

FEBRUARY 1982
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NEXT MONTH

LESURE is a much bigger pastime in the U.S. and the games which are successful over there tend to cross the Atlantic six-12 months later. In our next issue we report back on the latest toys and games to find their way onto the American scene.

HARDWARE changes its format next issue when we take an in-depth look at the Acorn Atom. With an exhaustive list of the companies which supply games software and peripherals for it. All you ever wanted to know about the Atom but didn't know where to look, want now.

EASILY go where no man has gone before in our Star Trek game next month. Star Trek 111.4 offers a few extra features, on top of the usual Klingons, starships and stars. Octodraw, Entomb and Yell-see also feature in our various listing section.

Figure 1. Study design.

Advertisement evidence [20] [21] [22]

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Chicago Tribune, 11/1/97

Abstract The purpose of this study was to determine the effect of a 12-week, low-intensity, supervised walking program on the physical and psychological health of sedentary, middle-aged women. The study was a randomized, controlled trial. The subjects were 40 sedentary, middle-aged women who were randomly assigned to either a supervised walking program or a control group. The walking program consisted of 12 weeks of supervised walking, 3 times per week, for 30 minutes per session. The control group consisted of 20 women who did not participate in the walking program. The physical and psychological health of the women was assessed at baseline and at 12 weeks. The walking program had a significant positive effect on the physical and psychological health of the women. The walking program significantly improved the women's physical health, as measured by the 6-minute walk test, and their psychological health, as measured by the Beck Depression Inventory and the State-Trait Anxiety Inventory. The walking program also significantly improved the women's quality of life, as measured by the SF-36. The walking program was well tolerated and had no adverse effects. The results of this study suggest that a supervised walking program can be an effective intervention for improving the physical and psychological health of sedentary, middle-aged women.

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1. *Journal of the American Medical Association*, 1997; 278: 1039-1044.

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Keywords: child sexual abuse; disclosure; legal system

Additional sample information including individual events should
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MAILBAG

BBC GAMES

Dear Sir,
I am about to buy a BBC Microcomputer (ARE 11) and I would be pleased if you could let me have sources of directly or readily obtainable available games software suitable for the RAM. Colin Lindsay Chorley Lovers

Editor's reply: At the moment the only firm known to be producing game software for the BBC Microcomputer is Acorn, the firm making the hardware.

The latest word is that Acorn is in the process of converting some of the games currently on its books to run on the BBC machine, but these are not expected to be readily available until March at the very earliest. I'm afraid you will just have to sit tight, or get to grips with programming and work on some of your own games. Colin. Good luck.

PREMIER'S NO. 1 FAN

Dear Sir,
I was surprised to read your comments on the Premier Publications' extreme. Skip at The Line, page 63, issue 2 of your lot is it my magazine.

I cannot speak personally of this game or any other CBI software as I own a U.K. 101, but I can tell you of the service offered by Premier.

To date I have bought five games, up-rated to the excellent standard.

"Cognate", added the new Basic ROM, "Rome 2", and have joined the "CBI/U.K. User Group", all thanks to Premier. I also receive a free newsletter which, apart from describing the latest additions to the range of games, ROMs and hardware, also offers hints and tips on how to expand and how to get the best from my machine. I am also reminded to know



Do you have any ideas or comments on Computer & Video Games? If so you would love to hear from you. We will also do our best to find answers to any queries you may have or solve problems you might be experiencing with your computer. Please drop us a line at: Computer & Video Games, EMAP, Bureau House, 11 Market Hill, London EC3R 6LB. If you have already sent in a letter which has not yet been published, please bear with us as we have been overwhelmed by mail after our early issues. We will get around to your query as soon as possible.

that if my computer decided to "throttle off this mortal coil", then Premier offers a computer repair system. If it ever became lost within the ROMs, RAMs, address buses, clock pulses or software listings, then a quick phone call, during office hours, or the use of the customer phone-in service will put me on the right track quickly and efficiently.

So, if on the very rare occasion that one of Premier's products fails to work correctly, then simply contact Premier. You will find them the most helpful and friendly people and easily Britain's. It is not the World's best software company, without another company meeting the standard of their products or service. Stephen Wood 205, Chrysler, Surrey

Editor's reply: We had expected that this may have been an isolated case. Stephen, but felt there was no access for sending out a tape which has people actually talking on it. The author of Skip at the Line has since sent us another copy of the game and we look forward to giving it another try in the near future.

NOVEMBER CAME EARLY

Dear Sir,
My main question is if I could somehow get a copy of what I think must be your November issue. That's the one I first saw, a friend had it.

I got down to the local newspapers on line as possible, but they already had the December issue, and thus had already sent back the others. After searching all over I found the situation was the same all over. So I tried convincing my friend to sell me his copy, but no dice.

So on a last resort I'm contacting you. Since I don't know how much it would cost for you to mail me a copy, I couldn't send the money along. But if you can save me one and write and say so and how much, I would happily send the money.

I love your magazine and think it will do very well. I only have one suggestion. Although you can't take the suggestion of B. A. Moore (December Bulletin), maybe you could put comments beside the not-as-obvious parts of the programs to explain exactly what they do. Then people could translate the games into whatever language they are working in. That way only one set of comments would be needed, used in only one language. English! I hope you can get me that copy. Colin Garrett Northover Avenue, Reading.

