of POGLOVIA. I have been chosen by the remaining inhabitants to try to assassinate the Emperor before he carries out his threat to blow up the island.

I have only 150 moves in which to either assassinate the emperor or to deliver the diamond to him. There are many problems to be solved in the process, as many areas of the island are very dangerous! Good luck!

NOTES

There are 103 locations to visit in this game.

The game is written in mode 7 and will work on a machine with disc interface without relocation. In order to run the program in an Electron, it will be necessary to use MODE6 and to delete all references to CHR\$ — which are used to select the teletext colours. Colour may then be introduced by using VDU19.

LINES 10-20 are there to prevent the player from breaking out of the program and should not be entered until you are sure that you have fully debugged the program.

HINTS

Read these only if you are really stuck!

1. If you are stuck at the bus terminus, why not GO BUS or RIDE.
2. If you are at the entrance to a cave or a building why not GO IN.
3. If you get stuck at the side of a ravine or on a wall, you could jump!

For the adventurous: a testing melodrama on your BBC Micro. The humour may begin to wear a little thin as the moves run out.



4. You can always JUMP or DIVE into a bath!

5. Boats are meant to SAIL and ROW!

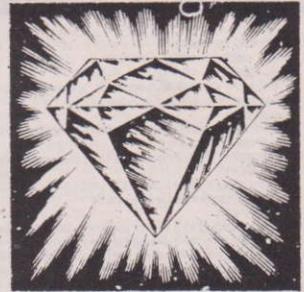
6. You can always climb ropes and trees.

7. Try GO UP or GO DOWN when you come to stairs.

8. Do not be tempted to try killing the emperor unless you have both the gun and the bullet.

WORDS UNDERSTOOD

N, S, E, W, UP, DOWN, HELP, SCORE, INVENTORY, GET, TAKE, GRAB, DRINK, EAT, SAY, SPEAK, KISS, LOOK, PRAY, READ, PHONE, CLIMB, JUM, WAIT, JUMP, DIVE, GET, TAKE, GRAB, DROP, LEAVE, PUT, OPEN, UNLOCK, GIVE, EXAMINE, SEARCH, KILL, SHOOT, ATTACK, SWIM



PROGRAM STRUCTURE

The main control loop of the program is the REPEAT UNTIL G% > 149 loop from line 100 to 660. (Where G% counts the number of turns). If you want to make the game harder reduce the number to G% > 100.

Inside this loop, the program checks for certain inputs and calls PROCs.

Adding extra responses should therefore be easy.

To add a game save routine try adding the following line.

For example:

CONTINUED OVER

```

405 IF C$="SAV" THENPROCsave_game.
2550DEF PROCsave_game
2560X=OPENOUT("GAME")
2570FOR Y=1TO3
2580PRINT#X,V$(Y)
2590 NEXT Y
2600PRINT#X,P%,SA,SB,SC,SD,SE,SF,SS
2610FOR Y=1TO30
2620PRINT#X,B$(Y,1)
2630NEXT Y
2640CLOSE#X
2650ENDPROC
    
```

A LOAD game routine should be implemented in a similar manner.

VARIABLES USED

The following is a brief list of the major variables used.

P% — CURRENT LOCATION
 X\$(X) — HOLDS MESSAGES
 Q\$(X) — HOLDS A DESCRIPTION OF THE

LOCATION
 V\$(X) — HOLDS WHAT YOU ARE CARRYING
 B%(X,1) — HOLDS POINTER TO WHERE ITEMS ARE
 S%(X,Y) — HOLDS MAP OF DIRECTIONS
 SA-SS — HOLDS CHECKS THAT CERTAIN TASKS HAVE BEEN COMPLETED!
 N\$(X) — HOLDS ITEMS UNDERSTOOD
 N%(X) — HOLDS POINTER TO ITEM



PROGRAM LISTING

```

10 ON ERROR RUN
20 *KEY10 OLD:IM RUN:IM
30 REM EE DEATH IN POBLOVIA EE
40 REM EE An adventure game for the BBC micro model B EE
50 REM EE BY S.W. Lucas EE
60MDE7
70P%=4;B%=0;SA=0;SB=0;SC=0;SD=0;SE=0;SF=0;SS=0
80PROCtitles
90FOR X=1TO2:PRINTTAB(0,10+X);CHR$(141);CHR$(136);CHR$(130+X);"<> 1983 S.W. L
uc$=:NEXT
100IMS$(103,4),X$(35),N$(30),O$(103),G$(30),V$(4),B$(30,1),N$(30)
110RESTORE:PROCdata:CLS
120REPEAT
130PRINTCHR$(131);"I am i-";O$(P%);A$="";IFS$(P%,1)>OTHENA$="North"
140IFS$(P%,2)>OANDLEN(A$)>OTHENA$=A$+","South"ELSEIFS$(P%,2)>OTHENA$="South"
150IFS$(P%,3)>OANDLEN(A$)>OTHENA$=A$+","East"ELSEIFS$(P%,3)>OTHENA$="East"
160IFS$(P%,4)>OANDLEN(A$)>OTHENA$=A$+","West"ELSEIFS$(P%,4)>OTHENA$="West"
170IFS$(P%,1)=0 ANDSX$(P%,2)=0ANDSX$(P%,3)=0ANDSX$(P%,4)=0THENA$="nowhere obvious"
180IFG%>100THENPRINTCHR$(134);X$(17)
190PRINT"CHR$(130):I can go i-";PRINTA$
200PRINT"CHR$(129):I have i-";150-B%:" moves left!"
210E=0;FOR T%=1TO20:PF%:=0;IFB$(T%,1)=P%THENPF%+=1
220IFPF%=1THEN240
230NEXT:GOTO260
240IFE=0THENPRINTCHR$(134);"That looks like i-"
250PRINTG$(T%);E=E+1;GOTO230
260PRINTCHR$(133);"What do I do now?";INPUTZ$;B$=LEFT$(Z$,2);C$=LEFT$(Z$,3)
270CLS;G%=G%+1;VDU7:PRINTCHR$(134);"Hang on a second!"
280K=0
290IFC$="LOD"THENK=1
300IFC$="SOC"THENPRINTCHR$(131);"This isn't a game you know!";K=1 ELSEIFC$="EAT"
THENPRINTX$(9);K=1
310IFZ$="RUB LAMP" THENPRINTX$(12);K=1
320IFC$="DRI"THENPRINT"I only drink milk and I can't see any!";K=1
330IFC$="HEL"THENPRINTX$(16);K=1
340IFC$="SAY"ORC$="SPE"THENPRINTX$(4);K=1
350IFC$="PRA"THENPRINTX$(18);CHR$(131);"nothing happens";K=1
360IF(B$="N"ORLEFT$(Z$,4)="GO N")ANDSX$(P%,1)>OTHENP%=SZ$(P%,1);K=1
370IF(B$="S"ORLEFT$(Z$,4)="GO S")ANDSX$(P%,2)>OTHENP%=SZ$(P%,2);K=1
380IF(B$="E"ORLEFT$(Z$,4)="GO E")ANDSX$(P%,3)>OTHENP%=SZ$(P%,3);K=1
390IF(B$="W"ORLEFT$(Z$,4)="GO W")ANDSX$(P%,4)>OTHENP%=SZ$(P%,4);K=1
400IFB$="RE"THENPRINT"I'm sorry, I can't see anything here to read!";K=1
410IF(B$="S"ORB$="N"ORB$="E"ORB$="W")AND=0THENPRINT"I can't go that way!";K=1
420IFC$="PHO"THENPRINT"I'm not E.T. you know, I do need a phone";K=1
430IFB$="FU"ORB$="PI"THENPRINTX$(22);K=1
440IFB$="BU"THENPRINTX$(23);K=1
450IFC$="INV"THEN PROCinventory
460IFC$="ROW"ORC$="SAI"ORZ$="GO BOAT"THENPROCsail
470IFB$="UP"ORC$="CL"ORZ$="GO UP"THEN PROCup
480IFC$="DOW"ORZ$="GO DOWN"THEN PROCdown
490IFC$="OUT"ORZ$="GO OUT"THEN PROCout
500IF(B$="IN"ORZ$="GO IN")AND=0THENPROCin
510IFZ$="GO BUS"ORZ$="GO RIDE"ORC$="RID"THENPROCride
520IFC$="WAI"THENPRINTX$(27);G%=G%+1;K=1;TIME=0;REPEAT:UNTIL TIME>1000
530IFC$="JUM"ORC$="DIV"THENPROCjump
540IFB$="GE"ORB$="TA"ORB$="GR"THEN PROCget
550IFC$="DRO"ORC$="LEA"ORC$="PUT"THEN PROCdrop
560IFC$="OPE"ANDP%=64THENPRINTX$(26);K=1
570IFC$="OPE"ANDK<>1THENPRINT"I can't do that just now!";K=1
580IF C$="UNL"THEN PROCunlock
590IF C$="KIS" THEN PROCkiss
600IFC$="GIV"THEN PROCgive
610IFC$="EXA"THENPRINT"I can't see anything special!";K=1
620IFC$="SEA"THENPRINT"I can't find anything here, despite searching!";K=1
630IFC$="KIL"ORC$="SHO"ORC$="ATT"ORC$="DES" THEN PROCkill
640IFC$="SWI"THENPRINT"Just give me a direction and I'll swim if I have to!";K=1
650IFK<1THENPRINTX$(5)
660UNTILG%>149
670IFG%>149 THEN CLS:FOR X=1 TO 2:PRINTTAB(0,13+X);CHR$(141);CHR$(X+129);"T H A
T I S B L O W N I T I !";NEXT:SOUND=,15,100,10;TIME=0;REPEAT:UNTIL TIME=300;
PROCclose
680END
690DEF PROCdata
700FORH%=1TO103:READD$(H%);FORD%=1TO4:READS$(H%,D%);NEXTD%,H%
710FORD%=1TO35:READX$(D%);NEXT:FORH%=1TO20:READG$(H%),B$(H%,1);NEXT:FORH%=1TO2
7:READN$(H%),N$(H%);NEXT
720ENDPROC
730DEF PROCwin
740CLS
750FORX=1TO2
760 PRINTTAB(0,X+14);CHR$(141);CHR$(X+130);"W E L L D O N E !";
770NEXT
780PRINT"CHR$(131):You have solved this adventure!"
790FORX=1TO5:FORY=1TO220
800SOUND1,-15,Y,0
810SOUND2,-15,Z55-Y,0
820SOUND0,-1,Y,0
830NEXTY
840NEXTX
850END
860DEF PROCcup
870IFP%=29THENPRINTX$(7);P%=30;K=1;ENDPROC
880IFP%=100THENPRINTX$(7);P%=101;K=1;ENDPROC
890IFP%=13THENPRINT"I try to climb out, but slip back in themud. I could be he
re forever!";K=1;ENDPROC
900IFP%=60THENPRINTX$(7);P%=61;K=1;ENDPROC
910IFP%=41THENPRINTX$(7);P%=40;K=1;ENDPROC
920PRINT"I can't do that here !";K=1;ENDPROC
930DEF PROCdown
940IFP%=30THENPRINTX$(8);P%=29;K=1;ENDPROC
950IFP%=11THENPRINTX$(27);P%=13;K=1;ENDPROC
960IFP%=40THENPRINTX$(8);P%=41;K=1;ENDPROC
970IFP%=101THENPRINTX$(8);P%=100;K=1;ENDPROC
980IFP%=61THENPRINTX$(8);P%=60;K=1;ENDPROC
990PRINT"I'm can't do that just at the moment!";K=1;ENDPROC
1000DEF PROCout
1010IFP%=74THENPRINTX$(27);P%=73;K=1;ENDPROC
1020IFP%=28THENPRINTX$(27);P%=27;K=1;ENDPROC
1030PRINT"I'm sorry I'm not able to do that here!";K=1;ENDPROC
1040DEFPROCin
1050IFP%=27THENPRINTX$(27);P%=28;K=1;ENDPROC
    
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1060IFP%=73THENPRINT*(27):P%=74:K=1:ENDPROC
1070PRINT"I can't do that here!":K=1:ENDPROC
1080DEF PROCride
1090IFP%=26THENPRINT"There isn't a bus in sight":K=1:ENDPROC
1100IFP%=38THENPRINT*(27)"I get off at the next stop!":P%=26:K=1:ENDPROC
1110PRINT"DONT BE STUPID !!!!!":K=1:ENDPROC
1120IF P%=63 THENPRINT" S P L A S H ! !":SOUND0,-15,190,10:P%=59:K=1:ENDPROC
1130DEF PROCjump
1140IFP%=90THENPRINT*(27):P%=89:K=1:ENDPROC
1150IFP%=25THENPRINT"Safe landing! I landed in soft sand!":P%=35:K=1:ENDPROC
1160IFP%=89THENP%=90:PRINT"I just made it!":K=1:ENDPROC
1170IFP%=63 ORP%=59THENPRINT" S P L A S H ! !":SOUND0,-15,70,30:P%=15:K=1:ENDPROC
1180PRINT"I can't do that here!":K=1:ENDPROC
1190DEF PROCget
1200PROCcheck
1210IFL<>1THENENDPROC
1220EX=0
1230FORH%=1TO20:IFB*(H%,1)=P%ANDB*(N%(R),1)=P%THENEX=1
1240NEXT
1250IFEX=0THENPRINT"I can't see it here!":K=1:ENDPROC
1260IFR=10SAND(R=1ORR=2)THENPRINT*(19):K=1:ENDPROC
1270IFR=8THENSAS=1 ELSEIFR=18THENBS=1 ELSEIFR=26THENSC=1 ELSEIFR=25 THENSB=1
1280IFP%=64ANDR=7ANDSE<>1THENPRINT*(3):K=1:ENDPROC
1290IFP%=64ANDR=23ANDSE<>1THENPRINT"I can't see it here!":K=1:ENDPROC
1300IFP%=56ANDR=27THENPRINT"I'm not that sort of person!":K=1:ENDPROC
1310IFP%=98ANDR=24THENPRINT"it's stuck!":K=1:ENDPROC
1320IFR=23THENBS=1
1330IFR=15ANDR=23THENPRINT*(11):SOUND0,-15,100,10:K=1:ENDPROC
1340EX=0:FORDX=1TO3:IFV*(DX)="" THENV*(DX)=B*(N%(R)):EX=1:DX=5
1350NEXT
1360IFEX=0THENPRINT"I'm sorry I can't carry any more!":K=1:ENDPROC
1370B*(N%(R),1)=0:K=1:ENDPROC
1380DEF PROCcheck
1390L="" :FORDH%=1 TO LEN(Z%)
1400IF MID*(Z%,H%,1)="" THENL*=RIGHT*(Z%,(LEN(Z%)-H%)):H%=H%+40
1410NEXT
1420R=0:LX=0:IFLEN(L%)<2THENENDPROC
1430FORH%=1TO27:IF LEFT*(N%(H%),LEN(L%))=L% THENLX=1:R=H%
1440NEXT
1450ENDPROC
1460DEF PROCdrop
1470PROCcheck
1480IFL<>1THENPRINT"I can't see a ":L:K=1:ENDPROC
1490EX=0
1500FORDX=1 TO 3
1510IFV*(DX)=B*(N%(R)) THEN V*(DX)="" :EX=1
1520NEXT
1530IFEX<>1 THENPRINT"I haven't got it!":K=1:ENDPROC
1540B*(N%(R),1)=P%
1550CLS
1560IF R=26 THENSC=0 ELSEIFR=25 THENSB=0 ELSEIFR=8THENSA=0 ELSEIFR=7THENSD=0
1570IFR=22THENSS=0
1580K=1:ENDPROC
1590DEF PROCinventory
1600PRINTCHR*(129):I have i-
1610EX=0
1620FORH%=1 TO3
1630IFV*(H%)<>""THENPRINT*(H%):F%=1
1640NEXT
1650IFEX=0THENPRINT"not a sausage!":I
1660PRINT
1670K=1:ENDPROC
1680DEF PROCunlock
1690IFP%=64 OR P%=35 THEN JX=9
1700IFJX<>9 THENPRINT"Don't be a SILLY BILLY!":K=1:ENDPROC
1710IFP%=64 AND SA<>1THENPRINT*(15):K=1:ENDPROC
1720IF P%=35 THENPRINT"The padlock is too rusty to unlock!":K=1:ENDPROC
1730IFSE<>0 THENPRINT*(25):K=1:ENDPROC
1740SE=1:PRINT*(29):PRINT*(30):B*(16)="" :The EDIAMOND of POGLOVIA!":K=1:ENDPROC
1750DEF PROCkiss
1760 IFP%=36THENPRINT*(27)"She smiles for a second!":K=1:ENDPROC
1770PRINT"There is nobody here I feel like kissing!":K=1:ENDPROC
1780DEF PROCsail
1790IFP%=52 ORP%=53 THENPRINT"I can't do that here!":K=1:ENDPROC
1800IFP%=52THENPRINT*(27)"I sail the boat!":P%=53:B*(10,1)=53:K=1:ENDPROC
1810PRINT*(27):PRINT"I paddle the boat !":P%=52:B*(10,1)=52:K=1:ENDPROC
1820DEF PROCgive
1830IFP%<103THENPRINT"I am not in a position to give the EDIAMOND yet!":K=1:ENDPROC
1840IFSS<>1THEN*(1)="" :I didn't have the EDIAMOND & he didn't like that!":I:PR
OClose
1850CLS:PROCwin
1860DEF PROCk11
1870K=1:P%=91:R=99
1880IFP%=23THENPRINT"Don't be cruel!":K=1:ENDPROC
1890IFP%=36 THENPRINT"I'm not a SADIST!":K=1:ENDPROC
1900IFP%<>103 THENPRINT"NOT HERE AND NOW!":K=1:ENDPROC
1910IFSB<>1THENPRINT"how can I ? I am unarmed!":K=1:ENDPROC
1920IF SB<>1THENPRINT"I FULL THE GUN!", but I have no bullet!":TIME=0:REPEAT:UNT
IL TIME<300:X(1)="" :I don't think he liked that!":P:ROClose
1930CLS:PRINTTAB(0,15):CHR*(131):"I quickly load the gun and shoot"
1940SOUND0,-15,100,4
1950TIME=0:REPEAT UNTIL TIME>300
1960PROCwin
1970DEF PROCtitles
1980CLS:FORX%=1TO2:PRINTTAB(5):CHR*(141):CHR*(X%+128):CHR*(136):"DEATH IN POGLOVIA":
NEXT
1990PRINT"I am in a very difficult situation." : "Whilst on holiday on the tiny i
sland of Poglovia, which is situated off the coast of mainland Zoblovia, I h
ave experienced several disasters."
2000PRINT"On the first day, the heavy rains causedextensive flooding and many a
reas of the island are still flooded."
2010PRINT"I ran out of money two days ago and to cap it all, the mad EMPEROR o
f ZOBLOVIA has invaded the island and killed most of its inhabitants."
2020PRINT"I have heard that he is in a secret hideout somewhere on the isla
nd and is threatening to blow up the island if the famous EDIAMOND OF POGLOVIAE
is not delivered to him within the next few hours."
2030PRINT" My task is to deliver the diamond to himOR to assassinate him before
the time runs out. I have only 150 moves to do this in!"
2040PRINTTAB(2):CHR*(131):"Press (SPACE BAR) to start the game.";
2050REPEAT:AS=GET$:UNTIL AS="" :CLS:ENDPROC
2060DATAIn Poglovia High Street,22,23,27,in the main shopping area,1,3,0,0,in
the shopping precinct,2,4,8,7,outside the public library,3,5,0,6
2070DATAIn the Civic Centre,4,16,12,0,by the checkout desk of the library,0,0,4
,86,in a small chemist's shop,0,0,3,0,on a main road,0,0,9,3,on a main road,0,0
,10,8,by some traffic lights,26,0,11,9
2080DATABy a workman's hut. There is a hole in the ground SOUTH of here,,0,0,0
,10,at the entrance to some swimming baths,0,0,0,5,at the bottom of a large hole
,0,0,0,0,at the shallow end of the swimming pool,12,0,0,0
2090DATAIn the deep end,0,58,0,0,in the village square,5,0,0,17,outside
e the HOTEL POST,0,21,16,18,on a narrow footpath leading towards the forest,0,0,1
7,1
2100DATAIn the forest. There is a large tree I could climb here,0,0,18,0,at th
e top of a tree,0,0,0,0,in the hotel entrance,17,64,0,0,in the high street,73,1,
24,0,in an amusement arcade,24,0,0,1
2110DATAIn a disused alleyway,0,23,25,22,on top of a low wall,0,0,24,at a bus
stop,0,10,0,0,outside Woolworth's,0,0,1,0,in the gardening department. It is by
the entrance,,0,0,0,29,at the bottom of a staircase.
2120DATAIn,34,28,0,at the top of the stairs,0,0,31,0,in the electrical departmen
t,0,32,33,30,in the cafeteria,31,0,0,0,by a lighting display,0,0,0,31,at the che
ckout,29,0,0,0
2130DATAIn a loading bay,0,0,36,0,in a narrow tunnel,0,37,0,35,at the end of a
tunnel,36,0,38,0,at a bus terminus. There are plenty of buses here,,39,0,0,37,at
the edge of town,0,38,40,0
2140DATAAt some traffic lights. There is an openmanhole here,,42,0,0,39,in a se
wer. It is full of EEEE,0,0,0,0,on a main road. The river nearby has burst its
banks,45,40,0,43
2150DATApadding in about four feet of water,,44,0,42,0,outside Barclay's Bank.
It is flooded,,50,43,45,46,where the floods have swept the road North away,,
0,42,0,44
2160DATAIn the entrance to the bank. It is flooded,49,47,44,48,at the bank
counter. There is no-one here!,46,0,0,0,in the main hall of the bank,0,0,46,
0
2170DATAIn the managers office. It is flooded to a depth of 4 feet.,0,46,0,0,by
a cinema. The flooding here is bad.,52,44,51,0,inside the entrance of the cinema
. It is shut!,0,0,0,50
2180DATAIn the road. The flooding to the North prevents me going that way!,0,5
0,0,0,by the roof of a large flooded building,55,0,0,54,on a large plank of wood
floating on thewater,0,0,53,0
2190DATAOn the roof.,0,53,56,0,by a chimney,,0,57,0,55,on the far side of the
roof. The floods stretch for miles!,56,0,0,0,on the steps at the side of the po
ol,15,0,59,0
2200DATAAt the side of the pool,0,60,0,58,at the bottom of some steps,59,0,0,0
on a balcony,0,0,62,0,on a diving board,63,0,0,61,at the end of the board,,0,63
,0,0
2210DATAIn the reception,21,65,0,0,in the main hall,64,0,66,0,at the end of the
hall. There are peepodding here!,0,67,0,65,at the end of a long bar,66,0,68,0
,at the other end of the bar.
2220DATAIn,69,0,67,in a lounge,,68,71,70,72,in the toilets,0,0,0,69,at the end o
f the lounge,,69,0,0,0,in an alcove,0,0,69,0,at the entrance to 'POGLOVIA ICE CA
VES',0,22,0,0
2230DATAIn a vast gloomy cavern. There is a deadquide here!,75,0,0,0,at the end
of the gloomy cavern,85,74,76,80,in a wide passage,0,77,0,75,in a narrow passag
e,76,0,78,0
2240DATAIn a narrow passage. It twists round here,,79,0,0,77,in the passage,
88,78,0,0,by a subterranean waterfall,84,81,75,82,on a narrow ledge at the side
of the waterfall,80,83,0,0,padding in the waterfall. I daren't go further.,0,0
,80
2250DATAIn,at a dead end,81,0,0,0,in a narrow passage. Ice blocks the way North,
0,80,0,0,in a small cave,0,75,0,0,in the reference section,0,0,8,87,in a reading
room,,0,0,86,0,at the end of the gloomy passage,89,79,0,0
2260DATAIn a small chamber. There is a narrow ravine to the North.,0,88,0,0,0
n a narrow ledge. There is a passage onthe South side of the ravine.,91,0,0,0
2270DATAIn a passage deep inside the mountain,,90,93,92,at a junction with pa
ssages in many directions,97,96,91,0,in a tunnel of ice,,94,95,0,91,in a vas
t underground chamber,,0,93,0,0
2280DATAIn a chamber with giant stalagmites madeof ice!,93,0,0,0,in a small off
ice. It seems strange to find an office here!,92,0,0,0
2290DATAIn a sloping corridor. It's obviously man made!,0,92,0,98,in a windin
g passage,,0,99,97,0,in a corridor with granite ikons,,98,100,0,0,by a sheer wal
l of ice! A rope hangs down from way above me,99,0,0,0
2300DATAAt the top of the rope,0,0,102,0,in a corridor lined with ice,0,103,0,
101,in the HALL OF THE MAD EMPEROR OF ZOBLOVIA. HE IS HERE!!!!,102,0,0,0
2310DATA"" ,it's far too dangerous,it's too heavy to lift,I'm sorry I don't spea
k the language,I'm sorry I can't understand you,it's stuck,I climb up,I climb do
wn,I'm not hungry
2320DATAThat word is not in my limited vocabulary,AAAAGGGGGHHH!!! it go
t me.,Rubbing an electric lamp is stupid! ,I've heard that one before,I'm nearly
there, I don't have a key,I don't have a clue!
2330DATAThe time is running out.I'll try it if you like,I wouldn't recommend it,Wha
t an ugly looking thing,not likely!,HOW DARE YOU SPEAK TO ME LIKE THAT,don't be
so rude!,It said you are a EEE, it's already open dummy!,it's locked
2340DATAO.K.,something happened,I can see something,It gleams brightly,what fun
,it's too dangerous,it's too hard,I've nothing to do it with,I've not got a shov
el
2350DATAThe EMPEROR OF ZOBLOVIA,103,a pint of beer,68,a bar of soap,70,a large
suitcase,64,a key,65,a sailing dinghy,53,a padlock,35
2360DATAasome driftwood,54,a small puppy,23,some ice,85,a rusty nail,16,a pair o
f swimming trunks,58,a nest,20,a cup of tea,32,a table,66,,"",64,a lever,98,a gun
,47,a bullet,2
2370DATAA small girl who looks very lost,36,EMPEROR,1,ZOBLOVIA,1,PINT,2,BEER,2
,BAR,3,SOAP,3,SUITCASE,4,KEY,5,SAILING,6,DINGHY,6,PADLOCK,7,LOCK,7,DRIFTWOOD,8,W
OOD,8,PUPPY,9,ICE,10,NAIL,11
2380DATATrunks,12,NEST,13,CUP,14,TEA,14,TABLE,15,DIAMOND,16,LEVER,17,GUN,18,BUL
LET,19,GIRL,20
2390DEF PROCclose
2400CLS
2410SOUND0,-15,100,10
2420FORTX=1TO 2
2430PRINTTAB(0,TX+15):CHR*(137):CHR*(141):CHR*(TX+128):" H A T ' S D O N E
I T ! ! "
2440NEXT
2450PRINT*(1)
2460PRINT"" :CHR*(134):"He pressed the button !!"
2470SOUND0,-15,100,10
2480PRINT"" :CHR*(133):"Do you want another game?":CHR*(131):"<Y>es or <N>o?"
2490REPEAT
2500AS=GET$
2510UNTILAS="" :ORAS=""
2520IFA="" :Y" THEN RUN
2530CLS
2540PRINTTAB(0,15):CHR*(131):"Thank you for playing this game !"" : "Goodbye!!!"

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Matrix Transformation

G W Gallagher

Most of the examinations taken at 'O' level or C.S.E. in Mathematics include two-dimensional transformations using matrix multiplication as a topic in the syllabus.

At 'A' level, the transformations may be 3-dimensional. Using a flat screen to represent such transformations includes extra factors involving the type of projection to be used. Because of those extra factors, this program concentrates on 2-D problems only, leaving 3-D for later.

The process of matrix multiplication is defined as

$$\begin{pmatrix} A & B \\ C & D \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} Ax + By \\ Cx + Dy \end{pmatrix}$$

that is: when a point whose coordinates are (x,y) is acted upon by a matrix containing the values A,B,C and D as above, the coordinates

Beyond the mathematics, two dimensional transformations of matrices are an efficient method of moving and manipulating objects about the screen.

of the new point are (Ax + By, Cx + Dy).

According to the values of A,B,C and D, any shape may be enlarged, rotated, reflected in any line in the plane, stretched in one direction, or transformed in any combination of these movements.

Accepting that it is necessary to be able to calculate and draw the results of such transformations, it can be helpful to use a computer to check a result or to see the effects which different matrices have.

It is impossible to discuss matrices without using large

brackets, so PROCdefine defines six characters (lines 2500-2570) which together draw brackets covering three text lines in depth.

THE STEPS REQUIRED

1. There must be an original shape to be transformed. In the example used in the program, four points are used, with coordinates (P(1),Q(1)), (P(2),Q(2)), (P(3),Q(3)), (P(4),Q(4)). In the example these are provided, but there is the opportunity to supply the coordinates for a maximum of 10 vertices from the keyboard.
2. There must be four numbers, A,B,C and D to form the matrix. Examples are given but there is the opportunity to experiment.
3. Each pair of coordinates must be multiplied by the matrix to give a new pair of coordinates. The four points become (X(1),Y(1)), (X(2),Y(2)), (X(3),Y(3)), (X(4),Y(4)).

THE PROCS USED

PROCAXES (1200-1295)

The axes are centred on the screen at the point (600,650), which leaves room for a text area in the bottom 8 lines of the screen. The x-axis is numbered from -30 to +30, and the y-axis from -20 to +20, with the scales equal on the two axes. (16 points to 1 unit).

PROCOLD (1300-1360)

The original points are plotted.

PROC MAT (1000-1040)

The multiplication is carried out to convert the point (P(1),Q(1)) to the point (X(1),Y(1)).

PROCNEW (1400-1460)

The new points are plotted.

PROCWAIT (2000-2030)

This is the delay until the operator is ready to move on.

PROCTITLE and

PROCDBL (2300-2430)

providing the title sequence.

PROCdefine (2500-2570)

This section defines the characters used to make the brackets.

PROCmatrix (2200-2250)

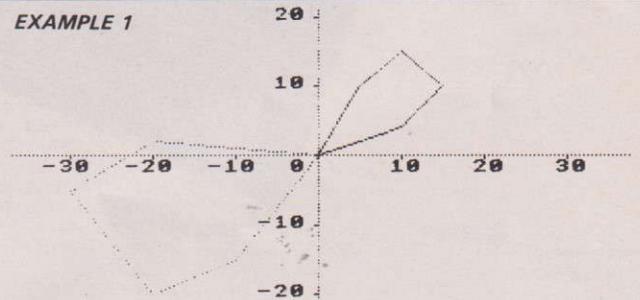
The matrix being used is displayed in the text area of the screen, using the defined brackets. PROCmatrix sets up the brackets to hold the values of A,B,C, and D.

PROCplus (2700-2750)

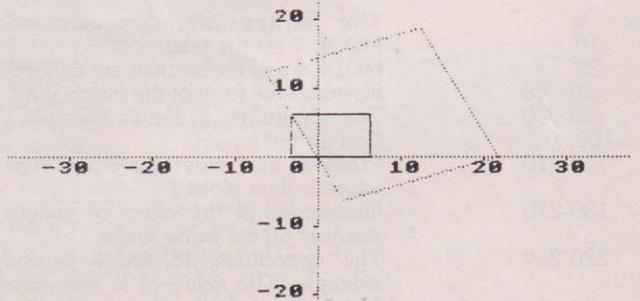
To ensure that there are no irregularities in the appearance of the brackets, positive and negative numbers must take up the same amount of space. PROCplus prefixes a positive number with '+' to balance the '-' sign included with a negative number.

The matrix will still look a little untidy if, for example, one of the four values is greater than 9, (in which case the shape is unlikely to fit on the screen!), or if decimal values are used in some but not all four numbers.

EXAMPLE 1



The matrix $\begin{bmatrix} -2 & +0 \\ +1 & -2 \end{bmatrix}$ applied to the shape shown



The matrix $\begin{bmatrix} -1 & +3 \\ +2 & +1 \end{bmatrix}$ applied to the shape shown

CONTINUED OVER



THE MAIN PROGRAM (5-900)

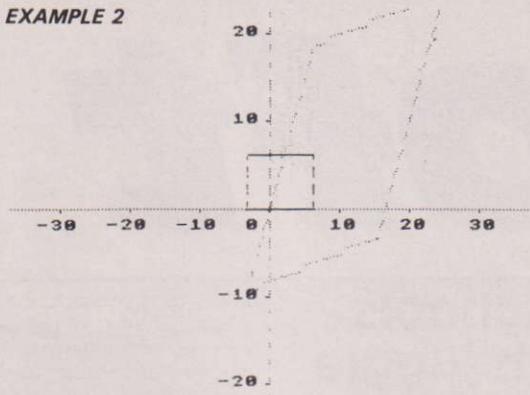
Line 5 The arrays are dimensioned.
 10 MODE 7 for the title.
 20 MODE 4 and the brackets are defined.
 30- 40 Illustrates the form of the matrix used.
 50- 80 The opportunity to see an example.
 100 Sets up the screen.
 110-210 Provides the values for a rectangle
 which is then plotted.
 130-210 Illustrations of the effect of various
 matrices on the same shape.
 220-260 The opportunity to see a second
 example. The value of K (see lines
 110,260) sends the program to line
 270 when a second example has been
 seen.
 270-310 The choice of applying your matrices

350-430
 500-590
 600
 900

to a given rectangle, or of providing
 the shape to be transformed.
 Sets up a rectangle, and asks for
 values for A,B,C and D.
 Asks for the number of vertices, and
 then the coordinates.
 Returns to line 360 to carry out the
 transformations.
 END

MODE 4 has been used because it
 gives the maximum space for
 combined text and graphics display,
 but it does not allow the use of
 different colours for the old and new
 shapes. (Dotted lines have been used
 instead) If colour is important in the
 context in which the program is to be
 used, then the text area would need to
 be resigned, or the graphics area
 made smaller.

EXAMPLE 2



The matrix $\begin{bmatrix} +1 & +3 \\ +3 & +1 \end{bmatrix}$ applied to the shape shown

PROGRAM LISTING