Editor's reply: We have had several enquiries about back issues. These can be obtained from EMAP National Publications Limited, Computer & Video Games Circulation Department, Reader Service, Boston Court, Boston, Peterborough, PE3 6DL.

On your other point, Colin, we are picking out a couple of programs each issue and giving a random on the variables and which parts of the programs do what.

DODGEMS DODGE

Dear Sir,
Modifications to allow your November Acorn Atom Dodgems program to run without floating point ROM.

- A) 1115: remove "COLCOUN 2"
- 1126: remove "COLCOUN 1"
- B) 26, 40, 48, 96 in each other "S = S + ROM(T-S)" to: "COSY: S=S-K" and add "COSY: E=T-S, IFE=0"
- C) During de-bugging, remove end of line "XXXX from "TIS-..." (Inclusive)

Tom Hoyt Holmby St. Mary, Dorking, Surrey. P.S. In 1115 should be CLEAR 2, not 0 — Congratulations on an otherwise high standard of bug free code!

Dodgems author John Dyson replies: Thanks for your modifications for running Dodgems on a machine without the floating point ROM.

MAILBAG

SARGON FOR THE SHARP?

Dear Sir,
I have a Sharp MC-805 MK computer and am interested in obtaining a chess program for it. I ideally Sargon II. I have been unable to find this program for the Sharp and wondered if you know of anyone producing it for my machine.

Alternatively could you let me know how the chess program that Newbeat Ltd, Newbury, Berks, have composed with Sargon II.

I enjoyed your first magazine, although I haven't managed to get "Magnum" working yet and look forward to your next.
/ Hinton,
Ave Gipsy,
Kinghouse,
W. Yorks.

Editor's reply: I'm sorry to have to report that chess games for the Sharp MC-805 are few and far between. There is no Sargon II available for the machine although Sharpsoft has written a review (and the copyright is owned by Hayden Books who are unwilling for Sharpsoft to market it).

Sharpsoft does market its own chess game but it is only for beginners. Experienced players would soon find the game unchallenging.

Newbeat's chess game is not as demanding as Sargon II either, and although it is not directly aimed at beginners the bulk of sales is made up of inexperienced players and children.

ATARI'S FAME

Dear Sir,
Congratulations on your first issue of Computer & Video Games which certainly fits more into my own microcomputer aspirations than any of the other more business oriented publications around.

Many of you may have tried to contact advertisers through our reader enquiry service. Unfortunately, due to the massive reader response we have not been able to process all of these. If you filled in a card and still have not heard from our advertisers, we would suggest you contact the company concerned directly. We are sorry for any inconvenience but nobody could have predicted the phenomenal response we received on our first two issues.

I am a keen computer games player, and writer, although I only presently own a Sinclair Z80. I am looking around to buy myself a new computer and have heard that the Atari duo have by far the best graphics facilities — although I have never seen either of these machines in action.

Could you please tell me if the Atari 400 and 800 graphics are more impressive than other machines in a similar price range — and if so why aren't other manufacturers using a similar system? Joseph Stroudridge, Chels, Stroudridge, Herts.

Editor's reply: The Atari computers certainly have good graphics characters, and the games ROM packs that plug into the system use these to their best advantage. However, the highest resolution of the Atari system is 320 x 192 points — or pictures elements (pixels). This is quite acceptable for most users. The Atari computers cost around £345 and £345 respectively.

Other manufacturers do use high resolution graphics — in up to 16 colours. Possible among Atari's competitors are IBM with the PC-XT costing £595. This has more memory than the Atari 800 — 48K compared to 128 — and has even more pixels — 1024 x 1024. Unfortunately it has only a small amount of very good software. Texas Instruments have recently reduced the price of the TI 99-4 to around £350. This has a similar specification to the Atari 800 — and has the capability of superior graphics because of the use of a 16 bit processor, compared to most other systems' 8 bit.

As you can see I have only scratched the surface and more systems are

coming onto the market all the time. The VIC-20 and BBC Microcomputer will also give the Atari 800 a run for its money — and both are cheaper. You can see that it's more difficult than you first thought.

Get friendly with your local dealer, and find out what support he'll give you. Compare dealers, if you have a choice, and then look at software availability and cost. Only you can evaluate all these factors yourself.

MASTERING THE MACHINE

Dear Sir,
Thank you for an interesting new magazine. It seems to fit the gap between the semi-professional format of the home computer user and the "toy" market.

I have an Acorn Archimedes MPF 1000 Video Games Centre with a variety of preprogrammed cartridges.

The one cartridge that is programmable is the Rally Module but, apart from the few programs they supply in their instruction manual, I cannot seem to master the machine code that is needed to operate it. Can anyone help?

The maker of the chip, a MOS by the name, has produced a book by S. J. Cipari titled Microcomputer Controlled Video Games but is now out of print and no hope of it being reprinted so now you know why I need help.

I have solved your cartridge puzzle the "old fashioned" way in about 15 minutes. If I had a proper computer I would, somehow, work out a program in order to enter your competition for the Vic-20 you are offering. I think it's great.

If any of your readers can help me find any programs for the MOS chip,

or loan a copy of the book above, I would be most grateful.