```

5 DIM P(10),Q(10),X(10),Y(10)
10MODE 7:PROCTITLE
20MODE4:GCOLOR,3:PROCdefine
30PRINTTAB(2,5):"The matrix used is in the form"
40PRINTTAB(5,7):"      "CHR#226" A B "CHR#229"
      "CHR#227"
      "CHR#228" C D "CHR#231
50PRINTTAB(2,12):"Do you want to see an example(Y/N)?"

60INPUTN$
70PRINTTAB(0,20):"At any stage,to move on to the next
diagram,please press the SPACE bar" :PROCWAIT
90IFN$="N"THEN270
90IFN$="Y"THEN 100 ELSE 60
100CLS:MODE4:PROCAXES:VDU28,0,31,39,24
110NV=4:K=1:P(1)=600:Q(1)=625:P(2)=600:Q(2)=650:P(3)=750
Q(3)=650:P(4)=750:Q(4)=625:PROCOLD
120PRINTTAB(0,26):"This is the rectangle which will be
transformed"
130PROCWAIT
140A=3:B=0:C=0:D=3:PROCplus:PROCmat:PROCmatrix
150PROCNEW:PROCWAIT
160A=-3:B=0:C=0:D=-3:PROCplus:PROCmat:PROCmatrix
170PROCNEW:PROCWAIT
180A=2:B=0:C=0:D=-2:PROCplus:PROCmat:PROCmatrix
190PROCNEW:PROCWAIT
200A=2:B=-1:C=2:D=-1:PROCplus:PROCmat:PROCmatrix
210PROCNEW:PROCWAIT:IFK>1THEN270
220MODE7:PRINTTAB(3,5):"Do you wish to see another exam
ple?(Y/N)"
230INPUTN$:IFN$="Y"THEN260
240IFN$="N"THEN270
250GOTO230
260NV=4:K=K+1:MODE4:PROCAXES:VDU28,0,31,39,26:P(1)=700:Q
(1)=750:P(2)=700:Q(2)=650:P(3)=550:Q(3)=650:P(4)=550:Q(4)
=750:PROCOLD:GOTO 120
270MODE7:PRINTTAB(3,5):"TYPE 1 to give your own values
of
A,B,C AND D"
280PRINTTAB(3,7):" 2 to draw the basic shape
yourself:"
290PRINTTAB(3,9):" 3 to end."
300INPUTN$:IF(N-1)*(N-2)*(N-3)<>0THEN300
310ON N GOTO 350,500,900
350NV=4:MODE4:CLG:PROCAXES:VDU28,0,31,39,26:P(1)=700:Q(
1)=750:P(2)=700:Q(2)=650:P(3)=550:Q(3)=650:P(4)=550:Q(4)=
750:PROCOLD
360CLS:PRINT"Your value for A is ?":INPUT A
370CLS:PRINT"Your value for B is ?":INPUT B
380CLS:PRINT"Your value for C is ?":INPUT C
390CLS:PRINT"Your value for D is ?":INPUT D
400PROCplus:PROCmat:PROCmatrix:PROCNEW:PROCWAIT
410CLS:PRINT"Another set of values?(Y/N)"
420INPUTN$:IF N$="Y"THEN 360 ELSE 430
430IF N$="N" THEN 270 ELSE 420
500MODE4:PROCAXES:VDU28,0,31,39,26
510PRINT"You will be asked to give the x and y "
520PRINT"coordinates of each vertex used."
530 INPUT"How many vertices?", NV:NV=INT(NV)
550 FOR I= 1 TO NV

```

```

560CLS: PRINT"Point ":I:" The value of x is ":INPUT P(I).
570 PRINT"The value of y is ":INPUT Q(I)
580 P(I)=P(I)*16+600:Q(I)=Q(I)*16+650
590 NEXT I
600 PROCOLD:GOTO 360
900END
1000DEFPROCmat
1010 FOR I=1 TO NV
1020X(I)=600+A*(P(I)-600)+B*(Q(I)-650)
1030Y(I)=650+C*(P(I)-600)+D*(Q(I)-650)
1040 NEXT
1050ENDPROC
1200DEFPROCAXES
1210MOVE0,650:PLOT22,1200,650
1220MOVE600,290:PLOT22,600,1010
1230PRINTTAB(17,12):"0":PRINTTAB(16,6):"10":PRINTTAB(16,
1):"20"
1240PRINTTAB(15,16):"-10":PRINTTAB(15,21):"-20"
1250PRINTTAB(12,12):"-10":PRINTTAB(7,12):"-20"
1260PRINTTAB(23,12):"10":PRINTTAB(28,12):"20"
1270PRINTTAB(2,12):"-30":PRINTTAB(33,12):"30"
1280FORI=-30 TO 30 STEP 10:MOVE600+I*16,649:DRAW600+I*16
,642:NEXT I
1290FORI=-20 TO 20 STEP 10:MOVE599,650+I*16:DRAW592,650+
I*16:NEXT I
1295ENDPROC
1300DEFPROCOLD
1310 MOVE P(1),Q(1)
1320 FOR I= 2 TO NV
1330 DRAW P(I),Q(I)
1340 NEXT
1350 DRAW P(1),Q(1)
1360 ENDPROC
1400DEFPROCNEW
1410 MOVE X(1),Y(1)
1420 FOR I= 2 TO NV
1430 PLOT21,X(I),Y(I)
1440 NEXT
1450 PLOT21,X(1),Y(1)
1460 ENDPROC
2000 DEFPROCWAIT
2010 X=GET
2020 IF X=32 THEN 2030 ELSE 2010
2030 ENDPROC
2200 DEFPROCmatrix
2220CLS:PRINTTAB(0,25):"The matrix      "CHR#226:" "A$:"
":B$:" "CHR#229:" applied to,the      "CHR#227"
      "CHR#230"
      "C$:" "D$:" "CHR#231
2240PRINTTAB(0,30):"shape shown"
2250 ENDPROC
2300DEFPROCTITLE
2310CLS:PROCDL("MATRIX",15,8)
2320PROCDL("TRANSFORMATION",10,12)
2330PROCDL("G.W.GALLAGHER",20,16)
2340PROCDL("1983",24,18)
2350FORI=1TO4000:NEXTI
2360ENDPROC
2400DEFPROCDL(X$,Y)
2410PRINTTAB(X,Y):CHR$(141):X$
2420PRINTTAB(X,Y+1):CHR$(141):Y$
2430ENDPROC
2500 DEFPROCdefine
2510 VDU23,226,15,16,32,64,64,64,64,64,64
2520 VDU23,227,64,64,64,64,64,64,64,64,64
2530 VDU23,228,64,64,64,64,64,64,32,16,15
2540 VDU23,229,240,8,4,2,2,2,2,2
2550 VDU23,230,2,2,2,2,2,2,2,2
2560 VDU23,231,2,2,2,2,2,4,8,240
2570 ENDPROC
2700DEFPROCplus
2710IF A<0 THEN A$=STR$(A) ELSE A$="+"+STR$(A)
2720IF B<0 THEN B$=STR$(B) ELSE B$="+"+STR$(B)
2730IF C<0 THEN C$=STR$(C) ELSE C$="+"+STR$(C)
2740IF D<0 THEN D$=STR$(D) ELSE D$="+"+STR$(D)
2750ENDPROC

```

Edsoft

Programs for schools and homes which juggle numbers and language for the young and not so young.

Griffin & George are already a tried and tested name in the education field. They are currently suppliers of hardware and software to schools, including Primary schools through the Department of Industry's 'Micros in Primary Schools' scheme. They have already supplied 12,000 schools and have a library of over 100 programs.

Griffin Software will now market the most suitable programs from their educational library for use in the home. The programs are developed with consultation from teachers from start to finish. These programs have also already encountered the detailed scrutiny of teachers, and more importantly children, in schools. The programs are aimed at four to eight year olds.

The first six programs are based on writing, reading and number skill teaching programs. The aim is to excite children with high quality graphics and at the same time teach fundamental rules. Griffin suggest that their software be used in schools as an aid to a teaching goal rather than as a straight remember and test combination. The parents' notes also hint at this sort of approach. Griffin have done their best to avoid the 'page by page' approach to software.

The program comes in attractive green packs with full step by step instructions. They cost £9.95. Amongst the programs are titles like Getset (featuring the excellent Olly the Octopus) and Tablesums. We now take a more detailed look at Wordspell and Numberfun.

Title: Numberfun
Publisher: Griffin Software
Machine: Model B
Price: £9.95

First things first. The packaging of the Griffin Software tapes is attractive and tough. These are important points when considering the wear and tear enthusiastic children will provide.

The manual is short but carefully presented and caused no confusion for adult or child. There is no doubt that even the five to nine age range quickly learn how to LOAD and RUN



programs by themselves.

The title page merely leads on to a simple menu with choices of addition questions (+), subtraction (-) or mixed (M) questions. Included on the screen is the instruction to press RETURN. A second menu allows for the range of numbers to be chosen, 0 to anything up to 99. A summary is given of the choices made.

The game now begins. The child has two pieces of informa-

tion displayed left and right of the action; one is the score so far; the other the number of stars rewarded for a correct answer. The question itself is printed in clearly spaced bold type at the top of the screen.

The graphics consist of a column (military parlance) of tanks driving from left to right across the screen. A line of bombs and aircraft are drawn beneath the question. The idea is to bomb the

tank which contains the correct answer. The use of military hardware (even simulated) to teach children has been called into question, and Griffin themselves have acknowledged the criticism and are considering the point.

Personally I think it would be safer to use a sporting context and thus avoid a computer game cliché. There are plenty of shoot'em up games so perhaps Fisher Marriot (the programmers) could exercise a little more imagination.

Strangely the BREAK key is not protected. The ESCAPE key however is (it re-starts the program) and the error-trapping is sound. Numberfun2 follows the same procedure but asks the child to shoot firework rockets from a milk bottle to hit clouds. Both displays are colourful but not breathtaking.

Ratings Table:

SOUND	50%
GRAPHICS	75%
DOCUMENTATION	90%
VALUE FOR MONEY	70%
OVERALL	65%

Title: Wordspell
Publisher: Griffin Software
Machine: Model B
Price: £9.95

This program is great fun to use and I'm certain will get its message across to young children. There are 116 word lists that test different English language topics and if that is not enough there are user friendly means of constructing your very own version. This facility enables parents to supply a list which coincides with their child's current reading material and ability.

A simple menu offers the choices: to summarise the available lists, to enter or practise your own list or to end. One piece of inconsistency is the use of lower case letters to denote options on the screen when plainly upper case keys have to be pressed. The lists test various awkward spelling, double consonants, vowels modified by 'r' and so on. They are lifted from 'A Classroom Index of Phonic



Resources' by D. Herbert and G. Davies-Jones.

Personal lists can be entered direct, LOADED and SAVED and easily edited. On screen prompts are all clear for these operations and the manual takes the user through step by step with the aid of actual shots of what to expect on the screen.

The game itself is simple but thoroughly enjoyable. A word is printed up in large letters with the prompt 'look'. After a moment the prompt changes to 'spell'. To invest the program with a challenge a target time is set for the completion of the test. The best bit of the game is when you get something wrong (shame about incentive). The invader-like characters, which have been in attendance all along, burst into life and chuck out all the letters you have got wrong. The letters are shifted about and correct ones inserted. I was mesmerised.

The test ends with a 'well done', the time taken and a list of words to be practised in the event of incorrect attempts. It really is tempting to make the odd deliberate mistake just to have another look at those invaders in action.

Ratings Table:

SOUNDS 50%

GRAPHICS 80%
DOCUMENTATION 90%
VALUE FOR MONEY 80%
OVERALL 80%

Title: Elem-Add & Elem-Sub
Publisher: Cottage Software
Machine: Model B
Price: £7.50

Two programs for the very young — 4 to 6 years, to teach elementary addition & subtraction. The main features being very good graphics and use of sound. Various objects are used such as Castles, Rabbits, Bananas, Dogs etc, etc. The screen will display 9 Rabbits and invite the child to count them; then, after a correct question 'How Many Rabbits'. Another correct answer and the screen displays $9 + 5 = \underline{\quad}$ followed by $\quad + 5$

Each correct answer is followed by a Red Tick, drawn slowly with lots of sound holding the child's attention to the question and answer. The end reward is a cartoonist's balloon announcing the results, accompanied by a peculiar looking gentleman who is all smiles if there are no errors but, full grimace if there are.

Elementary Subtraction is similar in detail, graphics and sound but uses different objects.

Having displayed 7 objects on the screen and the quantity confirmed by the child, 4 of the objects are covered with a cross, the child is now invited to count the crosses. Given a correct response is followed by $7 - 4 = 3$, the screen is cleared and offers the alternate form $\begin{array}{r} 7 \\ -4 \\ \hline \end{array}$

Two very good programs for this age group; very well put together excellent use of graphics and colour and, in addition to learning subtraction & multiplication there is a further bonus of the child learning to count and to read in the process.

Ratings Table:

SOUND 85%
GRAPHICS 90%
DOCUMENTATION 85%
VALUE FOR MONEY 85%
OVERALL 85%

Title: Maths-Translations
Publisher: Corona Software
Machine: Model B
Price: £5.00

This Maths program is concerned with the teaching of the Translation of triangles and quadrilaterals, on a progressive scale.

You start the program with a choice of speed that you wish the program to proceed at, it will then display a triangle, and a printed text, it will then plot another triangle, and tell you its translation from the first.

The program can be easily controlled to suit its application as at each section, the space bar needs to be depressed to continue on. First translations are in the positive X direction, then positive Y, then negative X, and so on right through triangles, and then onto quadrilaterals, and at each stage, a question is posed to the student to determine their understanding. It gives three attempts to give the correct answer, and if still wrong, will then tell you the correct answer. At the end of each section, if the question marks were below 50%, then a revision sequence is begun with more questions, however,

so as not to become stuck, the program will continue on, even if the marks are again under 50%.

I was very impressed with the clarity and choice of colours for the display, which proved to be very clear from a relatively long distance from a domestic television set.

The progressive course of this program would prove ideal for both class teaching, as well as individual teaching/revision studies.

Ratings Table:

SOUND N/A
GRAPHICS 85%
DOCUMENTATION 80%
VALUE FOR MONEY 85%
OVERALL 85%

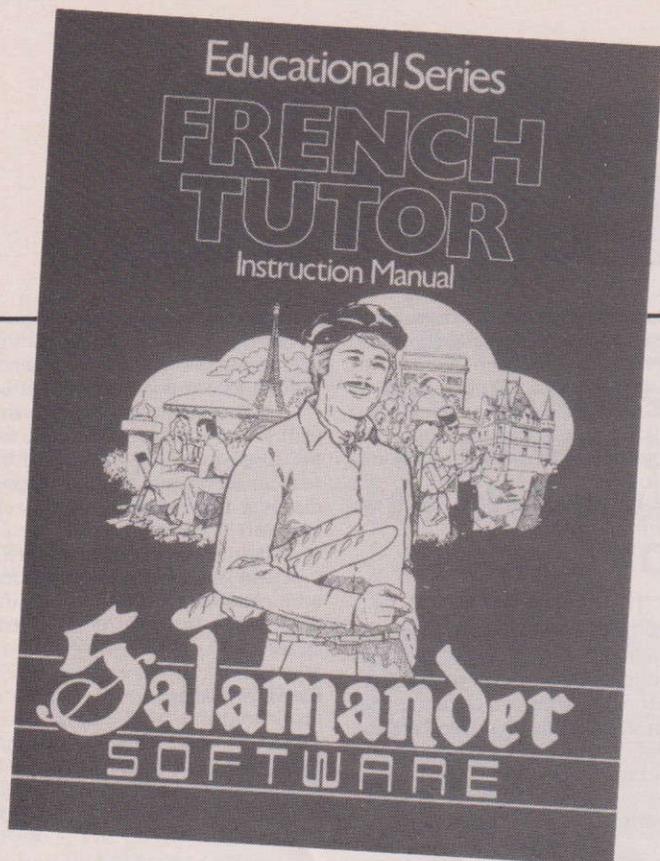
Title: French Tutor
Publishers: Salamandar Software
Machine: Model B
Price: £9.95

An excellent package for anyone interested in improving or resurrecting their knowledge of the French language is now available from Salamandar. It is billed as helping 'students of French up to GCE 'O' level and beyond' and this seems a fair summary of the standard aimed at. It could be used by a beginner but only alongside other conventional teaching.

The three programs on the tape are designed to give practice in vocabulary, phrases and idioms and irregular verbs. The manual is excellent quality and explicitly spells out loading operations for newcomers to the BBC. There is a cassette index which proves invaluable since each of the main tutor programs has a variety of data files to access. When using a cassette recorder with a counter, it is advisable to make a note of the position of each file for future reference.

The vocabulary test offers the option of working in English-French or French-English and there are data files covering outdoor, town, home and school situations. A particularly impressive feature is the full accen-

CONTINUED OVER



ting capabilities, the accents being provided on the first four red function keys. Once a question is correctly answered it will not come up again and it goes on a tally which is maintained at the top of the screen. On completing the test or pressing Escape at any time during the session, you will receive a progress assessment. There is a revision list with all the words you answered incorrectly with their meanings.

The phrases test incorporates the option of working uniquely with five phrases. Each batch is learned and a test given. Only when you feel that you have gained proficiency need you press a key to be tested and you have to answer them all correctly to go on to the next group.

Irregular verbs follow the same pattern. This time however, you are able to select which tenses you wish to be tested on. A simple Y or N answer decides. The same with specifying which verbs out of the ones loaded are to be employed. Answers have to be preceded by the appropriate pronoun and a second try is given should you get it wrong first time (by keying A). If the second attempt is also marked wrong then striking L reveals the whole tense of the verb concerned.

In general this is a very successful method of practising French vocabulary. The screen

format is clear and uncluttered and colour is carefully used for highlighting. There could have been more aural prompts but this didn't really mar the performance of the programs. The packaging is nice but seems a bit excessive for a single cassette. Nevertheless it's worth the money.

Ratings Table:

SOUND	60%
GRAPHICS	80%
DOCUMENTATION	95%
VALUE FOR MONEY	80%
OVERALL	85%

Title:	Multiply and Divide
Publishers:	Cottage Software
Machine:	Models A/B
Price:	£7.50

Both these programs are of the same standard and quality of Add & Subtract — Full use being made of Double Height characters and the change of colour on the column being worked. Again there is a choice of easy and hard division with a further option of selecting 2 or 5 questions. Having been given the sum, divide 71056 by 267... the first three figures '710' colours Yellow and, the 267 turns Green; i.e. Yellow divided by Green. The user is now encouraged to 'Guesstimate' how many 267s there are in 710, three wrong guesses are per-

missible after which, a wrong guess is recorded as an error. On inputting the answer '2' 267 is multiplied by 2 again with full use of colour i.e. Red X Green. The answer of 534 is printed under the 701, subtraction takes place followed by the '5' moving down visually and, again division starts with further 'Guesstimation' i.e. 1675 divided 267. Encouragement is continuous and, with 5 correct out of 5 the reward is a game of Hangman but, Hangman with a difference. The child has to find the name of one of many famous mathematicians, and this before he is hung; and before he/she uses up his 10 guesses.

In 'multiplication' the set up is much the same as to 2 X 7 — colour changing as each column becomes operative. The 'carry forward' is inserted in normal height but coloured 'CYAN' so, the next operation becomes Red X Green + Cyan. Good use is made of the 'space bar' to insert the zero's in the 'units' column before multiplying by the tens and, then by the 100s column. There is the usual choice of easy or hard questions — to do 2 or 5 sums and, the final objective for correct learning, a reward of six games of noughts and crosses for those who can achieve 5 out of 5 hard multiplications correct. These two programs cannot fail to encourage and improve learning.

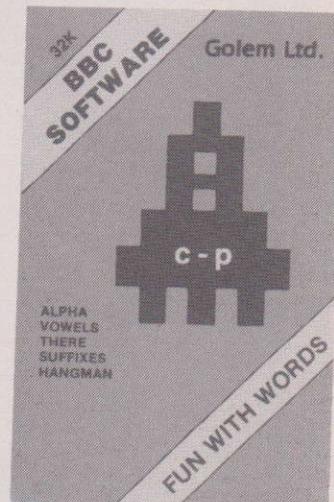
Ratings Table:

SOUND	80%
GRAPHICS	90%
DOCUMENTATION	90%
VALUE FOR MONEY	85%
OVERALL	90%

Title:	Fun With Words
Publishers:	Golem Ltd.
Machine:	BBC 32K
Price:	£8.00

There is no doubt that a pack like this is intended to give good value for money. There are in fact 5 programs on this cassette all aiming at an age of 5 to 11 or possibly a little older if language use is a problem.

The programs are all written to a reasonably high standard



and show considerable thought in their implementation. Most expect just a few key presses and the return key is required very little. The first game is 'Alpha' in which you have to deduct which letter has been selected from the clues you are given. The clues tell you if the letter is before of after the one you guess. This is a reasonable way of encouraging alphabet familiarity but is not very exciting at all.

The 'Vowels' game has more encouragement for the child, a rocket zooms in if the correct vowel is selected. Unfortunately there is little in the way of error correction so a child could type consonants for each answer and not know what they were doing wrong.

Homophones (words which are said the same though spelled differently) are important and can be learnt at this age. 'There' gives practice in the use of two of these (There and Their). It is a real pity though that the data structure is not explained so that other homophones could be used in the same program.

'Suffixes' is the most valuable program in the package. There are 5 different suffix rules explained and practiced. This is well done and has a great deal of data so that the same words occur very rarely. There is also an animated little man who jumps (presumably for joy!) if you get them right.

The last program on the pack

is the ubiquitous 'Hangman' in what can only be termed a very basic implementation which doesn't even check to see if you have tried a letter before. One gets the impression that this was clearly a makeweight program in this package.

With all these things taken into account however, it is very hard to believe that this package could fail to please anyone who bought it. Five programs at an average price of less than two pounds each is very good value indeed. The documentation could be better if there were data details etc. but certainly is accurate and enables you to use the programs easily.

Ratings Table:

SOUND	70%
GRAPHICS	70%
DOCUMENTATION	60%
VALUE FOR MONEY	90%
OVERALL	90%

Title:	Number balance Count on Bearings Prisms
Publishers:	Micro Concept
Machine:	BBC 32K
Price:	£5.00

These four programs are the first offerings from a new software house which intends to specialise in Educational Software. This is a growing market and it is important to realise that some programs are written with the idea of being used in schools, others for use in the home. This means that a piece of software written for one may not have the features required by the other. There is no doubt about it that these programs are meant for school use and include features which would not be required in the home such as printouts of the results of each child using the program.

It is also very important that programs aimed at young children should be very 'robust' and not crash at the first mistake made. There is a great deal of error trapping included in these programs but they are still not very robust unfortunately. In each of the programs I found errors, some serious others less so. There were so many errors that it is difficult to

believe that they have been properly tested at all. I will mention them as I cover the various programs in detail.

Number Balance gives practice in number bonds (sums of the 3+3=6 variety) which are very important as children begin to progress in maths. The idea is that you have to balance a program (eg 3+5) with its answer (8!!) and that is the answer given is correct then the balance is made. The balance is drawn on the screen and either balances or not depending on the answer given. The program is reasonable and does what is expected that the number 0 causes problems, the program regularly shows 0 as 'heavier' than say 3+5. Another problem common to the first three programs is that the printout routine doesn't work properly and, in this case, stops the program with a variable not found error.

Count On gives practice in the important skill of starting from one number, counting in so many and the finding then final number. The program has very little to interest the child however, and I would prefer to see children learning this skill by using Board games like Snakes & Ladders (yes, that is one of the reasons for young children playing 'games' at school). The problems with this program are, that the program 'hangs up' if the printer option is selected and there are errors in the correction routine eg "Wrong answe" is one of the the messages.

Bearings is meant for an older age range than the programs above (10+) and gives practice in estimation of angles (so many degrees), bearings (answers must be a three number format eg 090) and headings (answers using compass bearings). I find it rather strange that one of the features is angles OVER 360 degrees, how does one explain the utility of that to a child?

The printer routine this time causes an error message to be produced.

The final program Prisms gives problems in area and volume calculation. The screen features a drawing of the prism selected but this has no scaling in-

involved, so that a prism with its radius larger than its length has the same picture as one with its radius smaller than its length. This bears no relation to reality and could confuse a hesitant child. The screen presentation is also very cluttered and uses abbreviations such as V. and T.S.A. which may not be easily understood.

Overall it is hard to recommend any of these programs as they currently stand. There are just too many, admittedly minor but irritating, problems still to be resolved. If they are corrected then their utility is still not certain, as I am convinced most of the things they try to do, can be better done by other, perhaps more traditional methods.

Ratings Table:

SOUND	50%
GRAPHICS	50%
DOCUMENTATION	50%
VALUE FOR MONEY	10%
OVERALL	20%

Title:	Fun To Learn
Publishers:	Shards Software
Machine:	BBC B
Price:	£6.95

Five educational games for the small sum of only £6.95 seems to good to be true and it is! The educational value of most of the games on this tape is very low and most of them are 'old standbys' in a not particularly new guise. Having said that they are undoubtedly well error trapped and to some extent fun.

The package comprises one long program with a menu from which you move onto the various activities detailed below.

In the first game (COUNT) you have to count the number of letters on the screen as quickly as possible and you are praised or corrected as required. You are also told if you are getting faster or slower, though I cannot really see why.

MIXER could have been called 'Anagrams' for such it is. CALCULATOR is certainly the least useful program. It simply takes two numbers performs the selected operation and gives you the answer. A one line BASIC



program could do that, but you wouldn't get the fancy colour and sound!!

STARSHIP is a hangman variant with good teletext graphics and clues for the slower student. This is probably the best part of this package. CODEBREAKER is exactly that. A code (letter/letter) is set up and then words or sentences encoded and decoded as you choose. Not the most educational activity ever devised but with some value and fun.

The cassette card claims this program to be 'a comprehensive teaching program' but this is not fulfilled by this package and I doubt if such a package will ever exist. Therefore I do wish educational software houses would be more careful about making such claims. The result is damage to their reputation and they can also greatly hinder the acceptance of microcomputers in education as a whole.

Ratings Table:

SOUND	60%
GRAPHICS	50%
DOCUMENTATION	30%
VALUE FOR MONEY	50%
OVERALL	45%

Thermometric Beeb

L H Jones

You don't need expensive interfaces to make use of the Analogue In port on the BBC model B. Although the initial reaction was "it won't work", we have successfully used an ordinary copper-constantin thermocouple directly into the port to read temperature to within ± 2 deg.C over a wide range.

The reason why it shouldn't work is that the thermocouple produces a voltage of 4.28mV for 100 deg.C difference between the hot and cold junctions. The ADVAL function digitises the range 0 to 1800 mV in 4095 steps. Thus each step is equivalent to 0.44mV, or 10.3 deg.C. The way to make it work is to take a lot of readings and average them. At any given temperature the value given by ADVAL can be seen to be jumping apparently randomly between several values. By averaging a thousand or more readings intermediate temperatures are estimated surprisingly well.

THE SET UP

The experimental set-up consisted of some fine copper wire and some constantin of similar gauge. We had 40 gauge, which is very thin, later we used proper dual thermocouple wire. If you have separate copper and constantin, you will need about 2 metres of each type. Cut the copper wire in half and solder a piece to each end of the constantin to make two junctions. (Any two dissimilar metals will do, you can use copper and nichrome, the wire used in fire and iron elements.) The free copper ends are plugged into pins 8 and 15 of the Analogue In port, i.e. the two at the left hand end. See p.505 of the User Guide. Pin 8 is labelled AGND (0 volts) and pin 15 is CH0 which is the channel read by ADVAL(1). You should use a proper connector but we stiffened the ends of the wires by bending them back, and plugged them straight in, holding them in place.

In order to get a voltage out of the thermocouple you need a stable cold reference for one junction. This is easily provided by filling a thermos flask with ice cubes and covering them with

This specialist project proves the versatility of the BBC and provides an interesting example of dealing with analogue input to the computer.



cold water. The temperature of melting ice is 0 deg.C and it will hold steady while there is any ice left. Give it a good stir to get the temperature to 0 deg. and insert the cold junction. (You will soon find out which junction is which from the reading the thermocouple gives. Swap them if the answer comes out negative.

CALLIBRATION

The thermocouple response is

not quite linear, and each thermocouple needs individual calibration. The first thing to do is see the millivolt output of your thermocouple. Program 1 produces a value for the millivolt output averaged over 10000 readings. The value will be updated every 15 seconds or so.

LISTING 1