J. P. Riddick
Ashford
Kent.

Our expert replies concerning your problem with the Acorn Archimedes MPF 1000 Video Games Centre. You rightly state that the chip is a MOS from Signetics, made by Mullard. This is a general purpose microprocessor with a TI code instruction set.

I am afraid I can find no information on the book Microcomputer Controlled Video Games by S. J. Cipari. You and you only suggest you try the public library. If the book was on sale in this country then the Central Library will have a copy.

On the other hand, Mullard produce a data sheet and Signetics a complete family booklet, both available from Mullard or Fortington Place in London. Both include the complete instruction set but you may have to consult a separate book to understand how to use the different addressing modes.

MOLE GOES DOWN

Dear Sir,
I have entered your Mole program and it is a very enjoyable game but I cannot get a score and feel there is a mistake in line 25 which I cannot enter successfully.

Can you help?
I have entered the other two Sinclair games in your January issue and found them most enjoyable.

Congratulations on an extremely impressive magazine.
D. Johnson
Claydon, Surrey

Editor's reply: A bug slipped into this program which had to be typed. Line 25 should read:
25 LET B = FREE SPACE
1000 - 200 * FREE SPACE

We apologise for the mistake and hope you enjoy the game.



GONE ON THE GREEN THINGS

Dear Sir,
Many thanks for a wonderfully delivered magazine. I am particularly impressed with the way you have tried to present the games listings in an interesting and imaginative way. The bugs are a marvelous invention and almost worth a magazine on their own.

Among the other artwork, I thought the most impressive were the strange creatures which were used to illustrate the *Amos Atom's Green Things* game. I look forward to seeing more work by your artistic team in the future.
David Green,
Melbourne,
Calif.

BOGGED DOWN IN ACTION

Dear Sir,
For just over a year now my friends and I have been making up a variety of arcade-style computer games on the school computer (an Apple II 40K Expanded).

The main problem with these games is that the more action, speed and character the more bogged down and slower the program gets. This causes all moving shapes to flicker something terrible.

Obviously what is needed is machine language routines, such as those used in Bill Budge's *Pinny Arcade* where the ball does not flicker and will bounce off anything that is not black. The information to make up similar routines is readily obtainable from the available Apple manuals and so I must seek your help.

At the moment the shapes for our games are stored on disc, separate from the programs and are loaded and addressed by an assembler program which is fine for me, but not for less knowledgeable people who just run the program and expect it to work.

We do have programs which will load the shapes when asked but the addressing causes interference with any inputs immediately afterwards.

Naturally the direct FORK-ing of the shape table into the Apple memory in the first issue's *Nix* program interested me and I would be grateful if you could tell me how the author achieved this and how shape tables can be made without all the messing around with binary numbers, plotting diagrams, vectors and hexadecimal numbers.

I think your magazine is just what the computer industry needs and I hope to contribute some of my program listings in the near future.

Ned Forsyth
Waim
Newcastle
New South Wales

Garry Marshall: The high resolution shape tables, available in AppleSoft, are precisely what you need. As far as "messing about with the binary numbers" is concerned, you have to do it that way, because that is the way it works. Actually, it isn't at all difficult to do, once you have got the hang of it. I don't think that you would expect to get rapid moving graphics effects without expending a little effort.

The graphics effects can be really spectacular once

the shape is entered. AppleSoft permits it to be drawn, erased, moved and rotated with a minimum of programming effort. Watch the Graphics page for further details.

A SOFTWARE SENSATION

Dear Sir,
To my mind, people are attracted to arcade games automatically, for they often get out far more than they put into these computers.

Take *Atom's Battlegrounds*. It caught my eye in a tacky shop because of the EY monitor with vector scans, and the prodigious amount of motion the computer gets through in real time. In some you haven't met it, it's a fighting tank simulator in which you drive around a valley dodging missiles and rocks. Everything is portrayed in full perspective, right down to the missiles flying longer to distant targets.

A kind man let me meet one. There's a \$900 riding a 12K program, plus four custom bit-plane chips doing 3-bit logic internally, among the 150 other support devices. One certainly puts out more than you put in. At a guess the software came out of the backdoor from NASA, Boeing and Lockheed.

Thought your readers might be interested.

Jonathan Pope
Chesham Road,
Cambridge.

TAINTED BY TINTS

Dear Sir,
I have just copied a program for solving Rubik's Cube from your magazine, and I think you may be

interested in the following remarks on the presentation of this kind of material.

I presume you wish your readers to get the programs in your magazine up and running with as little trouble as possible. A clear and accurate printing is therefore required. I know that many microcomputers are provided with poor printers, and that accuracy demands that you print by some photographic process from such output.

I am not convinced, however, that you are not adding further difficulties for your readers by the way the programs are printed. The stark grey on light grey technique of page 42 is particularly troublesome, the pictures on some of the pages are also distracting. Fortunately I did not have to contend with printing on the sheet, or with a program printed over pictures, both of which occur elsewhere.

A lively pictorial presentation is of course an admirable aim, but if you want your readers to enjoy the programs, you publish and buy further copies of your magazine I feel you must make copying the program more easy.
D. Reed
Kempsey,
Ipswich.

Editor's reply: Thank you for your comments Mr Reed. We do appreciate the difficulties of laying-in programs, especially the long and complicated ones. We do take great care to ensure that when coloured tints and pictures are placed over printed, that the symbols are still be seen clearly.

If you find them a distraction I suggest you use a ruler (or, dare I suggest, a template) to keep your place in the listings. Our aim is to keep the listings both readable and presentable.

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS N GAMES NEWS

EAT AWAY A HIGH SCORE

MUNCHIE MAN

The Munchie Man's appetite is of a kind common among readers of gaming magazines.

He digests without discomfort and travels around your Acorn Atom screen consuming dots as fast as he can. But he has enemies, four ghosts, whose aim is to put a stop to the voracious creature by eating him up.

In this version of the arcade game Pacman or Munchie Man, you play the part of the Munchie Man and score points for every morsel you eat.

Bonus points are accumulated by eating the evil means when the tables are reversed. This is achieved by gulping down one of the flashing ghosts in the corners of the screen, which puts you the energy to chase and eat the enemies for a few brief seconds.

Program Power is the supplier of the game which costs at a full memory Acorn Atom and will cost £4.95 for a cassette. Perhaps it could be good evening therapy for a glutton.

TAKE A BALLOON TO THE TOP

THE GREAT BALLOON RACE



SAVE DARTH'S EMPIRE

EMPIRE STRIKES BACK

Join the forces of the tyrannical Darth Vader, waging war against the rebels who dare to oppose the Empire.

In Empire Strikes Back you are given command of a squadron of Walker Tanks, which look like tanks but are made of metal and are equipped with lethal laser guns.

You answer to the menacing leader Darth Vader if you lose

a tank and the Empire goes down on numbers.

Your five Walker Tanks are in pursuit of the rebels and you must shoot down their aircraft, then troops and finally the rebel base itself. If you lose a tank in combat, the one taking over carries on where the other left off, so you don't have to go back to the beginning of the game and start again.

The Walker Tanks are present, but in their movement and you must be careful not to stop them when they are in an unstable position. If you do the Walker will reel over and collapse into a useless heap.

Throughout the game you can check how far away the Walker Tanks are from the rebel base and you can also spot enemy positions on your radar scanner.

Incorporated on the screen is a multi cycle meter which, when completed, either generates more energy for the Walker, or carries out any repairs the tank needs.

Supplier of this game is Tandy software specialist Melmore of Sussex. It can be yours for £19.95 (including VAT) and runs on a ZX Spectrum 128 or 256 Level II.

LUNAR RESCUE MISSION

SPACE RESCUE

A stranded tribe of lunar creatures in fear of their lives look to you for an escape route.

As commander of the mother ship hovering over the surface of the moon, your brief in Space Rescue is to save the moonlets, or pods, as they are usually known. A special landing craft carried by the mother ship is under your control and struggling against the relentless onslaught of a meteorite storm.

You have to land the craft on the moon's surface and pick up five pods, at the same time dodging the rocks to underneath. After each pod is rescued you must take him back to the mother ship.

Points are scored for pod picking and meteorites destroyed.

Altogether you get four lives to play with and there are nine skill levels to try out — and sound effects too. Available now from Pat software specialists Supersoft, it costs on an ZX machine and runs on ZX plus V.A.T.

A DASH OF OUTER SPACE DIPLOMACY

STARSHIP COMMAND

Continue Star Trek with the war-game concept, add a dash of Diplomacy and you'll end up with Starship Command.

The game is set in a spaceworld which permits the galaxy, seeking out enemy spacecraft and keeping your allies on the right side.

In front of you is a three dimensional view of the galaxy divided up into quadrants. You must shoot down enemy ships while avoiding them too.

But you are also in contact with other planets, some of which are hostile and others friendly. Your job is to boost the morale of your supporters to stop them changing sides and going over to the enemy.

It runs on the Macrom and costs £9.95 available from Program Power of Leeds.

GAMES NEWS

BURIED AND DEAD

ALIEN

Old fashioned yuck and shovelled work is the only way to rid your planet of a strange new breed of alien creatures.

In Alien, the action takes place in a maze, infested by ugly beings, whose aim is to hunt you down and eat you.

Your only escape is to dig holes in the labyrinth of the maze blocking the hungry creatures' way. When they fall into the holes you have dug, you must hover nearby and fill the hole in over their heads.

The aliens are surprisingly agile and in a flash they can hop out of their potential coffin and eat your man up in one fell swoop. You get points for the number of evil machines you successfully bury, and if you wipe one frame clean of them you get the chance to have another go at a new frame.

Alien will run on a VIC-20, and makes use of the machine's high resolution graphics. It can be played for £19.95 from Commodore dealers.

RACE AGAINST THE CLOCK

SUPER RACETRACK

Driving round a race course at top speed is a test of concentration and skill to stay on the track and take the chequered flag in Super Racetrack.

This game is a race against the clock with the object being to break up and race records. There is plenty of variety in the course selection so if you want to anticipate the harpish bends on one track, try another.

Steer the car around the course keeping clear of other cars and the barriers bordering both sides of the course.

At the start, the car appears on the bottom of the screen but when the race is underway, the track unfolds before you on the screen.

This Acorn Atom cartridge is reasonably priced at £9.95 from Program Power of Leeds.



A JUMBO SIZED JOB

747 FLIGHT

Passengers and crew of a 747 Jumbo Jet are in your hands as a flight to land at England's busiest airport headwinds.