```
10 S:=0
20 FOR I:=1 TO 10000
```

```
30 S:=(S+INT(ADVAL(1)*100/364))
40 NEXT
50 M:=S/100/100
60 PRINT"Thermocouple output ";M;" mV"
70 GOTO 10
```

Start by placing both junctions in ice. The result should be zero, but we got a "zero" reading of 0.85 millivolts, this zero reading must be subtracted from subsequent readings. Other reference temperatures can be used to construct a calibration curve. Room temperature can be used to construct a calibration curve. Room temperature gave a thermometer reading of 25 deg.C, body temperature is 37 deg.C (thermocouple under the tongue) and a saucepan of boiling water gives 100 deg.C. For a higher temperature we melted some lead in an old pan for a reference at 324 deg.C. The observed values were fairly close to the tabulated standard thermocouple output once the "blank" value had been deducted. We plotted a calibration curve and used it to modify slightly the values in the standard table. A reasonable approximation to temperatures in the range 0 to 100 deg.C can be made by dividing the corrected millivolt reading by .042. We constructed a look-up table at 10 degree intervals up to 400 deg.C.

Program 2 prints out both the average millivolt reading and the temperature. Each cycle of 10,000 readings plus calculation of the temperature takes about 30 seconds to complete. Fewer loops will give shorter intervals between reading at the expense of some accuracy. Averages over 1000 readings are usually within 2 deg.C. of the mean value which may be good enough.

LISTING 2

```
10 MODE7:CLS
20 E:=4.28283
30 PRINT TAB(6,2)"TEMPERATURES BY THERMOCOUPLE"
40 PRINT TAB(4,6)"Temperatures updated
every 30 sec."
50 PRINT TAB(4,18)"Press (ESCAPE) to stop"
60 DIMT(41):DIM H(41)
70 X=INKEY(500)
80 CLS
90 PRINTTAB(2,5);CHR$(141)"Millivolts"
;TAB(16,5);CHR$(141)"Temp. Deg.C"
```

```

;TAB(2,6);CHR#1 41"Millivolts"
;TAB(16,6);CHR#141"Temp. Deg.C"
100 REM THERMOCOUPLE CALIBRATION TABLE
110 PROCCALIBRATE
120 MU=FNMU
130 temp%=INT(FNtemp(MV))
140 PRINTTAB(3,10);CHR#141;CHR#131;MU;TAB(17,10);CHR#141;CHR#131;temp%;TAB(3,11);CH
R#141;CHR#131;MU;TAB(17,11);CHR#141;CHR#131;temp%
150 GOTO120
160 DEF FNtemp(MV)
170 I%=0:REPEAT:I%=I%+1:UNTIL:M(I%)>MV
180 I%=I%-1
190 MU=(M(I%)/T(I%))
200 DEF FNFM
210 S%=0
220 FORI%=1TO10000
230 S%=S%+INT(ADVAL(1)*1001/364)
240 NEXT
250 =INT(S%/DIV100)/100-.05
260 DEF PROCCALIBRATE
270 DATA -10,-.38,10,.39,20,.85,30,1.28,40,1.7,50,2.15,60,2.55,70,3.0,80,3.36,90,3
.81
280 DATA100,4.2,110,4.75,120,5.23,130,5.71,140,6.2,150,6.7,160,7.21,170,7.72,180,8
.23,190,8.76
290 DATA 200,9.49,210,9.82,220,10.36,230,10.91,240,11.46,250,12.01,260,12.57,270,1
3.14,280,13.71,290,14.28
300 DATA 300,14.86,310,15.44,320,16.03,330,16.62,340,17.22,350,17.82,360,18.42,370
.19,03,380,19.04,390,20.25,400,20.87
310 FOR I%=1TO41
320 READ T(I%),M(I%)
330 NEXTI%
340 ENDPROC
    
```

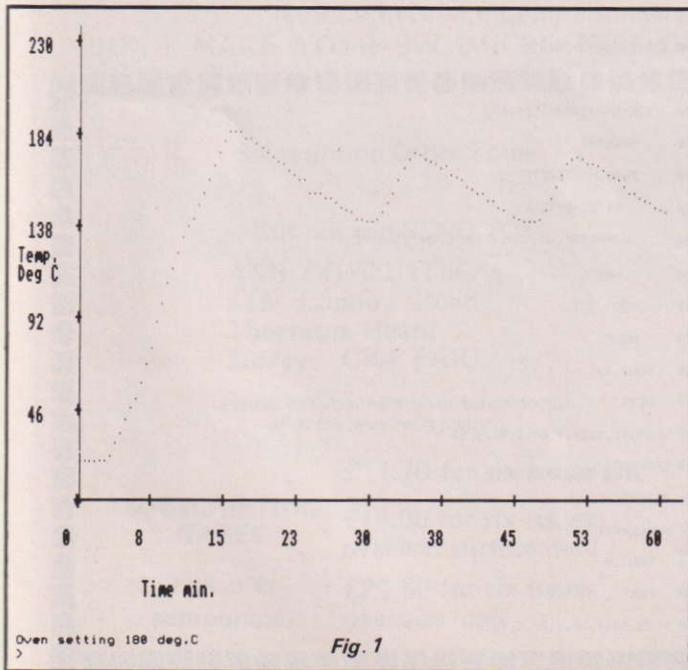


Fig. 1

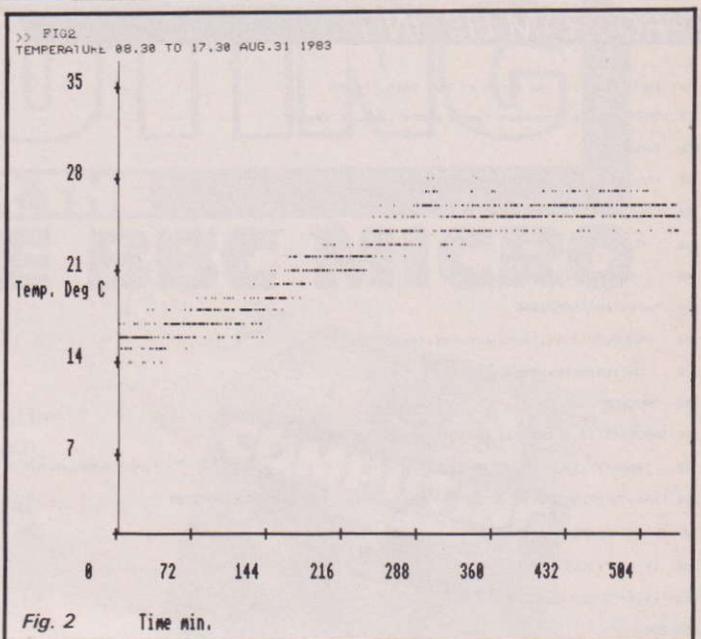


Fig. 2

MAKING IT WORK

Our first project (homework for an A level physics project) was mapping the temperatures within a candle flame. Although we could not calibrate the thermocouple at these temperatures it gave convincing values between 800 deg.C. in the yellow and 1150 deg. in the hottest, blue, part of the flame before it melted.

A more useful application was the measurement of temperatures in the kitchen oven, in the range 100 deg.C. to 280 deg.C. For this we developed Program 3 which incorporates a plotting routine and a screen dump for the NEC PC-80823BE-

C printer. The results were very revealing! We found the oven cycled over a range of about 40 deg. over heating-cooling cycles of 20 minutes. (Fig.1) and the mean was about 20 degrees too low (Fig.1). No wonder my wife was complaining!

Finally we put it to the test of following the air temperature during the day and obtained the plot shown in Fig.2. Although there is some scatter of values it is fairly easy to estimate the temperature to the nearest degree, even in this narrow range.

Now when anyone asks of the computer "But was use is it?" we are at least able to offer one genuine application in the home. There must be some more if only we can think of them!

PROGRAM LISTING 3

```

10 MODE0
20 CLS
30 PRINT TAB(6,2)*"TEMPERATURES BY THERMOCOUPLE"
40 PRINT TAB(2,6)*"Temperatures updated every 30 sec."
50 PRINT TAB(4,10)*"Press <ESCAPE> to stop"
60 DIMT(41):DIM M(41)
70 PROCCALIBRATE
    