The huge aircraft is solely in your command as you fly in the pilot's hot seat through the suburbs of London. When you have located the position of two Heathrow runways you must start the descent and safely land the aircraft. Just how good a pilot you are will be revealed once you have completed the landing — as you receive points for airmanship.

Bug Byte's 747 Flight runs on an Acorn Atom and was actually written by a Jumbo Jet pilot for the Liverpool software supplier, so it earns top marks for its realism.

On the screen you are confronted with various figures representing altitude, the state of the undercarriage, a compass, the rate of climb in feet per second, the speed of the aircraft in knots and the angle of the flaps in degrees, to name but a few.

To help you on your flight, a map of Heathrow's environs has been included with the game. On it are marked the 16 stations (six of which are close to the two runways) and possible flight paths.

All 128 memory is needed to run this simulation game and it costs £8.

INVADERS NEW ONSLAUGHT

INVADERS

Shot away at a fleet of attacking creatures in defence of your home base while avoiding the onslaught of laser beams.

With four protective shields to protect your ship from the raging torrent of enemy fire you must weave the laser to the left and right of the screen. Keep up a constant stream of shots to destroy each fleet, but don't expect to end up on the winning side.

This 128,000 version of space invaders has been written in machine code to achieve high speed screen action with a fleet of invaders numbering 21 made

up of three rows of seven creatures each. Two points are gained by hitting the flying saucer at the top of the screen.

Invaders costs £4 from Bug Byte of Liverpool, which has also just brought out a new chess game for the Acorn Atom.

Bug Byte says the game's strengths lie in its graphical representation. It is clearer than most chess games, in some there is confusion over the black and white pieces. It runs on a 128 Acorn and comes in cassette form with instructions, costing £9.95.

WE HAVE TOUCHDOWN

SUPERLANDER

Landing a spaceship on the craggy hazardous surface of a strange planet is no easy task and you need a steady hand at the controls.

In the first batch of games brought out by Commodore Business Machines for the VIC-20 your task is to successfully land your spaceship. There are three safe landing sites to steer the ship towards. A safe landing needs careful judgement and a steady slow approach.

You use the joystick to control the movement of the space-

craft, guiding it upwards, downwards, to the right and to the left. An extra feature is its power thrust facility. If you want to build up speed the engines will be boosted by pushing the control joystick down.

Points are awarded depending on the difficulty of the site you choose to land on. Superlander is available now from Commodore dealers for £19.95.



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NEW PRODUCTS NEW PRODUCTS NEW PRODUCT GAMES NEWS

FULFIL L'EMPEROR'S EURO-DREAM

NAPOLEON

A revamped computer depicts the tread of your armies' boots when you try to recreate the conquests of France's 19th Century Emperor, Napoleon.

The computer organises the defence as the armies of Austria, Britain, Spain, Prussia, Russia and Prussia prepare to thwart your ambitions.

The power-hungry Emperor Napoleon, has since been hailed as 'the first European.'

His aim was to conquer the

main European countries and to lord and master from his beloved mother country, France.

To carry out your task there are six French armies at your disposal.

The computer's armies start off from their respective countries except the British one which begins its manoeuvres from Iberia or Prussia, for ease of troop movement.

You begin the wars in June 1798, and have a time limit of 11 years imposed on you to achieve complete Napoleon's ambitions.

Troops take a long time to move being without fast means of transport. Weather conditions have to be taken into account when moving troops either into battle or to a new camp location. Historically Napoleon's big blunder was to make an army march on Russia in winter, when the troops were ill-equipped to cope with the conditions.

Napoleon is the appropriate name of the game. It runs on a Tandy TRS-80 in 19K and is available from Mailmark. It is only out in tape form for the price of £11.95.



FLIPPER FLICKING FOR THE FAMILY PINBALL

Invent your own pinball machine design to make the most of your flipper-flicking skills.

Pinball wizards are given their chance to improve on arcade designs in the latest cassette for the new Tandy TRS-80 Colour Computers.

A feature of the game is that you can decide how many flippers you want, where they should be positioned and how difficult or easy the finished game is and then try it out on the

rest of the family.

Pinball incorporates all the features of the classic arcade game, you have to judge the best angle to hit the ball in order to make the best improvement to your score.

The game is for up to four players and you can try it out for yourself at the Which Computer? Show in a competition which offers the Colour Computer as a prize.

All the entry money collected will be donated to the Muscular Dystrophy Group and will be spent on more electronic aids for medical research. Scores are high for piles of cash as the show organiser Dapo & Polak is to match the sum raised on competition entry fees.

If you fancy a go the show is on from 19-22 January at Birmingham's National Exhibition Centre. The Pinball cassette costs £22.95 from your Tandy dealer.

HAZARDS ON THE FAIRWAY GOLF

Roller 'Pace' if you hit a very-wind shot in the most recent golf game on the computer scene.

And then cross your fingers and hope none of the wind has wandered into the path of your ball.

This is one of the hazards in Program Power's Golf cassette, which strays towards new frontiers of fairway realism. The player is invited to take part in a championship golf tournament, to face an imposing selection of clubs to choose from and a variety of wind and ground conditions to overcome.

VICS HELP YOU TUNE MORE EASILY TUNESMITH

Gary Numan has brought electronic music back into vogue and now the Commodore VIC-20 is bringing similar sounds into your front room.

All you need is the latest music pack called the VIC Tunesmith and you are ready to rock. This piece of software will impress the musicians in the flat and make better use of the VIC-20's sounds facility.

Study the manual that comes with the machine — there is a section listing musical notes complete with true notes, flat notes and sharps. Each has a number assigned to it which the computer understands and by typing that in via the keyboard you can write your own piece of music.

Tunesmith has a capacity for 99 note melodies and you can add in a suitable drum beat and set the speed of the tune you create. If, when you play it back, there are a few notes that make you wince don't worry — there's a special editing facility which allows you to replace the part-of-tune notes or delete them altogether.

From the VIC Centre, Tunesmith is a recent addition to the VIC software range and costs £5.95.

The wind speed changes to make the game more challenging as you have to judge the power behind your shot accordingly. It also affects the direction.

Watch out for obstacles on the course. There are awkward bunkers and clumps of trees border the fairway.

You even have vent-a-crowd on hand to bolster your confidence when you hit a good putt but be careful not to knock them out.

Golf is available for Masscan machines and has a price tag of £7.95.

TEN WAYS TO USE A TEMPLATE

"A card for Telly Savalas," said G. B. Ray of Marley, Whitehorn in Dorset and as a judge's whim he was awarded a prize. To give Mr. Ray his due, this use of a template was more sensible than most of the ideas we received.

In a similar vein was Jim Hanley's suggestion that we paint a buckle on one end and use it as a fashion belt for Twiggy. But this was not topical enough for our judge, so instead she chose his second idea, that the template would make a great beer clarity tester. Puzzled? Well so were we, but Mr. Hanley elucidated with instructions: (1) place template in pint glass. (2) Read words in red letters. (3) Check against following chart: clearly visible, light etc; very vague, brown etc; impossible to see, Guinness.

Yes it really works, impressed we despatched a T-shirt to Nelson in Lancs.

The by-the-way cynicism prize went to Keith Parker of Crook, Co. Durham, whose entry read: "1) Take template. Fold twice down length to produce a strip 1" x 2". (2) Wedge this under Sinclair 128 RAM pack ... presto! The dreaded RAM pack wobble is cured — words tell me (sorry Uncle Eric, we all love you really.)"

Where does the cynicism come in? Well somewhere. The prize: one of our T-shirts.

Anthony Hood of Kilburn, Derbyshire gave us a rhyme: "This piece of plastic, it's a 7". A computer shall be stuck thereon; So when I puzzle, come and try; I think of C.B.V.G., the

When we gave away a free template with our second issue, we little realised what strange perverted uses the poor defenceless pieces of plastic would be put to.

Trained only in the art of helping readers to key-in our games program listings, the templates may be hard-pressed to fulfil some of the tasks you planned for them.

Innocently we asked: "What other uses could you find for a free template?" And

in implicit detail you told us! After we had thrown those out we were still left with a few bizarre suggestions and from these we picked our 10 lucky winners of Bugs T-shirts.

The winning entries are presented below and should not be read by anyone who is feeling in a delicate state. Our judge has given us trying to explain her choice of T-shirt winners and is unavailable to anyone trying to contest the decision.



granted. And about the T-shirt I won: With those lovable Bugs displayed upon; Otherwise I'll probably use it to set the gap on my spark plugs."

And you thought Kato was good! Anthony wins our Great McGonagall Poetry prize — a T-shirt. We are currently investigating claims that Anthony is a part-time Vegan spaceship captain.

No such doubt exists in the case of Kevin Etheridge — who freely admits his alien origins. Apparently the tem-

plate was the answer to his dreams — mainly to get off this "dunghill of a world" and back to his native planet. Kevin linked the template into his Hambletondale Generator link, 41 via the automatic spark-ignition module to reverse the polarity on the poly-chrome infundibulator and enabled him to disappear into hyperspace. Before he goes, Kevin will be hanging on for his T-shirt at Balgaty Bay, Hambletondale — he is a "large-size" alien.

D. B. Cowap of Letchworth, Herts. came up with the artistic suggestion of using the template as a De-Stopping device (left).

Robin Hill came up with several suggestions, the most sensible of which, was: "Memorise this contour so you'll recognise a straight line when you see one."

He claims his address as: The Street Office, British Aerospace, Brough, N. Humberside.

Removing the skin off old rice pudding, was the simple and practical idea put forward by Simon Hodgson of Colchester, Tyne-and-Wear.

Just to prove there is nothing socialist about this magazine (although all the Bugs are made car penultimate winner was Linda Evans of Burgess Hill, West Sussex.

Linda reckons the template is ideal for removing her pet parent's little offerings from the carpet — leaving no trace! Linda assures us that the template is thoroughly wiped before being returned to trying-in duty.

And finally, Simon Young of Clapton, London E8, reckons Adam Ant uses a template to draw the make-up lines across his face.

And if you think these 10 were bad — at least they were printable. We hope we haven't given you too many ideas.

BRAINWARE ANSWERS

The answer to our January Mind Riddles is that the triangular pyramid has 4, 6 and 8 layers, which gives you 28, 36 and 120 balls.

The square pyramid has 1, 2 and 7 layers which gives you 1, 36 and 148 balls.

The November Crossword solution is printed right and we will publish the names of the winners next month.

This month's Brainware problems can be found on page 83.





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CHESS



A common myth — especially among non-players — is that expert chessplayers and chess-playing programs somehow look at every possible variation in the game.