```

CONTINUED OVER

PROGRAM LISTING

```

90 INPUT "Enter duration of run (min.)*dur%
91 INPUT "Enter maximum temperature (deg.C)*tmax%
100 TIME=0
110 PROCAXES(dur%,tmax%)
120 REPEAT
130   MV=FNMV
140   temp%=INT(FNtemp(MV))
150   minutes=TIME/6000
160   PROCPLLOT(dur%,tmax%,minutes,temp%)
170   UNTIL minutes>dur%
180   PROCBEEP
190 INPUTTAB(16,2)"Do you want to print out?(Y?N)*A$
200   IF A$="Y" THEN PRINTTAB(16,2) "          ";PROCCLUMP:A$="N"
210 IF A$="N"PRINTTAB(16,2)"Do you want to run again?(Y?N)":INPUTB$
220 IF A$(C)"N"AND A$(C)"Y"THEN190
230 IF B$="Y"CLS:GOTO800
240 IF B$="N"CLS ELSE210
250 END
260 DEF FNtemp(MV)
270 I%=0:REPEAT:I%=I%+1:UNTIL(M(I%))>MV
280 I%=I%-1
290 =MV/(M(I%)/T(I%))
300 DEF FNMV
310 S%=0
320 FOR I%=1 TO 10000
330   S%=S%+INT(ADVAL(I%)*100IV364)
340 NEXT
350 =(S%/DIV100)/100-.85
360 DEF PROCAXES(A%,B%)
370 CLS
380 IF A%<10 THEN C%=10 ELSE C%=A%
390 @%=0
400 VDU5
410 VDU29,120;200;
420 MOVE 0,0:DRAW1200,0:MOVE0,0:DRAW0,1000
430 FOR I%=0 TO 16 STEP 2:MOVE(I%*70-12),12:PRINTCHR#43:NEXT
440 FOR I%=0 TO 16 STEP 2:MOVE(I%*70-32),-50:PRINT INT(C%*I%/AX%/16+.5)/C%:NEXT
450 FOR I%=0 TO 5:MOVE-10,(I%*160+10):PRINTCHR#45:NEXT
460 FOR I%=1 TO 5:MOVE-100,I%*160:PRINT INT(I%*XB%/5+.5):NEXT
470 VDU4
480 PRINT TAB(0,12)"Temp.":PRINTTAB(0,13)"Deg C"
490 PRINT TAB(15,30)"Time min."
500 ENDPROC
510 DEF PROCPLLOT(A%,B%,C,D%)
520 REM A% IS DURATION OF RUN
530 REM B% IS MAXIMUM TEMPERATURE
540 REM C% IS TIME IN MINUTES
550 REM D% IS TEMPERATURE
560 PLOT69,1120*CX/AX,800*DX/B%
570 ENDPROC
580 DEF PROCBEEP
590 D%=TRUE:REPEAT:TIME=0:REPEAT
600   UNTIL INKEY(-74)=-1 OR TIME>200
610   IF TIME>200 THEN VDU7 ELSE D%=FALSE
620   PRINT TAB(16,2)"Run finished,press <RETURN>"
630   UNTIL D%=FALSE
640 ENDPROC
650 DEF PROCCLIBRATE
660 REM THERMOCOUPLE CALIBRATION TABLE
670 DATA -10,-.38,10,.39,20,.85,30,1.28,40,1.7,50,2.15,60,2.55,70,3.0,80,3.36,90,3
.81
680 DATA100,4.2,110,4.75,120,5.23,130,5.71,140,6.2,150,6.7,160,7.21,170,7.72,180,8
.23,190,8.76
690 DATA 200,9.49,210,9.82,220,10.36,230,10.91,240,11.46,250,12.01,260,12.57,270,1
3.14,280,13.71,290,14.28
700 DATA 300,14.86,310,15.44,320,16.03,330,16.62,340,17.22,350,17.82,360,18.42,370
19.03,380,19.64,390,20.25,400,20.87
710 FOR I%=1 TO 41
720   READ T(I%),M(I%)
730 NEXT I%
740 ENDPROC
750 DEF PROCCLUMP
760 ON ERROR PROCError:END
770 VDU2,1,24,1,13,1,10,1,27,1,84,1,49,1,54,1,27,1,91
780 FOR Y%=0 TO 200 STEP 16
790   VDU1,27,1,83,1,48,1,54,1,52,1,48
800   FOR X%=-120 TO 1159 STEP 2
810     BYTEX%=0
820     FOR Y%=15 TO 0 STEP -2
830       BYTEX%=BYTEX%/X2
840       IF POINT(X%,Y%-Y%)>0 THEN BYTEX%=BYTEX%+1
850     NEXT
860     VDU1,BYTEX%
870     NEXT
880     VDU1,13
890     NEXT
900     VDU1,12,1,27,1,84,1,50,1,52,3
910   ENDPROC
920 DEF PROCError
930 FOR E%=-XX TO 640
940   VDU1,0
950   NEXT
960   VDU1,13,1,10,1,27,1,93,3
970 ENDPROC

```

A&B COMPUTING

FOR THE USER OF THE BBC MICRO

A&B Computing is a new bi-monthly publication dedicated to users of the BBC Micro.

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clubs

Corner



Find out the hottest spots to learn about the BBC Micro. Are there any in your area?

It's easy to feel you are alone when you are sitting in front of your micro wondering why it won't do what you think you've instructed it to do! But you need never be alone again. User groups are springing up all over the place and can be an invaluable source of help, enjoyment and inspiration.

We list here some of the clubs that are particularly interested in the BBC Micro. If you don't see one in your area, why not start one up and let us have details? Please remember though, that this list is by no means comprehensive.

BEEBUG

The National Independent User Group for the BBC Micro
33 St. Julians Road,
St. Albans,
Hertfordshire.
Contact: D E Graham or
Sheridan Williams

BEEBUG runs a regular newsletter (10 issues a year) including program listings, hardware and software tips, reviews and advice, all exclusively devoted to the BBC Micro. Membership is available for £4.50 for six months or £8.50 for the full year's subscription.

KINGS LYNN AND WEST NORFOLK BBC MICRO USER GROUP

Norfolk College of Arts and Technology,
Tennyson Avenue,
Kings Lynn.
Tel: 61144 ext. 323

PETERBOROUGH PERSONAL COMPUTER CLUB

Tel: 0733 44342 after 5pm.
Contact: Andrew Pike

The club meets at Crosfield Electronics Social Club, fortnightly on Mondays. BBC Micro users welcome.

COMPUTER USERS CLUB

72 Sidmouth Road,
Welling,
Kent DA16 1DS.
Tel: 01-304 3910
Contact: Tony Latham

The club produces a monthly printout of software ideas for the BBC Micro, programs and advice on programming technique.

CATERHAM LEISURE CENTRE COMPUTER CLUB

Caterham Leisure Centre,
Godstone Road,
Caterham,
Surrey CR3 6RE.
Tel: Caterham 48304
(M Goldsbrough) or
Caterham 43316 (J Hodges)
Contact: M Goldsbrough
(Centre Manager) or J Hodges

The club has started at the Leisure Centre which has a Model B BBC Micro available. Meetings are on Thursday nights at 8.00 pm and new members

(and their micros) are welcome to come along.

THE FAREHAM AND PORTSMOUTH AMATEUR COMPUTER CLUB

23 Sandy Close,
Petersfield,
Hants GU31 4HF.
Tel: 0703 4059 (evenings)
Contact: Peter Smith

Established back in 1980, the Fareham and Portsmouth Amateur Computer Club have recently organised a referral service and a Users Club for the BBC Micro. The group meet at 7.00 pm on the third Monday of each month at the Portchester Community Centre.

THE COMPUTER REFERRAL SERVICE

PO Box 7,
London W3 6XJ

This acts as a central clearing house for information about the BBC Computer Literacy Project. Please remember to enclose a

large SAE and, most important, to write on your envelope just what information you require: User Groups, Software, General Query, etc. They have also published a large number of factsheets about various aspects of the project: regional groups, suggested books, micros and the small business, micros and education, and jobs in computing. These are available free on receipt of a large SAE—again please mark it clearly.

BBC NORWAY

O-Inform
PO Box 716
N3191 Horten
Norway

The Scandinavians have shown great interest in the BBC micro along with most of Europe. In Norway Oivind Grenness has decided to set up a club. Contact him at the above address.

PRESTON BBC USER GROUP

8 Briar Grove
Ingol
Preston PR2 3UR
Contact: Mr D. Coulter

POTBUG BBC USERS GROUP

8 St George's Avenue
High Lane
Tunstall
Stoke-on-Trent
Tel: 818499
Contact: Mr M. G. Forster

WEST HERTS 80 USERS ASSOCIATION

St. Stephens Parish Centre
Station Road
Bricketwood

The West Herts 80 Users Association has decided to start a BBC unit sub group. This will allow them to maintain bulk purchase schemes and membership of the BBC computer literacy scheme of which the Association is a member.

As an Association, with a constitution, bank account, regu-

CONTINUED OVER



lar premises and organisational experience, the unit can offer a service to BBC users who want their own club.

R. C. Smith, the Herts Association secretary, tells us that the present venue is just off the A405 near St. Albans, within easy access of the A5, M1, M10 and A1.

The present membership comes from the local area of Hemel Hempstead, Tring, St. Albans, Watford, Hatfield and from as far away as Ware, Loughton in Essex, Slough and Uxbridge. They also have a few Londoners for good measure.

NORWICH & DISTRICT BBC MICRO USER GROUP

Department of Electronics
Norwich City College,
Ipswich Road,
Norwich NR2 2LJ
Tel: 0603 60011 ext 231
Contact: Paul Beverley

Meetings are held at Norwich City College twice a month during term time. On the first Tuesday of each month a visiting speaker takes part. On November 1st Mr Chris Pointeer and Mrs Diana Thomson survey educational software. On the third Tuesday of each month there is a workshop. All meetings take place at 7.00pm. The first session is free, thereafter you pay the subscription of £3.00 (students and OAPs £1.50).

ACORN COMPUTERS USERS CLUB

BP 325
1000 Brussels 1

Monsieur Meerts writes to us from Brussels: "The BBC Micro is an enormous success in the whole world, including Belgium. In this country, owners of the BBC still tend to think they are unique. They're not. A users club is already in existence."

Apparently the club issues a monthly newsletter full of infor-

mation and programs and has bi-monthly (to coincide with the publication of A & B?) meetings in Brussels and several provincial cities.

Anyone interested in becoming a member can obtain a free copy of the latest newsletter if he/she applies to the above address.

Contact: Jean-Louis Meerts, Rue de la Sympathie, 24, B-1070 Brussels.

GARFORTH BBC USER GROUP

1 Manley Court
Garforth
Leeds LS25 2HY
Tel: 0532 860594
Contact: Dave Carlos
(Chairman)

Garforth User Group is an organisation dedicated to helping and educating owners of the BBC Micro and in future owners of the Electron. Meetings are held in the Welfare Hall, Garforth, on the first and third Tuesdays of the month.

The first Tuesday usually involves some instructions for all abilities, beginners to advanced programmers. The second session takes the form of a lecture or question and answer discussion.

The club offers family membership at £2.00 per annum and 30p a session. There are currently 30 family groups taking part. The club also likes to arrange interesting social events, like their recent visit to a mainframe installation.

WELLINGBOROUGH USER GROUP

49 Addington Road
Irthlingborough, Northants
NN9 5ST
Tel: Wellingborough 650883
(Evenings)
Contact: R. Houghton

A new club for users of the BBC in the East Midlands.

CARDIFF BBC COMPUTER CLUB

Cardiff University College
CBCC, 2 Whitcliffe Drive,
Penarth,
South Glamorgan
Tel: 0222 701023
Contact Geoff Barker,
Chairman

The Cardiff Club holds regular meetings at the university and welcomes all owners of a BBC micro, from beginners to old hands.

NORTH LONDON BBC MICRO USERS GROUP

Dept. of Chemistry
Westfield College
University of London
Kidderpore Avenue
London NW3 7ST
Tel: 01-435 0109
Contact: Dr Leo McLaughlin

BBC USERS GROUP OF CANBERRA

5 Hatfield Street
Evatt ACT: 2617
Australia
Tel: (062) 58 7719

Just one of the increasing number of clubs down under reflecting the international success of the BBC. Contact Steve McLeod at the above address.

LiveShow

Mark Webb/Clive Grace

How does it go? Never work with animals or children. I think all those concerned with the recent BBC live show spectacular would want to include microcomputers in this show-business advice. We at home know how petulant they can be and that's just loading and saving games and simple programs. Much of the 'state of the art' demonstrations on the live show involved interfacing with other complex equipment, be it alongside the micro or a main-frame many miles away.

Millions of people watched, some fascinated, some in awe. The public response to this programme was exceptional from the very first hints in the media that it was going ahead. Over 200,000 letters were received containing friendly suggestions and requests for tickets. Representing us in the studio was an audience of 40 including 15 specialists, all invited for the enthusiasm or special interest they had shown in their original letters.

ON THE SPOT

In the audience was our reporter Clive Grace. He presented himself at Television Centre for 9.30 am with the ticket (and small map) sent to him by the BBC. After waiting around and casually chatting with fellow guests, he was ushered into the main building and into a studio where the camera crew and floor technicians were busily putting the final touches to the scenery.

Joe Public's other route into Television Centre was by telephone. The lines were open from about half past ten but some calls had already been lined up. Any particularly interesting or relevant call was immediately noted down and the caller asked to wait. The gist of the question was then taken, at a run, up from the conference room (where the telephones were situated) to the studio. The articulate caller was then re-contacted and heard studio sound until cued for his/her hard won question. Mike Cocker, the producer, maintained a stack of four questions/comments throughout.

Although experienced

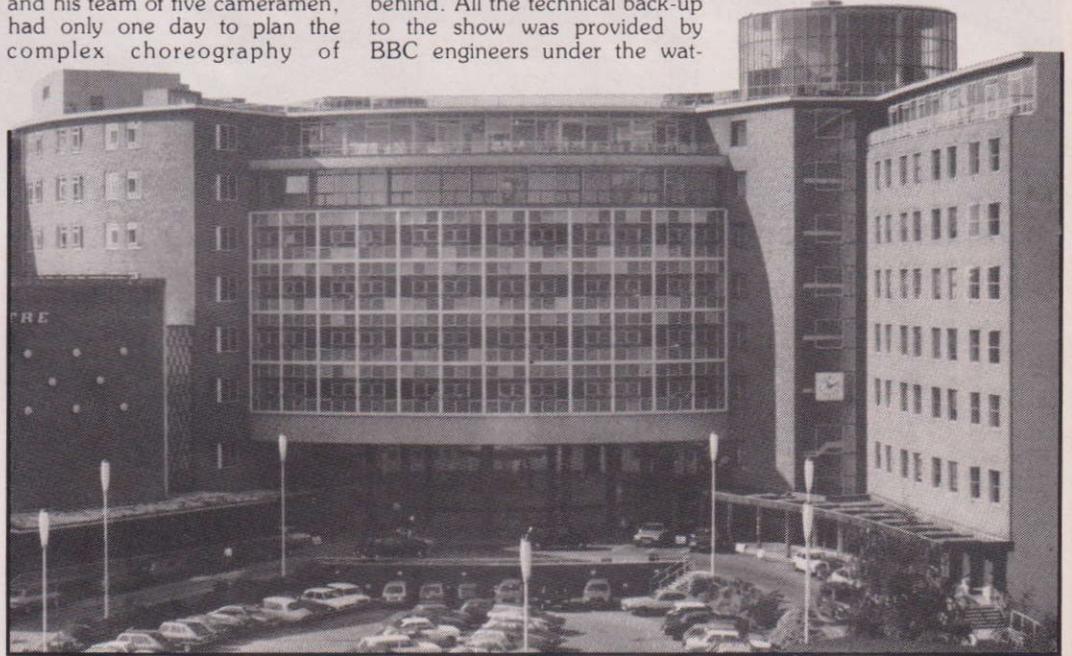
The BBC continued their excellent coverage of the microcomputer world with their Autumn live show. We look back behind the scenes and in front of the cameras.

presenters, Mac and his team were all new to live television. They, the director Mike Binney and his team of five cameramen, had only one day to plan the complex choreography of

the spot where the various set-piece demonstrations were wheeled on from the workshops behind. All the technical back-up to the show was provided by BBC engineers under the wat-

Just think back and imagine how many cables and plugs had to be threaded along the floor and into the correct connection. It was also necessary to actually change connections on air with no room for error, live on a Sunday morning.

Nor was there any backing down in the face of technological problems. The tele-software down-load was done without cheating. The UHF signal was coming from two studios away because, quite naturally, the studio is shielded and the signal impossible to get within the four walls. They could have used a



camera positions and cues.

A major problem with which they had to cope was the fact that their studio (TC3) can handle only eight channels at any one time and for this programme there were 14 separate sources. That's where the cable switching came in.

TRIPPING OVER THE TECHNOLOGY

In front of the banked audience was the interview position and

chful eye of Chris Lowrie. Chris is all too aware of the problems involved in handling sensitive microcomputers and peripheral equipment. He knows what a bumpy half-mile journey in the back of a BBC van can do unless great care is taken. The disc based software is also threatened by the harsh studio environment. The scene-hands were apparently used to manhandling props but of course this sort of equipment can't be thrown about.

Another headache was organising the connections between various pieces of hardware.

video feed which would have been unnoticeable but, to their credit, went for authenticity.

The only prerecorded studio sequence was done on the Saturday before and involved the video sub-titling demonstration. The BBC themselves use some powerful software written by Ian Trackman to control caption generating hardware. Mac showed how a home video system could achieve parallel results and apparently the hardware (design-

CONTINUED OVER



ed by Tim Vaugh) and Ian Trackman's controlling software may be marketed commercially, costing well under £100. One of the next surges in the home-computer market may be in this very direction. Already the equipment is available to capture input from a video camera, put it on your television screen and carry out editing and retouching with a lightpen.

Back to Clive in the audience. He recognised the format of the special since it followed much the same path as the 'Making the Most' series. Dave Ellis went deeper into the subject of sound sampling and demonstrated this with an Apple system linked up to a sampler. Rumours were that he was to bring along a BBC equivalent but unfortunately the gremlins struck because his version was far from a production model. We live in anticipation.

As far as the audience perceived, everything went entirely as it should. The 'Hackers' traditionally hacked their way

through the live electronic mailbox system and quite conveniently provided a lighthearted prelude to the subject of system security.

ELECTRONIC VANDALISM

John Coll had threatened to open up a whole new electronic adventure with his demonstrations of 'cracking' mainframe computer installations. This is a potentially dangerous area. 'Electronic vandalism' is what an American consultant on computer crime called it.

In the United States there are thousands of electronic bulletin boards, some with names like Pirate's Cove and Secret Service. Those using them take on exotic pseudonyms and offer to swap access codes to nuclear research centres and even the Dow Jones computer. The authorities accept that 'technological trespass' is widespread and they are worried that intruders could cause considerable damage to fragile databases. It appears that every high school and college that

teaches computer technology has kids doing this sort of thing.

Expert John Vince from Middlesex Polytechnic brought us up to date with the exciting possibilities for graphics which our micros open up. More down to earth however was the glimpse of the not too distant future which the Oxford Exam Board are already realising. Nine hundred schools, some with nine hundred entries in up to one hundred and fifty subjects used to dutifully fill in the appropriate forms each year. The paper based information was put onto the tape of a mainframe for processing and returned to the schools on paper again.

Why? when all schools now have at least one micro. They answered the question with some user-friendly software to help the form filling process, auto-checking of subject code numbers and security through identity codes. The result is a disc sent to the mainframe and better facilities for the teachers. Each year they save 25p per candidate and soon direct micro to mainframe communication will cut out any need for hard copy, except for back-up

records at the individual schools.

Meanwhile the task programmers were keying away at their round table. They consisted of two Acornsoft programmers on the BBC (surprise) and two Research Machine's programmers on the Link 480Z plus a Sinclair Spectrum. It was also nice to see the item on non-keyboard input for the young and disabled and the return to see Chris Webb, the head of Nottinghamdale ITEC, the first in the country.

The audience, mainly consisting of teachers and teachers' wives apparently, had plenty to say to Kenneth Baker. The minister had originally been booked to make a speech but insisted on taking a more involved role.

After the show our correspondent chatted to the presenters and partook of the refreshments. By the way, the food was impeccable so don't believe everything Terry Wogan says. We can only hope that the results of the competition announced towards the end of the show will provide an excuse for another Live Special.

Flagger

At the time when Napoleon was trying to persuade the peoples of Europe to join his version of the Common Market, the tiny village state of *Oeufauvisage* occupied a precarious position on what was then the border between France and Holland.

Forever on the verge of invasion by one or other of the great rivals, the local count had a flag made up of stone blocks which could easily be set out to form the flag of whichever power was looming over the horizon.

The keepers of the flag stones, two BLOCKHEADS, had simply to select one block and, thanks to the power of the local witch, it and another would change colours according to the wording of her spell – or curse as the blockheads came to believe it was.

By a careful choice of stones and switches it was possible to change one flag into the other in double-quick time. Possible – but something the blockheads never managed to do before the invaders arrived and took umbrage at the insult to their national banner, with the usual dire consequences for the locals.

Now, thanks to the power of the BBC Micro, you can exercise your own magic wand and see if you can do better.

Type in the program and promote yourself to CHIEF BLOCKHEAD! At each turn you will be asked to select a block by an INPUT of the COLUMN and ROW numbers and then to choose one of three types of switch (A,B, or C).

Your aim is to change the graphic representation of the French Tricolour into the horizontal RED, WHITE, BLUE of the Dutch Flat in as few moves as possible.

(The three flags are not true representations, the white strip is of double width to fit the lawn outside the village inn.) We could be kind and explain exactly how the witch's spell works. The three choices are simple, logical and consistent. But, like Bonaparte, we feel a fit of the vapours coming on and will leave you to work out just what happens at each move – either by a trial RUN of

How many moves will you take to solve this Brain-teaser? Puzzle over our program and why not send in your ideal solutions to A&B



the program or a careful study of PROCSWITCH.

The program generously allows you one hundred moves before giving up recording your effort but the changeover can be effected in a lot, lot fewer moves than that.

So, what kind of a blockhead are you?

Just how few moves do you need to take?

PROGRAM NOTES

The program has been deliberately designed to be as short as possible and uses only elementary techniques and features of BBC BASIC.

There are no irritating sound effects and you will definitely not be zapped!

The program runs in MODE 5 and should work on both A and B models.

LINES 150 to 190 redefine colours two and three to give RED,WHITE,BLUE in numerical sequence and also to define text and graphics windows.

LINES 200 to 260 set up the initial display of the french flag shown by sixteen colour rectangles in a 4 x 4 array, numbered for reference horizontally and vertically.

The main program runs from LINES 280 to 430. An INPUT for column and row is requested, each repeated until valid entries are made. The third INPUT is for choice of move, A,B, or C, each of which has a different effect.

PROCSWITCH effects the change according to all three inputs. All that will be revealed here is that each move changes the colour of two rectangles – the one selected by input and another determined by the choice of move. RUNNING the program disguises this to some extent as, on occasions, a block is changed to the colour it already is!

The three choices are simple, logical constructions and the effect of each can be completely determined from the listing –

CONTINUED OVER

there is no random factor involved.

LINES 390 to 400 add the last move to the solution array for printing when the puzzle is finally solved.

LINE 420 calls PROC-CHECKSOLVED which checks the colour of the rectangles in rows against the required solution colour.

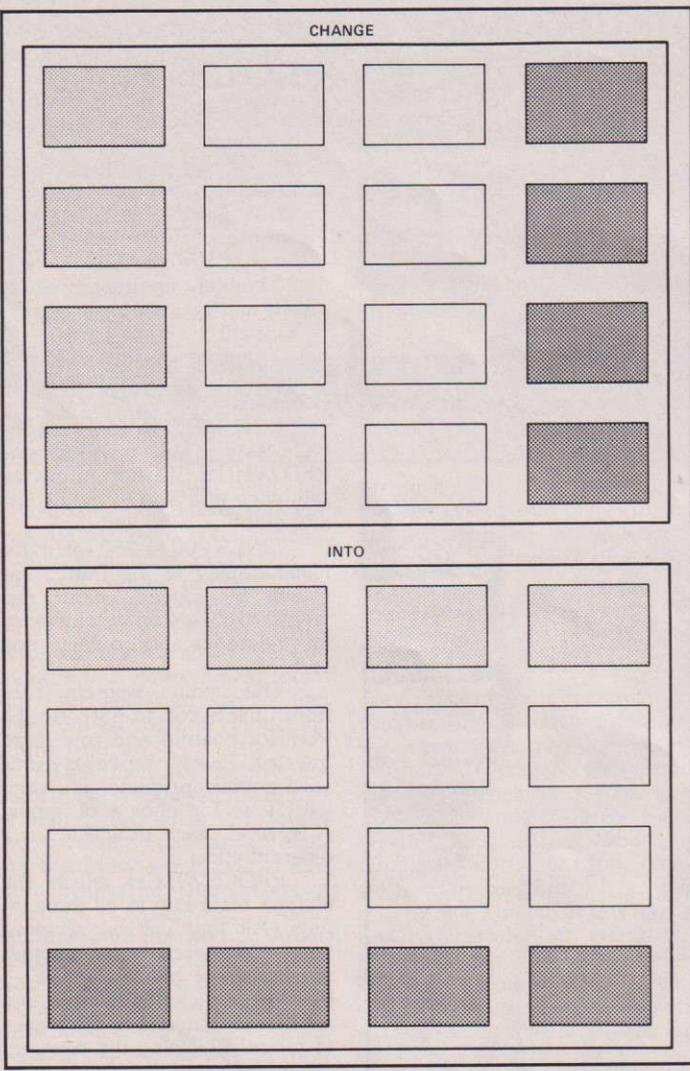
Any failure ends the check without the test going on to other rows.

The program loop REPEATS until PROC-CHECKSOLVED makes FLAG%=1. LINES 440 to 490 print the number of moves taken, a list of moves made and invites another attempt.