A little analysis shows that this cannot possibly be so. In the initial starting position for chess, White has a choice of 20 moves (16 pawn moves and four knight moves). Whatever move he plays, Black has a choice of 28 replies, making a total of $20 \times 28 = 560$ possible combinations of one move on each side, including such unlikely combinations as 1.P-QR4, P-KR4 and 1.P-KR3, N-QR5. For subsequent moves each side is likely to have perhaps 30 alternative choices

By Max Brammer

ified form, is used in virtually all programs to play chess, go, draughts and similar two-person games. It is easiest to illustrate the method by a simpler example than chess and I have taken the humble game of naughts and crosses as an example.

In the position marked 1, it is X's move and he has three choices shown as positions 2, 3 and 4. Number 3 is terminal and a win for X, in numbers 2 and 4 it is O's move, to positions 5, 6, 7 or 8. Position 8 is also terminal and a win for O. Following every sequence of moves through to either a win for X, a win for O, or a draw gives the complete figure which is called a game tree. Notice that only terminal positions 3, 6, 8, 10, 11 are labelled as a win or draw.

However, every other position can now be labelled (working from the bottom of the tree upwards) as a straightforward win. Numbers 5 and 9 must be draws and 7 is a win for X since there is only one legal move each time.

Now look at position 2. It is O's move and he can either move to 5, a draw, or 6 a win for O. Since it is O's move he will choose the best alternative from his own viewpoint, in this case 6. So 2 is also a win for O. In the same way 4 is a draw, since O will certainly avoid playing to 7 and losing. Finally reconsider position 1. Now it is X's move and the choice is between 2 (a win for O), 3 (a win for X) and 4 (a draw). He naturally will choose 3 and so the original position 1 is a win — as is obvious on a glance — with the best move being to 3.

The same method would work equally well for any size of game tree, with any number of levels, provided the players move alternately, as they do in chess.

The first step towards a solution is to extend the idea of a score, instead of just win, draw or loss, every position is given a

numerical value, e.g. +100 for a large White advantage, -3 for a small Black advantage (it is convenient always to score from White's viewpoint). Of course, this is much less precise and requires a great deal of judgement to do even reasonably well (how does a weak pawn balance against a strongly centralised queen?).

Just as in the naughts and crosses example, the score of the initial position being analysed can be computed by "backing-up" values, level by level. Figure two shows an example, analysing just one move for each side. Note that all scores are taken from White's point of view, so negative scores are favourable to Black.



The values -8, -3 etc. are scores assigned to the final position, i.e. those where analysis stops. In positions 3, 3 and 4 it is Black's move. In 2, he will play to 5 since a value of -8 is better than -3 or -2 from his viewpoint. Thus 2 has a score of -8 and similarly 3 and 4 should score +5 and -4, respectively, with Black always playing to minimise the score of the resulting position. From White's viewpoint, in position 1, it is best to maximise the score he can obtain, thus he chooses to play to 3, value +5, not 2, value -8 or 4, value -4. The same alternative of White maximising and Black minimising would again work with any number of levels and, not surprisingly, is called the minimax algorithm. Using the minimax algorithm does not solve the combinatorial explosion, since even looking two or three moves ahead for each side gives a vast number of positions, but it is an invaluable start.



on average until quite late in the game. Thus we can reasonably estimate the number of possible ways of playing just the first three moves for each side by $20 \times 28 \times 30 \times 30 \times 30 \times 30 = 324$ million!

The so-called "combinatorial explosion" of variations is one of the greatest obstacles to writing almost all game-playing programs. Nevertheless, it is extremely helpful to start by thinking in terms of exhaustive analysis, stopping only when a position is a checkmate or a "drawn" draw is stalemate or inadequate material for either side to checkmate, since this leads to an elegant method of move selection, known as the minimax algorithm. This, in mod-

TV GAMES CENTRES TV GAMES CENTRES TV GAMES CENTRES VIDEO SCREEN

KEEP THIS VILLAIN'S BOMBS AT BAY

KABOOM! THE MAD BOMBER

Kaboom the Mad Bomber is an evil character who lives up to his name.

To rule the road in the top of a wall and has instant access to a cache of bombs which he drops from a great height. It's up to you to thwart Kaboom and literally wipe the smile off his face. For each time you let a bomb hit the ground it brings a wicked grin to his face.

This Activision cartridge fits the Atari VCS and has an addictive quality making it hard to put down. At the bottom of the screen are three blocks which you can move about with your paddle controllers.

Kaboom moves erratically from one side of the screen to the other and drops a series of bombs with timed fuses which you catch with your block.

At first the bomber moves slowly so there's no problem catching the bombs but as the game progresses Kaboom really does go mad making it a hard job for you to tackle.

There are two options to vary the game. On the first the blocks are piled three high, on the sec-

ond the blocks double in length making your task easier.

Although the only skill in playing the game is having a quick hand to move the block across the screen it is an extremely competitive reaction game.

The points system is simple, one point for each bomb, but the score can quickly mount up.

Kaboom the Mad Bomber will torment your life for £18.95 from Activision UK distributors.

PITCHING FOR WORLD CUP PLAY

FOOTBALL AND ICE HOCKEY

Football fans are in for a good time next year with the World Cup in full swing.