```

150 MODES
160 VDU 19,2,7,0,0,0
170 VDU19,3,4,0,0,0
180 VDU24,0,0,1279,864,
190 VDU28,0,4,19,0
200 FOR Y=100 TO 700 STEP 200
210 PROCBOX(100,Y,1):PROCBOX(350,Y,2):PROCBOX(600,Y,2)
   :PROCBOX(850,Y,3)
220 NEXT Y
230 @%=00001
240 VDU5 :GCOL0,2
250 FOR X=200 TO 950 STEP250:MOVE X
   ,50:PRINTINT(X/200):NEXT
260 FOR Y=175 TO 775 STEP 200:MOVE1200,
   Y:PRINTINT(Y/175):NEXT
270 VDU4
280 REPEAT:COLOUR2
290 REPEAT
300 CLS: INPUT TAB(0,2)"WHICH COLUMN..",column%
310 UNTIL column%>0 AND column%<5
320 REPEAT
330 CLS: INPUTTAB(0,2)"WHICH ROW..",row%
340 UNTIL row%>0 AND row%<5
350 REPEAT
360 CLS:INPUT TAB(0,2)"WHICH MOVE (A,B,C)..",move$
370 UNTIL ASC(move$)>64 AND ASC(move$)<68
380 PROC SWITCH(column%-1,row%-1,move$)
390 count=count+1
400 sol$(count)=STR$(column%)+STR$(row%)+move$
410 FLAG%=0:CHECK%=0
420 PROC CHECKSOLVED
430 UNTIL FLAG%=1
440 MODE7
450 PRINTTAB(0,10)"You have solved it in ";count;"moves."
460 FORX=1 TO count:PRINTsol$(X);" ";:NEXT
470 PRINT:INPUT"Another try (Y/N)",A$
480 IF A$="Y" THEN RUN
490 END
500 DEFPROCBOX(A,B,COL%)
510 GCOL0,COL%
520 MOVE A,B:MOVE A+200,B:PLOT85,A+200,B+150
530 MOVE A,B+150:PLOT85,A,B
540 ENDPROC
550 DEFPROCSWITCH(c%,r%,m$)
560 LOCAL colA%,colB%,cA%,rA%
570 cA%=250*c%+100:rA%=200*r%+100
580 colA%=POINT(cA%+50,rA%+50)
590 IF m$<>"A" THEN 620
600 colB%=POINT(1000-cA%,850-rA%)
610 PROCBOX(cA%,rA%,colB%):PROCBOX(950-cA%,
   800-rA%,colA%):ENDPROC
620 IF m$<>"B" THEN 690
630 LOCALcB%,rB%
640 cB%=250*r%+100:rB%=200*c%+100
650 colB%=POINT(cB%+50,rB%+50)
660 colA%=(colA%+1) MOD4:IF colA%=0 THEN colA%=1
670 colB%=(colB%+1) MOD4:IF colB%=0 THEN colB%=1
680 PROCBOX(cA%,rA%,colB%):PROCBOX(cB%,rB%,colA%):ENDPROC
690 LOCAL cc%,rc%
700 c%=(c%+1) MOD4:r%=(r%-1:IF r%=-1 THEN r%=3
710 cc%=250*c%+100:rc%=200*r%+100
720 colB%=POINT(cc%+50,rc%+50)
730 colA%=colA%-1:IF colA%=0 THEN colA%=3
740 colB%=colB%-1:IF colB%=0 THEN colB%=3
750 PROCBOX(cA%,rA%,colB%):PROCBOX(cc%,rc%,colA%):ENDPROC
760 DEFPROC CHECKSOLVED
770 FOR X=150 TO 900STEP 250
780 IF POINT(X,150)=3 THEN CHECK%=CHECK%+1
790 NEXT
800 IF CHECK%<4 THEN FLAG%=0:ENDPROC
810 FOR X=150 TO 900STEP250
820 IF POINT(X,350)=2 THEN CHECK%=CHECK%+1
830 IF POINT(X,550)=2 THEN CHECK%=CHECK%+1
840 NEXT
850 IF CHECK%<12 THEN FLAG%=0:ENDPROC
860 FOR X=150 TO 900STEP250
870 IF POINT(X,750)=1 THEN CHECK%=CHECK%+1
880 NEXT
890 IF CHECK%<16 THEN FLAG%=0:ENDPROC
900 FLAG%=1:ENDPROC

```



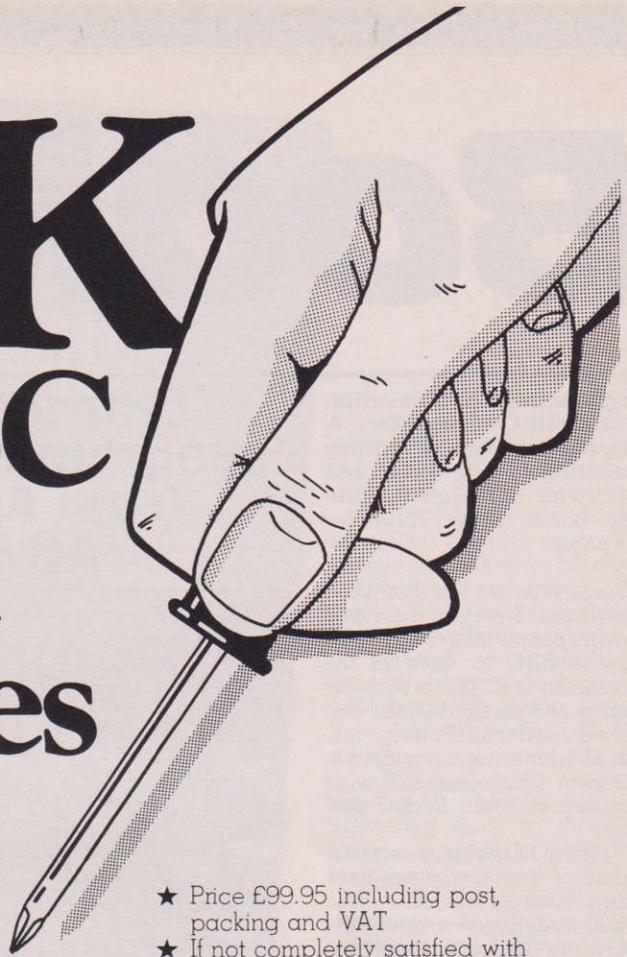
PROGRAM LISTING

```

100 REM***FLAGGED***
110 REM***BY TREVOR TRURAN***
120 REM***AUGUST 1983***
130 REM***COPYRIGHT RESERVED***
140 DIM sol$(100)

```

Add 20K to your BBC micro in five minutes



- ARIES-B20 -

Features

- ★ Adds 20K of useable RAM to your BBC Micro
- ★ Run programs up to 28K long in ANY SCREEN MODE
- ★ Extra memory can be used directly from BASIC I and II, VIEW 1.4, FORTH, LISP, and many other existing programs
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BBC Micro - can be removed at any time

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- ★ If not completely satisfied with your purchase, we will refund your money in full providing you return the ARIES-B20 in good condition in its original packaging within 14 days

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Also available IEEE-488 interface.
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Bookshelf

Programming for Education on the BBC Computer, A Handbook for Primary Education by John Scriven and Patrick Hall. Published by Sunshine Books. Price: £5.95 for 213 pages.

A book such as this has been sorely needed and long awaited by many people interested in putting the BBC to work in the educational field. It is a book for teachers and parents by teachers, John Scriven and Patrick Hall, both of whom use computers in their own classrooms and write their own excellent BASIC programs.

First of all they give us a brief resumé of how computers have become such an important piece of school equipment and why the BBC Micro has proved particularly appropriate for the educational environment.

The authors explain that the educational (aimed at primary school ages) and programming content develops as the book goes on, from simple arithmetic tests to true interactive simulations.

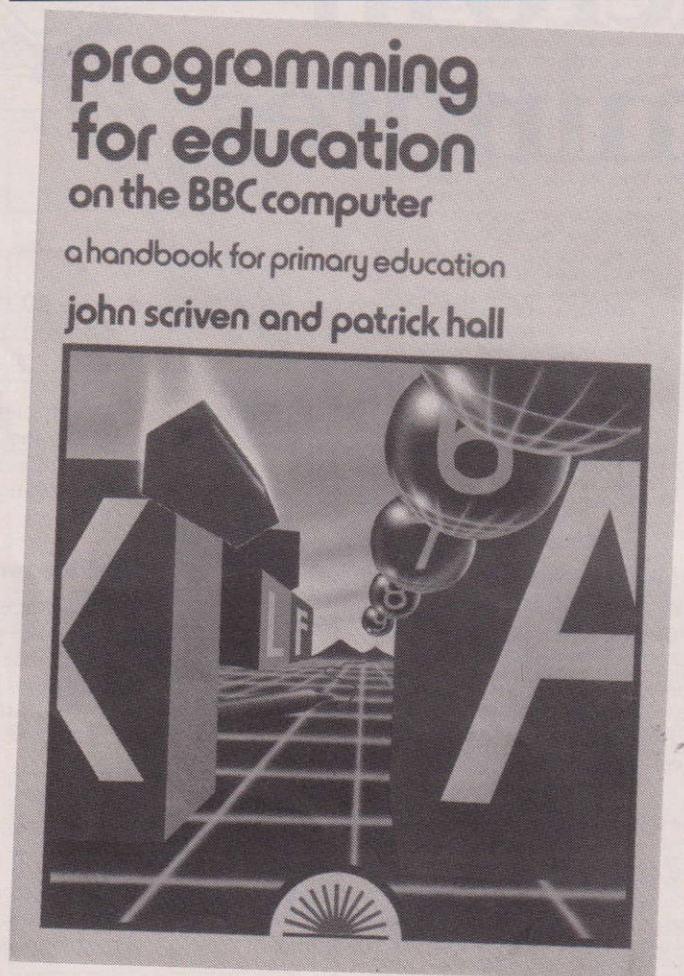
The first chapter of programs, starting with Maths, introduces some of the BBC's graphics and sound capabilities but emphasises the care that has to be taken to use these devices to motivate and not to distract.

Each program in the book is fully explained after the BASIC listing (all dumped to a dot matrix printer by the looks of things and all crystal clear). This explanation is aided by the modular form of all the programs. Every step is formulated as a procedure and this means that useful routines like circle drawing and upper to lower case conversion will find their way into the readers' own programs.

As well as presenting programs to test numerical skills like Bingo Factor and Firework, the authors venture into the area of English skills in chapter five (Words, Words, Words).

Characters are handled very much the same as numbers by the computer and the same advantages accrue. The programs take full advantage of the computer's ability to check input, pro-

Learned tomes on programming your BBC, from Assembly to Adventure.



mpt helpfully and congratulate success. Hangman, Anagram, Cloze and Opposite all deal with different aspects of basic spelling and comprehension skills.

An Angle on Fractions is a self-explanatory chapter title. The programs Angle, Fractions and Cancel are beginning to get longer but remain fully structured and therefore fully comprehensible. The main programs consist only of calls to PROCs within a REPEAT UNTIL loop. Helpful REMinders appear in all the right

places. The explanation includes clear diagrams of how the user-defined characters have been built up, the use of flags to signal a certain status as true or false and tests on the content of answer input.

For someone new to BBC BASIC, the clear description of simple PROCs which pause or erase are a revelation. Seeing the various bits of code in the context of a working program is often akin to the biblical scales falling from the blind-man's eyes.

The content of DATA statements is also documented so that, as the reader gets more adventurous, these may be changed appropriately.

The authors themselves are not lacking in good programming ideas either. The method used to draw and fill block graphs by producing different graphics windows is marvellously simple and effective.

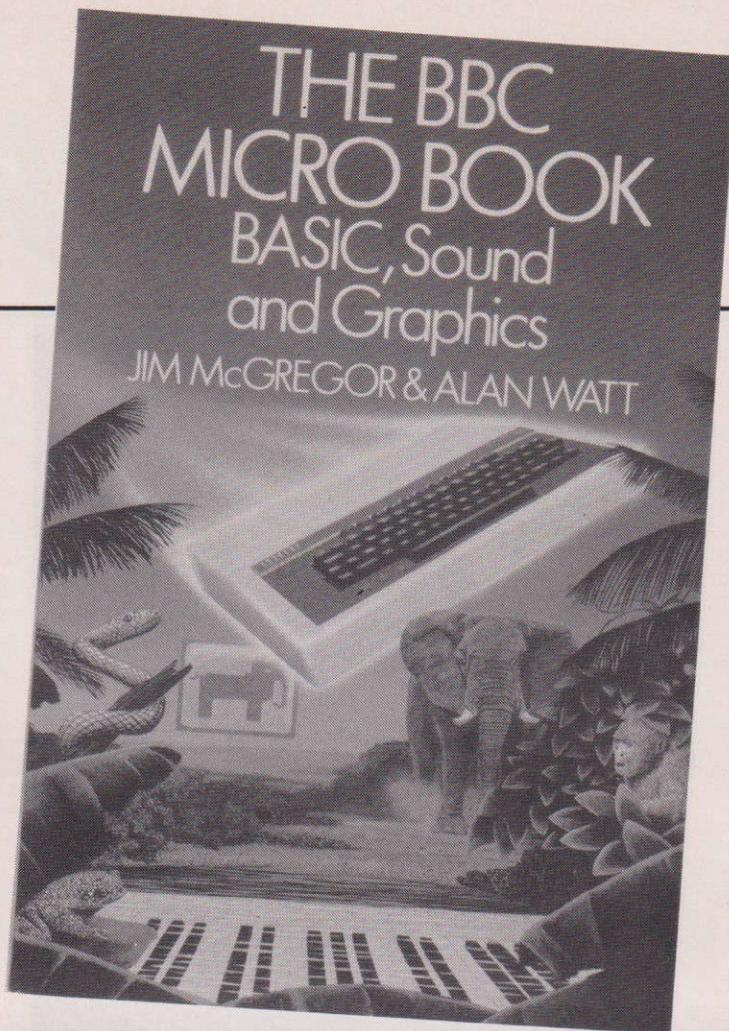
Graph and Piechart form chapter eight, Graphic Descriptions. Information display is clearly an important function which the computer can perform in various subject areas and this is a good introduction.

Story Time provides two programs, Story and Gosh, which are designed to stimulate creative writing. Story concentrates on the use of adjectives. The chapter actually begins with the alarming question "Can a computer be creative?" My answer would be a firm 'no' but these programs make it clear that the computer can be a friendly tool in the hands of young children.

Treasure, Hunt and Ricochet all introduce new programming points into games which teach logical reasoning and problem solving. They also act as a stimulus for discussion and the pooling of ideas. This group discussion around the computer, often a logistic necessity in schools, is proving a most valuable offshoot of having a computer in the classroom.

The final set of programs simulate an excursion on the river, electricity generation, probability and Pascal's triangle. I agree with the authors that in computer simulation we have the most effective application of the machine's powers. The imagination goes haywire just considering the possibilities. Of course it will all take time and cost money but in the meantime this book offers us a taste of things to come.

The final chapter offers helpful advice on how to spread the small amount of computer time available, where to set up and how to secure the valuable equipment. All in all an excellent volume for all concerned in educational computing.



The BBC Micro Book by Jim McGregor and Alan Watt. Published by Addison-Wesley. Price: £7.95 349 pages.

The sub-title of this book is "BASIC Sound and Graphics", and presumably reflects the way in which the authors view the grouping of material within. There are no subsections marked in the contents however and I think it is fair to say that the first eight chapters concern themselves with BASIC (BBC BASIC), and chapter 10 with sound and chapters nine and eleven with graphics. The BASIC chapters are an introduction to the language as it is implemented on the BBC. Sensibly, input and output (in the form of PRINTing) are dealt with first. Variables, elementary layout and graphics come next, plus an explanation of READ and DATA.

Further chapters investigate the more complex structures available, the use of logical operators, mathematical operations, arrays and colour. The culminating chapters introduce procedures and functions plus a comprehensive guide to Mode 7.

As a guide to anyone setting out to learn about their BBC these chapters would be hard to beat. The explanations are comprehensive and clear with examples of BASIC listing and instances of what to expect on the screen. The actual format of the book makes the visual connection between text, listing and screen shot very easy indeed. Apparently the authors themselves set the book in Bookface Academic using SROFF, the text processing system at the University of Sheffield.

There is also extensive use of block diagram to make loop operations clear to the beginner and plenty of advice on exercises, which are aimed at different levels of expertise.

Despite the fact that PROCS and FNs are only introduced at chapter seven, the authors use the available structures of BASIC throughout, especially procedures. This makes the book all the more important as a beginners' guide; The GOTO state-

ment merits just two paragraphs in the entire book and these merely warn against using this 'deceptively simple' statement. If the reader works his/her way through this section without shirking the typing duties and exercises then a good understanding of BBC BASIC is assured.

Now come the interesting chapters on colour, graphics, sound and animation. Once again diagrams and screen shots (illustrating the graphics effects produced by the example programs) abound. Some of the description of the image planing techniques is necessarily complicated but when used in conjunction with the computer the examples given offer a clear view of what happens if not why.

The final chapter on animation takes some of the ideas on graphics and expands their use into object animation. Character printing, user defined characters and multi-frame images are all dealt with. A simple bat'n'ball program illustrates the principles of controlling motion from the keyboard. An invaders type game introduces more sophistication, combining some of the special effects implemented by

changing the palette.

The authors implement gun-flash effects, spinning discs and spiral patterns. Finally in this chapter they consider the VDU 5 statement for creating foreground-midground images. These examples are all it takes to set the imaginative games programmer firmly at the computer until the early hours of the morning.

The BBC has many engaging and unique qualities. Some would say that the sound capabilities (the excellent software control) are the most attractive of all. The authors of this book obviously enjoy the complexities of ENVELOPE statements and have delved deep into the possibilities. The visual information is once again up to scratch in this chapter: there are diagrams showing the actual waveforms of some of the sounds produced as well as comparable natural sounds. There is an excellent reproduction of a piano keyboard and stave with the notes and their corresponding code on the computer.

The ENVELOPE statement is a bit much to take in all at once and the various testing programs

make understanding easier through actually experiencing the differences in sound pitch, duration and so on. The chapter also deals with rhythm, rests, composing with programs, and generating different styles. It all sounds very ambitious but the examples work and inspire many ideas. There is no doubt that even somebody previously uninterested or confused by musical notation and harmonics will thoroughly enjoy learning from the exploration of BBC sound.

This book is an excellently presented, helpful and illuminating guide to the BBC. Reserve a permanent spot for it beside your machine.

Addison-Wesley also supply a cassette with most of the examples as well as the main program included. This takes the toil out of entering the listings from the keyboard but also negates the value of pouring over and debugging the routines and thus learning how they work not just the fact that they work.

Creating Adventure Programs on the BBC Micro by Ian Watt
Addison-Wesley and Interface £6.95
128 pages
ISBN 0 201 14678 9

This guide to the adventure game and its implementation on the BBC makes very interesting reading. A short introductory chapter addresses itself to adventure novices, explaining the conventions of scenario and of game playing itself. All true adventures follow a fairly standard set of rules and accept standard instructions such as GO, GET and DROP. These and many more are explained in the course of the book are used in the program examples. This first chapter explains what we might expect to see in terms of display, instructions, choices and computer replies, during the course of such a game.

Chapter two gets straight down to the techniques of writing the BASIC lines into the com-

CONTINUED OVER

puter. Each stage in the planning of the game, the number and names of the rooms and their contents for instance, is thoroughly dealt with. After each stage we are invited to enter the equivalent lines of the program. The structures, codes and variables are carefully gone into with reference to each section of listing.

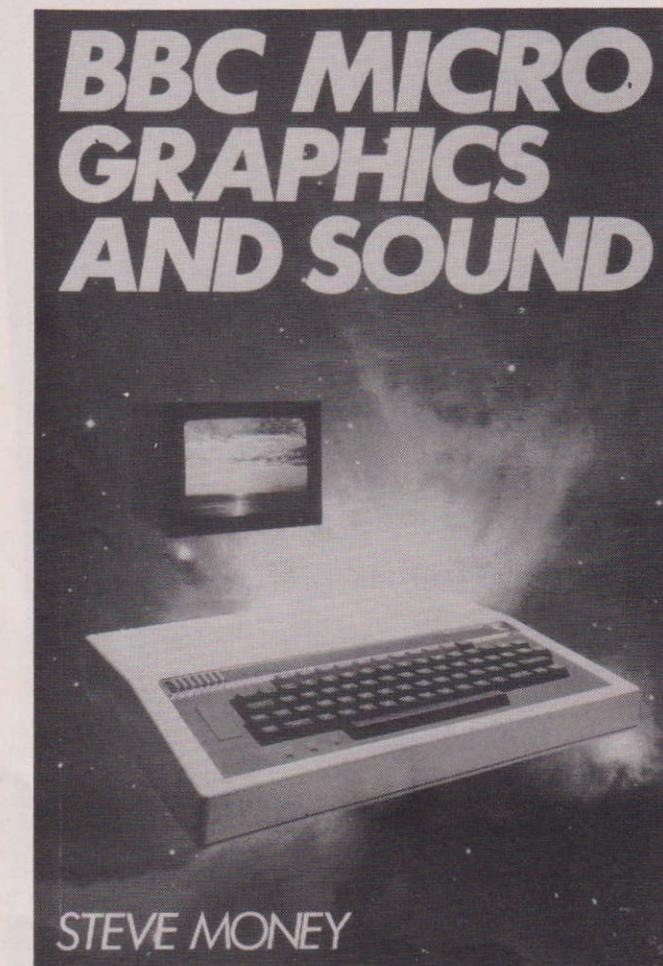
The author also goes into simple error trapping methods and more interestingly into the way user input is coded to extract a predetermined response. Now comes the interesting bit where imagination takes over at least partly from program design, the 'filling' for the adventure.

This is an adventure, so many of the replies are determined by traditional usage but there remains plenty of room for invention and humour. This is where you start to get your own ideas. Chapter two ends with the full listing of the example program called Captive.

The 10 pages of chapter four are entirely given over to instructions on how to convert the program to other machines which have lesser BASICs than the wonderful BBC. This should present little problem to your friends who have an inferior machine since the full BBC BASIC facilities are under-utilised in all the programs presented in this book. Adventure game programming cries out for lots of IF...THEN...GOTOs and this is what we get.

Chapter five starts out with the listing of an adventure called Dracula. The chapter goes on to describe the program and its various components but in a much more concise fashion since it shares many variables and techniques in common with Captive. Unfortunately in this section there are a couple of printing errors in the text. Nothing serious though and it doesn't result in any confusion. In fact I found it quite fun reading all the joined up words - somebody might even include it in an adventure.

Chapter six provides the sequel to Dracula with similar



variable listing and line analysis. More interesting should have been chapter seven which contains the author's ideas on possible improvement for the future.

The more futuristic possibilities are certainly worth discussing but I would have preferred some new ideas specifically related to the BBC. After all, if you are going to adventure into the area of graphics and sound then the BBC offers untold possibilities. The author rightly points out the restraints placed on the adventure game writer by memory but there is room in his own 16K text only games for some use of graphics. The use of sound is also unimaginative and could be improved upon.

In chapter eight you get your chance. The author provides an

outline, a set of rooms and an extensive scenario, for you to use as a basis for your programming. In conjunction with chapter two it should be possible to use this information to come up with a clone of this type of adventure. The last 38 pages of the book are taken up with three Appendices which list in considerable detail the commands and their meanings, the objects and their uses and, for the cheats among us, how to solve the adventures. Some of this information is merely repeating the main text but for the adventure enthusiast who wishes to master these games these tables are a mine of knowledge.

A fascinating book then for the uninitiated and a store of info for those with the habit. But more

a book about adventures than about programming on the BBC.

BBC Micro Graphics and Sound by Steve Money. Published by Granada Publishing. Price £6.95 for 170 pages.

After an introductory preamble recommending the BBC for graphics and other books in the Granada series for the BBC, Steve Money sets about the long haul of going into both graphics and sound facilities. He begins with a look at the seven modes, their individual memory requirements and display sizes. The first commands to appear are MOVE and DRAW and these are used to produce squares and various polygons. These are the basics of any introduction to graphics on any home computer. There are various methods of producing circles (quadratic and rotational) and some nice random displays for your screen. Relative plotting, scaling and rotating figures round off chapter one. By now you have probably realised that this is a pretty comprehensive treatment of the subject.

Next comes colour, choosing, filling, creating mirror images and windows. There is a Moire pattern program listed as an example. There is an informative chapter on how to create various graphs and charts, including a thermometer program and listings for multiple bar charts. The illustrations, like all the listings in the book, were produced on an Epsom MX80. As well as pie charts, Steve Money produces some interesting dial/clock type displays and a moving sector display ideal for any application from egg timer to space shuttle.

Chapter six forms an excellent survey of teletext graphics, beginning with the dedicated character generator chip and the special screen format. The implications and advantages (1K memory usage) are discussed. Foreground/background colour, double height, separated graphics, flashing and use of hold are all gone into. An example of the BBC logo drawn large demonstrates the use drawing of larger block graphics using data

statements. There are also some random drawing examples.

More advanced techniques in the high resolution modes involve use of VDU 19 to change logical colour and therefore expand the palette in the two and four colour modes. There are some colour switching demos. GCOL actions one to four are carefully explained with illustration of the effect of the logical function actions on the relevant four bit binary words. As a programming example we are served up the old favourite of a spaceship passing over a planet. There are explanations of the more involved PLOT commands, examples of mixing colours using alternate lines and by mixing dots. There is also a listing for a basic elastic band sketch program.

Character definition, animation, moving objects and three dimensional representation are all dealt with. The three dimensional bar charts and circular plotting are particularly impressive. The graphics section ends with a listing for an aircraft landing program which I'm sure will inspire a few games ideas among the book's readers. We are now at page 138 which leaves 30 pages to cover sound. This is not the most equitable allocation of space in a book which boasts both features on the cover.

The author runs through SOUND command parameterws with examples from the three tone channels and the noise channel (steam engine) plus and interesting concatenation of the two. The ENVELOPE parameters are similarly dealt with listed programs to try out. These demonstrate what can be achieved and include some nice bell, chime and drum type sounds. The author has obviously experimented a great deal and advises the reader to do the same. He rightly states that the possibilities of using amplitude and pitch controls provided by the ENVELOPE command are almost endless. Examples include vibraphone and woodwind simulations and vibrato effects. There are also the standard laser and explosion sound effects.

Playing music is dealt with in

the final chapter where simple tunes are assembled from data statements representing individual note characteristics. Flushing the sound channel is explained in association with the four digit hexadecimal number which can be used as the first parameter in a SOUND statement. Chords and synchronisation lead naturally to the creation of a keyboard instrument program.

Overall the book represents a value for money introduction to graphics techniques but comes up with nothing remarkably original. The sound section is standard. The presentation is fairly good through there is an obvious contrast between the text and the rather fuzzy Epsom listings and screen dumps. There

is only one textual error when VDU is printed in lower case.

100 Programs for the BBC Microcomputer by John Gordon. Published by Prentice/Hall International. Price £7.95. Cassette: £12.50

This book consists of over 200 pages of listings, illustrations and explanations of 100 (sorry 101, I forgot about the bonus program!) programs for the BBC. It's a sort of history of how John Gordon has been getting along with his Beeb. Bat'n'Moths, he tells us was the first of these many programs which he has written for our enjoyment. If you are a new BBC owner then and you want to experience the joys of discovering how noisy, playful and sometimes useful your com-

puter can be, then buy this book. If you want to get into John Gordon's shoes but without having to type in countless lines of program then buy the cassette tape.

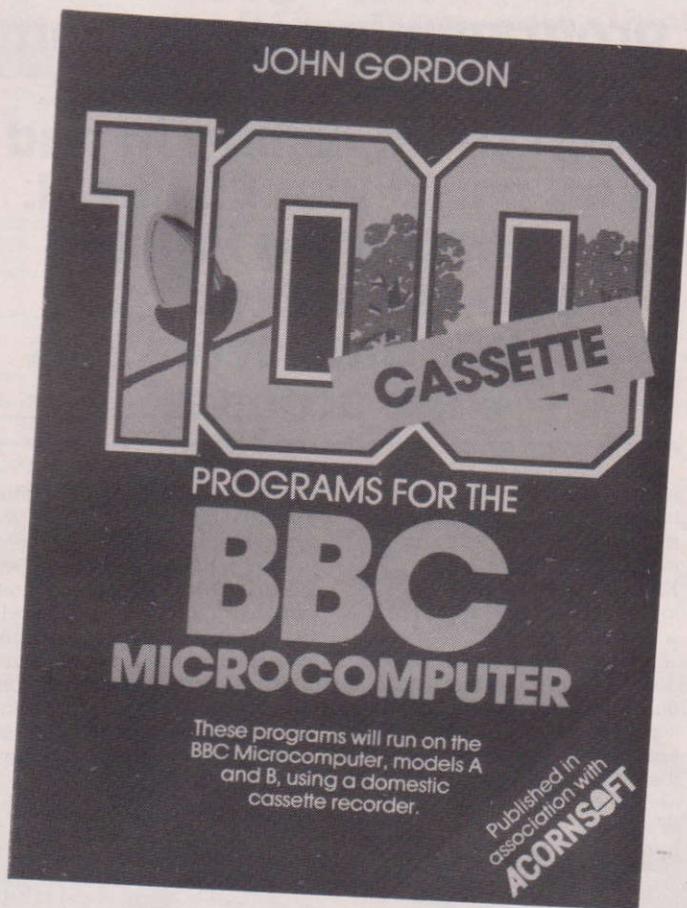
The first programs are musical and sensibly so. Depreciation or Merge might have been a bit of a turn off. The patterns and discordant noises of Nitemare are fun but point to the sort of standard we are to expect throughout the 100. Musak, with some nice chiming envelopes, woke me up on a Monday morning but I'm afraid the simple graphics and animation demonstrations which followed sent me straight back to sleep.

There's a clock, moving Jimmy about the screen, Mastermind and some simple games. The listings are neatly laid out and have REMs at all the right places. This was, I'm sure, John Gordon's purpose in writing these programs, to make things clear to the beginner.

Unfortunately the games quickly become boring and there is no error trapping beyond the most basic constraints. Loan Repayment fell down on a simple mortgage calculation. Pie Chart often looked more like a random graphics demo but the examples of writing text at the graphics cursor provided a useful look at VDU 5.

The German and French tests supplied three attempts at each word even if the first attempt was correct. The 99th program, Spelling, has, like other programs in the collection, text PRINTed at the very top of the screen. A little more forethought would have saved much time typing in *TV commands.

Both the book and the alternative tape (I can see no reason why anyone should need both) are programs for beginners, often demonstrating what any computer could do rather than what the BBC Microcomputer can do. The most advanced features of the BBC are only touched upon. Alternatively this might make a good introductory base for a young child coming to computing for the first time. For the more seasoned user it is a comprehensive batch of programs that are individually of a low standard.



scrolling, it is easily adaptable to other modes, and it is (hopefully!) easier to understand.

Yours sincerely,
Tim Scratcherd
Kirkless Microelectronics Centre

PROGRAM LISTING

>REM CHERRY - MULTICOLOURED USER DEFINED CHARACTERS
>REM TIM SCRATCHERD SEPTEMBER 1983

```

100MODE5
110VDU19,2,2,0,0,0
120VDU19,3,3,0,0,0
130VDU23,240,0,0,6,15,&6F,&F6,&F0,&60
140VDU23,241,&FB,&70,0,0,0,0,0,0
150VDU23,242,4,4,0,&30,0,0,0,0
160A$=STRING$(14," "):A$=""
170FOR I%=1 TO 14:READ X%:A$=A$+CHR$(X%):NEXT I
180CLG
190B=GET
200MOVE 640,512:VDU5:PRINT A$:VDU4
210DATA 18,0,1,240,8,18,0,2,241,8,18,0,3,242

```

Dear Elspeth,
I was pleased to see that you used my "COCKPIT" program in the September issue of A&B.

I enclose below an adaptation

in order to use a joystick rather than the cursed cursors. It does make it a bit easier to play. This works with the BEEB joysticks but I don't know about others.

Richard Jones

```

511REM: Joystick Version
512REM: Use the right joystick
513REM: Delete lines 520 to 560 and replace with the following lines
515JOY% = ADVAL(3)DIV100:VJOY%ADVAL(4)DIV100
516TRIG% = ADVAL(0)AND 3
520IFHJOY% > 400 BOMBX% = BOMBX% + 20

```

```

530IFHJOY% < 200 BOMBX% = BOMBX% - 20
540IFVJOY% > 400
BOMBY% = BOMBY% - 20:ALT% = ALT% + 10
550IFVJOY% < 200
BOMBY% = BOMBY% + 20:ALT% = ALT% - 10
560IF TRIG% = 2 PROCFIRE

```

Dear Editor
Please find enclosed "snippet" which you may care to publish. It is a copy of a section I wrote for the Newsletter M.I.K.E. (Micros In Knowsley Education) which I edit.

When developing a new program it is advisable to make copies as you go along so that a power cut or some such disaster will leave you with at least a reasonably up to date copy.

This simple function key routine will save a program as a number, increasing the version number (V%) each time a save is made.

1) Type out the routine as it stands

```

*KEY0
V% = V% + 1:DIME %30:$E% = "SAVE" + STR$(V%) + "
" + STR$(PAGE) + " " + STR$(TOP) + "
8023":PRINT $E%:X% = E%MOD256:Y% = E%DIV256:C-
ALL&FFF7:M

```

2) Save the function keys by typing

```
*SAVE "KEYSAVE" 0B00 0C00
```

3) Type or load the development program and when ready to save a version simply press f0.'

For those interested, the routine requests space to store a string, the string being the save statement together with the title, start address, end address and execution address (BASIC). OSCLI is then called with the address of the line to be interpreted stored in the X and Y registers.
Colin Rowling,
St. Helens,
Merseyside.



Software Listings

Finding and choosing the correct software for your needs is a daunting task indeed, whether you are looking for a word processing package or for a new game to test your alien-destroying, treasure-seeking, path-finding talents!

Often you can be put off even looking through the pages of advertisements which tempt you with vivid descriptions of the amazing graphics and sound effects of the game being offered, you sit there with pen poised above cheque book and your eye catches the small print that tells you that the game will run on just about every available machine except the one sitting beside you!

Want a program for your BBC Micro. Look no further than our listings to make your choice.

But BBC Micro owners despair no longer — help is at hand in the following pages. We have put together as comprehensive a list as possible of the software available for the BBC Micro. In order to fit in as many as possible we have had to use codes in some columns. The title of the software, the memory

required to run it, the company that produces it, whether it is tape/cartridge or disc, the supplier and the price, are given for each piece of software listed. The codes used are:

Code Explanation
 Gm Game
 Bs Business Routine

Ut Utility (ie programming aid)
 Do Domestic
 Ed Educational
 C Cassette

As you are probably aware new software is surfacing all the time so don't assume that there is no such item as the one you are looking for if it is not included in this list. Also, remember that games in particular that at present run only on a machine other than the BBC Micro may well soon appear in a BBC version. If you are aware of a piece of software that is not listed here, whether you are a user or a producer, feel free to let us know.



SOFTWARE LISTINGS

Title	Type	Manufacturers	Memory	Software Supplier	Price
ABC	Ed	Bryants	32K C	HW	£4.85
Abductor	Gm	Salamander	16K C	NZ	£7.95
ABM	Gm	Alligata	16K C	AG	£4.95
Action of the Heart	Ed	Garland Comp.	32K C	JX	£11.76
Accounting Ratios	Bs	Microplex	32K C	MP	£7.95
Add-Tabs and Mul-Tabs	Ed	Cottage Soft	16K C	CT	£7.50
Adventure	Gm	Program Power	16K C	GK	£7.95
Adventure 1	Gm	Odyssey	32K C	OG	£4.50
Adventure 2	Gm	Odyssey	32K C	OG	£4.50
Adventure	Gm	Micro Power	32K C	GK	£6.95
Adventure	GM	Program Direct	32K C	NP	£5.99
Adventure Quest	Gm	Level 9 Computing	32K C	CU	£9.90
Algebraic Manipulation	Ut	Acornsoft	16K C	AL, GA	£9.95
Alien	Gm	FBC	16K C	FB	£6.00
Alien Destroyers	Gm	Program Power	32K C	GK	£7.95
Alienswirl	Gm	Amcom	32K C	AO	£5.95
Alien Swirl	Gm	Program Power	32K C	GK	£6.95
Alien Destroyers	Gm	Micro Power	32K C	GK	£6.95
Airlift	Gm	Bug Byte	32K C	KP	£5.50
Android Attack	Gm	Computer Concepts	32K C	GJ	£7.80
Anagram	Ed	Ed.Soft	32K C	ES	£4.95
Angles Navigate	Ed	Primary Programs	32K C	PP	£3.95
Angle(4)	Ed	Chalksoft	32K C	KT	£6.95
Anglezap	Gm	Gem	32K C	GM	£7.50
Apollo	Gm	Software Invasion	32K C	IS	£6.95
Append It	Ut	Aztec S/W	16K C	IB	£3.00
Alien Dropout	Gm	Superior Software	32K C	SE	£7.95
All Fingers Go	Ed	NEC	16K C	NC	£14.95
Alpha	Ed	Golem	32K C	OB	£8.05
Alphachopper	Ed	Sulis	32K C	SU	£9.95
Alphabeta	Bs	H and H Software	32K C	HH	£28.50
Android Attack	Gm	Computer Concepts	32K C	GJ	£8.95
Animated Arithmetic	Ed	Ludinski CAL	16K C	KA	£6.50/ £7.50
Apocalypse	Gm	Red Shift	32K C	RS	£9.95
Arcadians	Gm	Acornsoft	32K C	AL	£9.95
Arcade Action	Gm	Acornsoft	16K C	GA	£11.90
Arcade 1	Gm	Odyssey	32K C	OG	£3.00
Arcade Games	Gm	Ganymede Systems	32K C	GY	£9.95
Area Radar Controller	Gm	Software For All	32K C	KN	£6.95

Arrow of Death (1)	Gm	Digital Fantasia	16K	C	IT	£6.95
Arrow of Death (2)	Gm	Digital Fantasia	16K	C	NT	£8.95
Asteroid Storm	Gm	Program Power	32K	C	GK	£7.95
Asteroids/Frong	Gm	Aardvark Software	16K	C	IU	£4.00
Asteroid Belt	Gm	Electronics Applied	32K	C	IF	£11.50
Asteroid Belt	Gm	Computer Concepts	16K	C	GJ	£7.80
Astro Navigator	Gm	Micro Power	32K	C	GK, NR	£6.95
Atlantis	Gm	IJK Software	32K	C	IT	£6.95
Awari	Gm	Foilkade	16K	C	NR	£5.95
Backgammon	Ut	Bug Byte	32K	C	EA, KP	£8.00
Bailiff	Gm	Sulis	32K	C	SU	£9.95
Ballard	Ed	Ed. Soft	32K	C	ES	£3.00
Balloons	Gm	C J E	32K	C	NV	£6.00
Bandits at 3 O'Clock	Gm	Microcomputers Program Power	32K	C	GK	£6.95
Barrage	Ed	Program Power	32K	C	GK	£9.95
Basic Goodies	Ut	Simonsoft	16K	C	MS	£5.95
Basic Maths	Ed	Aztec S/W	16K	C	IB	£3.00
Basic Statistics	Bs	Micropak	32K	C	MP	£7.95
Battlefield	Gm	Micro-Aid	32K	C	IZ	£2.50
Battlezone Six	Gm	Kansas	32K	C	KA	£9.50
Beebart	Ut	Quicksilva	32K	C	QS	£14.95
Banner	Do	Micro-Aid	16K	C	IZ	£2.95
Beeb-Chase	Gm	Database Software	32K	C	NU	£7.50
Beebmunch	Gm	I.J.K. S/W	32K	C	IT	£5.95
Beebtrek	Gm	Software for All	16K	C	KN	£7.95
BEEP-BEEP	Gm	IJK	32K	C	IT	£3.95
Beeb-Beeb (Super Simon)	Gm	IJK Software	32K	C	IJ	£4.50
Beebcalc	Bs	Gemini	32K	C	GM	£19.95
Beebmon	Ut	Program Power	16K	C	GK	£7.95
Beebplot	Bs	Gemini	32K	C	GM	£19.95
Beeboids	Gm	Odyssey	16K	C	OG	£2.75
Beebon Mon	Ut	McKeran	16K	C	MK	£2.00
Beebsynth	Ut	Clares	16K	C	CL	£7.95
Beeb-Tote	Gm	Program Power	32K	C	GK	£5.95
Beefeater	Ed	Sulis	32K	C	SU	£7.95
Besieged	Ed	Sulis	32K	C	SU	£9.95
Beyond Basic	Ed	BBC/NEC	16K	C	KB	£7.25
Billiards	Gm	H and H Software	32K	C	HH	£8.50
Blackjack/Textpro	Gm	Software Invasion	32K	C	IS	£6.95
Bomb Alley	/Ut	Software Invasion	32K	C	IS	£7.95
Bomber Scramble	Gm	Kansas	32K	C	KA	£9.50
Bounce	Gm	Computercat	16K	C	CC	£4.95
Bouncers	Gm	A&F	32K	C	GE	£8.00
Bounty Pirates	Gm	Aztec S/W	16K	C	IB	£5.50
Break-Up	Gm	Miking S/W	32K	C	KC	£3.95
Breakout	Gm	I.J.K. S/W	16K	C	IT	£3.95
Breakout	Gm	Bryants S/W	32K	C	HW	£3.75
Brick 'em in	Gm	Software For All	32K	C	KN	£6.95
Bridge to the East	Gm	Ixon	32K	C	IN	£8.05
Bridgeman	Gm	Bridge S/W	32K	C	KJ	£7.90
Budget	Bs	Micropax	32K	C	MP	£7.95
Budget-Multiproduct	Bs	Micropax	32K	C	MP	£12.95
Budget-Multiproduct	Bs	Micropax	32K	D	MP	£25.00
Bug Bomb	Gm	Virgin Games	32K	C	VG	£7.95
Business Game	Ed	Acornsoft	16K	C	AL	£9.95
Bun Fun	Gm	Squirrel Software	32K	C	SS	£6.50
Canyon	Gm	BBC Pubs	32K	C	KB	£10.00
Capitals and Punctuation	Ed	RJE Software	16K	C	RJ	£4.95
Carbohydrate Metabolism	Ed	Garland Comp.	32K	C	JX	£18.24
Cards	Gm	Micro Aid	16K	C	IZ	£2.95
Carousel	Gm	Acornsoft	32K	C	AL	£9.95
Car Race	Gm	Kingfisher	32K	C	KF	£6.90
Cashbook Accounts	Bs	Gemini	32K	C	GM	£59.95
Cashbook	Do	Micro-Aid	32K	C	IZ	£5.95
Cashbook B	Do	Micro-aid	16K	C	IZ	£3.95
Cassette 99	Ed	Ludinski CAL	16K	C	KA	£5.00
Castle of Riddles	Gm	Acornsoft	32K	C	AL	£9.95
Catalog	Bs	Dialog	32K	C/	D	DG
Catalogue	Ut	Baksoft	16K	C	BK	£4.00
Cat and Mouse	Ed	Kingfisher	16K	C	KF	£6.90
Cat & Mouse	Gm	Micro Power	16K	C	GK	£4.95
Catchapple	Ed	Kingfisher	16K	C	KF	£6.90
Caveman Adventure	Gm	Program Power	32K	C	GK	£6.95
Caves of Anoran	Gm	FBC Systems	32K	C	FB	£7.00
Cells and Serpents/ Stockmarket	Gm	ASP Software	16K	C	OD	£11.45
Cells & Serpent	Gm	Hexagon S/W	16K	C	JA	£5.00

SOFTWARE SUPPLIERS

Supplier Code	Supplier Name	Supplier Address
AM	Microplus Software	6 Litton Way Leeds
AA	Anthony Aspitel Software Systems	56 London Road Harleston Norfolk IP20 9BZ
AO	Amcom	23 Hielings Hill Chesham Bucks HP5 2PG
AP	Processor Applications	22 Mercer Close Basingstoke Hants
AB	ABC Primary	19 Crumstone Court Longmeadow Estate Killingworth Newcastle Upon Tyne
AD	Dial Software	72 Downend Road Downend Bristol
AG	Superior Systems Ltd	178 West Street Sheffield WS1 4ET
AJ	Mollimer Ltd	1 Buckhurst Road Town Hall Square Bexhill-on-sea East Sussex
AL	Acornsoft Ltd	4a Market Hill Cambridge CB2 3NJ
AM	Microplus Software	6 Litton Way Leeds
AO	Amcom	23 Hielings Hill Chesham Bucks HP5 2PG
AP	Processor Applications	22 Mercer Close Basingstoke Hants
AS	ASD Ltd	30 West End Launton Bicester Oxon
AV	A J Vision Service Ltd	61 Jeddo Road London W12 9ED
BB	Bug-Byte	Mulberry House Canning Place Liverpool L1 8JB
BK	BAKsoft	34 Humberstone Road Cambridge
BU	Busco	16 Colwill Walk Mainstone Plymouth
CA	Carvells	3/7 Bank Street Rugby
CD	Carsondale Enterprises Ltd	44 Kingsway Stoke-on-Trent Staffordshire ST4 1JH
CG	Challenge Games	64 Ferndale Road London E11
CH	Chalksoft Ltd	37 Willowslea Road Worcester WR3 7QP
CS	Stable Software	Compton Street Compton Nr Winchester Hants
CT	Cottage Software	Heather Cottage Selly Hill Whitby North Yorkshire
CU	Level 9 Computing	229 Hughenden Road High Wycombe Buckinghamshire HP13 5PG
CX	Contex Computing	15 Woodlands Close Cople Bedford MK44 3UE
DC	D.A.C.C. Ltd	23 Waverly Road Hindley Greater Manchester WN2 3BN
DG	Dialog	19 Short's Gardens London WC2H 9AT

CONTINUED OVER

SOFTWARE LISTINGS

Title	Type	Manufacturers	Memory	Software Supplier	Price	
Centipede	Gm	Superior S/W	32K	C KH	£7.00	
CESCIL	Ed	Eduquest	16K	C/NW	£19.95	
Centpede	Gm	Superior Software	32K	C SE	£7.95	
Cesil Interpreter	Ed	Computersmith	32K	C LC	£15.00	
Character Formatter	Ut	BBC	16K	C KB	£3.00	
Character Shapemaker	Ut	Square	32K	C SQ	£7.00	
Chargen	Ut	Busco	16K	C BU	£3.95	
Chargen and Demo	Ut	Rainbow Research	32K	C RR	£8.50	
Character Builder	Ut	Davensoft	16K	C/NX	£4.95	
Characters	Ut	Computer Concepts	32K	C GJ	£6.67	
Character Generator	Ut	MP S/W	32K	C JZ	£3.00	
Character Generator	Ut	Software for All	32K	C KN	£4.95	
Characters	Ut	Computer Concepts	16K	C GJ	£6.67	
Characters & Envelope Definer	Ut	Electronics Applied	32K	C IF	£5.50	
Children From Space	Ed	A.S.K.	32K	AK	£9.95	
Chargen	Ut	Odyssey	16K	OG	£4.50	
Chemical Analysis	Ed	Acornsoft	32K	C AL, GA	£13.80	
Chemical Simulations	Ed	Acornsoft	32K	C AL, GA	£13.80	
Chemical Structures	Ed	Acornsoft	32K	C AL, GA	£13.80	
Chemistry	Ed	Program Power	32K	C GK	£6.95	
Chess	Gm	Program Power	16K	C GK	£5.95	
Chess	Gm	Program Power	32K	C GK	£7.95	
Chess	Gm	Acornsoft	32K	C AL, GA	£9.95	
Chess	Gm	Bug Byte	32K	C EA	£11.50	
Chess	Gm	Micro Power	32K	C GK	£6.95	
CHI-Squared	Bs	Micropax	32K	C MP	£7.95	
CHI-Squared, contingency tables	Bs	Micropax	32K	C MP	£7.95	
Chords	Ed	Aztec	16K	C AZ	£6.50	
Circus	Gm	Digital Fantasia	32K	C NT	£8.95	
City Defense	Gm	Bug-BYte	32K	C BB	£7.50	
Claws	Ed	Bryants S/W	16K	C HW	£3.75	
Clone Ranger	Ut	J.C. Software	32K	D JS	£11.60	
Cloze	Ed	GED Software	32K	C GD	£4.50	
Cloze Procedure	Ed	Bryants S/W	16K	C HW	£4.85	
Cards	Gm	Micro-Aid	16K	C IZ	£2.95	
Cobra/Robo-Swamp	Gm	Software for All	16K	C KN	£6.95	
Cobra/Robo-Swamp	Gm	Software for All	32K	C KN	£6.95	
Code Breaker	Gm	Program Power	16K	C GK	£4.95	
Code-Breaker	Ed	RJE Software	16K	C RJ	£4.95	
Code Race	Gm	Computer Concepts	16K	C GJ	£6.67	
Code Race	Ut	Computer Concepts	32K	C GJ	£6.67	
Colossal Adventure	Gm	Level 9 Computing	32K	C CU	£9.90	
Comatch	Ed	Clares	16K	C CL	£4.95	
Commercial Accounts	Bs	Gemini	32K	C GM	£19.95	
Community	Gm	Ixon	32K	C IN	£6.90	
Compass	Ed	GED Software	32K	C GD	£4.50	
Compendium	Gm	Computercat	32K	C CC	£5.95	
Connect 4	Gm	Database Software	32K	C NU	£5.90	
Constellation	Ed	Program Power	32K	C GK	£6.95	
Contribution Analysis	BS	Micropax	32K	C MP	£7.95	
Cookbook Wizardry	Do	Database Software	32K	C NU	£7.50	
Cosmic Asteroids	Gm	Alligata	32K	C AG	£4.95	
Cosmic Fighters	Gm	Kansas	32K	C KA	£9.50	
Coucapcur	Ed	Ed. Soft	32K	C ES	£4.95	
Countdown to Doom	Gm	Acornsoft	32K	C AL, GA	£9.95	
Counting	Ed	Clares	16K	C CL	£4.95	
County (SW/SM)	Ed	Bryants	16K	C HW	£4.85	
Cowboy Shoot-out	Gm	Micro Power	32K	C GK	£5.95	
Cranky	Ut	A.S.K.	32K	C AK	£9.95	
Creative Graphics	Ed	Acornsoft	32K	C AL, GA	£9.95	
Cricket	Gm	SJG Soft	32K	C SJ	£7.50	
Croaker	Gm	Program Power	32K	C GK	£9.95	
Crocodiles	Ed	Bryants	16K	C HW	£4.85	
Crossed Words	Ed	Aztec S/W	16K	C IB	£6.50	
Crunch	Ed	Oxhey Tutors	32K	C OT	£6.50	
C. Rules	Ed	Ed. Soft	32K	C ES	£5.95	
Cube Master	Gm	Acornsoft	32K	C/AL	£9.95	
Curse of the Middle Cylon Attack	Gm	Merlin	32K	C MN	£7.95	
	Gm	A&F	32K	C GE	£8.00	
Danger! UXB	Gm	Program Power	32K	C GK	£7.95	
Database	Ut	Computercat	32K	C CC	£12.95	
Database	Bs	Gemini	32K	C GM	£19.95	
Data-Quiz	Ut	Bryants S/W	32K	C HW	£4.88	
Database	Bs	Acornsoft	32K	C AL	£11.90	
Database	Ed	Ed. Soft	32K	C ES	£19.95	
Database	Bs	Primasoft	32K	C CT	£9.95	
Database	Bs	Computercat	16K	C LJ	£11.95	
Database	Bs	Software for All	16K	C KN	£9.95	
Data File	Do	Kansas	32K	C KA	£12.50	
Defchr	Ut	Micro-Aid	16K	C IZ	£2.95	
Demon Decorator	Gm	Program Power	32K	C GK	£6.95	
Density and Circuit	Ed	Acornsoft	16K	C	£11.90	
Descender	Gm	FBC Systems	32K	C FB	£7.50	
Desk Diary	Bs	Acornsoft	16K	C AL	£9.95	
Devil's Causeway	Gm	Anirog Computers	16K	C OA	£6.00	
DFM Database	Bs	Dialog	32K	C/DG	£24.00	
DFM Mail Labels	Bs	Dialog	32K	C/DG	£10.00	
Disassembler	Ut	Simonssoft	16K	C MS	£6.95	
Disassembler	Ut	Micro Power	16K	C GK	£5.95	
Disassembler	Ut	Program Direct	16K	C NP	£3.00	
Disassembler	Ut	Davansoft	16K	C NX	£5.95	
Disassembler	Ut	C J E	16K	C NV	£5.00	
Distances	Ed	Microcomputers	Micro-Aid	32K	C IZ	£3.95
Dissembler	Ut	Rainbow S/W	16K	C KS	£2.50	
Digital X-Word Compiler	Gm	N. Darwood	16K	C JB	£6.00	
Dmon	Ut	Alligata	16K	C AG	£7.95	
Dmove	Ut	FBC Systems	32K	C FB	£12.50	
DNA Replication	Ed	Garland Comp.	32K	C JX	£17.65	
Dracula Island	Gm	Kansas	32K	C KA	£9.50	
Dragon Rider	Gm	Salamander Software	32K	C NZ	£7.95	
Dragon Quest II	Gm	Bug Byte	32K	C KP	£11.50	
Dragon Quest	Gm	Bug Byte	32K	C KP	£11.50	
Draughts/Reversi	Gm	Acornsoft	32K	C AL, GA	£9.95	
Draw	Ut	Program Power	32K	C GK	£9.95	
Drawing	Ut	B.B.C.	16K	C KB	£10.00	
Dr. Who: The First Adventure	Gm	BBC Pubs	32K	C KB	£10.00	
Dungeon Adventure	Gm	Level 9 Computing	32K	C CU	£9.90	
Dynamic Nuclear Magnetic Resonance Spectroscopy	Ed	Microwave	32K	C MW	£3.95	
Early Learning	Ed	B.B.C.	16K	C KB	£10.00	
Early Numbers	Ed	Bryants S/W	32K	C HW	£4.80	
Early Warning	Gm	A&F Software	16K	C GE	£6.00	
Easylease	Bs	Zero-Software	32K	C AZ	£12.95	
Easy Graphics	Ut	Hexagon Software	32K	C HX	£13.50	
Ecological Simulations	Ed	Garland	32K	C JX	£16.50	
E. D. G. Graphics Package	Ut	Salamandar	32K	C NZ	£24.95	
Educare's 50	Ed	Educare	16K	C EU	£7.95	
Education (1)	Ed	Microplus	16K	C AM	£4.25	
Educational (1)	Ed	Golem	16K	C OB	£8.00	
Educational (2)	Ed	Microplus	16K	C AM	£5.25	
Educational (2)	Ed	Golem	16K	C OB	£8.00	
Educational (3)	Ed	Microplus	32K	C AM	£5.25	
7 Educational Games	Gm	Micromail	32K	C OE	£5.75	
Eiffel Tower	Ed	Chalksoft	32K	C CH	£9.25	
Eldorado Gold	Gm	Program Power	32K	C GK	£6.95	
Electric	Ed	Database Software	16K	C NU	£5.50	
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EB	Ebury Software	National Magazine House 72 Broadwick Street London W1V 2BP	HW	Bryants (Educational) Software 1 The Hollies Chalcraff Lane North Bersted Bognor Regis PO21 5SX
EH	Heinemann	Computers in Education 22 Bedford Square London	HX	Hexagon Software 17 Straits Road Gornal Dudley West Midlands DY3 2UR
EJ	Logic Systems	85 Hemingford Road Cambridge	IB	Aztec Software 25 St Mark Road Deepcar Sheffield S30 5TS
EL	ECL Software	29 Richmond Close Ware Herts SG12 0EN	IC	Ian Copestake 23 Connaught Crescent Brookwood Woking Surrey GU24 0AN
EU	Educare	139a Sloane Street London SW1X 9AY	IF	Electronics Applied 4 Dromore Road Carrickfergus County Antrim BT38 7PJ
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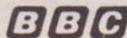
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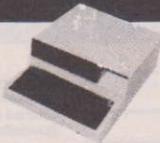
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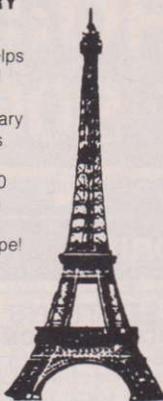
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