Games centres are well catered for on the football front, the latest to add one to its range is Philips for the G1000. In this version the match is fought out between two five man teams, each complete with a goalie. The man are moved around the pitch



ANOTHER BRICK IN THE WALL

SUPER BREAKOUT

Being trapped in a small space means horror for the claustrophobic and Super Breakout will have them crying out in anguish.

The only way to get out of the dilemma is to shatter the bricks above you which are four layers deep. On either side of these layers the walls form you in so you are truly trapped.

Super Breakout is one of the latest games for the Atari Video Computer System following the traditional version. Five different variations of play are included in the package, regular Breakout, Double Breakout, Crazy Breakout and Progressive Breakout. All for one or two players.

At the bottom of the screen is a bat which you control, using the Atari's compatible paddles. When the game starts off a ball is served into the play area which you have to bounce off your block to make it rebound against the coloured bricks at the top of the screen.

Each brick you successfully knock out disappears from the screen and you are awarded points.

Bricks in the first two rows of the regular game go for one point each. The second and third rows are worth three points each and the fifth and sixth rows will net you five per brick, and the seventh and eighth rows bricks earn you seven points each.

Depending on the game version you play and certain stages reached in the play the points are sometimes doubled or tripled. In Double Breakout the maximum score is infinite, as you can go on building up a high score indefinitely.

Another feature is a children's version making the game easier if you want to let the kids let rip. The difference is that the speed of the game is slowed down so you have more time to react and judge the best place to position your bat to hit the ball.

The cartridge sells for £14.95, from Atari distributors.



REVERSI

By Tom Naylor

SCREENING YOUR PROGRAM

There are plenty of practical problems which crop up when putting the game of Reversi on a computer screen.

Leaving the actual programming of the machine to play a good game aside for a moment, in just representing Reversi on a screen there are several guidelines which can help in the presentation of the game.

The problem arises when one tries to show a board and pieces on a screen, since almost every computer has its own unique way of doing this.

The method I used was to draw the fixed information such as the board and its square numbering using BASIC PRINT statements and then to POKE the pieces into the correct memory locations to make them appear on the board.

This is much quicker than reprinting the whole display after each move.

My board is pale blue with dark blue lines dividing the squares. The machine plays with blue pieces and the human player with red ones. One afterthought that turned out to be essential was to make each newly placed piece flash for several seconds. Without this, it was difficult to spot where the computer had moved, particularly once it had started turning over the pieces.

However, it's not impossible to write a Reversi program on a non-graphic monochrome computer, it's just a little slower and not so pretty.

The strategy my program uses is: for every unoccupied square, test to see if a legal move is possible. If it is, evaluate the move and compare it with the best move found so far. Save the better move.

After testing all the squares, play the best move found. Turn

Reversi is the old English name for the board game which has recently become popular in Britain since being re-invented in Japan.

As Othello is the trade name for the game we have decided to revert to calling our column "Reversi" as this is the name frequently given to computerised versions of the game.

over all the appropriate pieces then wait for the human player's response. Test that the human player's move is legal and display the new board position if it is. Repeat until either both players pass or successive moves or more 65 is reached. Add up totals of both players and announce winner.

I have glossed over the move evaluation routine. A simple program will use two Basic arrays, one 10 by 10 to represent the state of the board and another that contains the desirability factors assigned to each square. The board state array is 10 x 10 in size simply to enable the edge of the board to be indicated to the legal move testing routine.

The same routine is used to check the legality of both player's moves by changing the value of the flag "P". Assuming the square concerned is unoccupied it goes like this. For direction 1 to 8, keep stepping out so long as only opposing pieces are encountered. If a space or the board edge is found, try the next direction. If a friendly piece is found is a direc-

tion that contains at least one opposing piece then the move is legal. It's shorter in Basic than in English!

To evaluate a move the routine adds twice the value of the square played on to the sum of values of the pieces captured. The values assigned, which should be varied by anyone experimenting with the program, reflect such factors as the desirability of corner and edge squares and the relative undesirability of squares that enable one's opponent to make a corner or edge move.

Towards the end of the game, positions are relatively unimportant and only sheer numbers matter, this is reflected by setting all the values to 1 for the last few moves.

A more complicated program could try resetting the values to reflect the position of the pieces, for example once a corner has been taken, the squares next to the corners could have a higher value assigned to them.

Only legal moves should be fully evaluated but even so the computer will take 15 to 25 seconds to make up its mind. First attempts should not try to make the machine look at its opponent's possible responses, it would just take too long.

One compromise I have worked on but not yet completed is to write the move examination routine in machine code while still using Basic for the rest of the program. This would speed things up enormously.



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Space cast and alien beings were the preserve of the science fiction enthusiast long before they began appearing on our computer screens.

Sci-fi also has a long tradition for being the most innovative family in the literary class. We thought we should tap this source of new ideas and invited author David Langford of the Science Fiction Foundation to lead us gently into the diverse futures imagined by the latest science fiction authors.

David will sift through the latest ideas and reproduce the best of these and provide some greatly appreciated humor on the way.

In his first column, David looks at one way for beginners to approach giving a game a science fiction feel and presents a simple example, *Space Blockade*.

New computer owners may well be alarmed by the awesome accuracy seemingly needed to prepare a lengthy Basic program.

Ignoring the howls of the purists (the ones who have no time for you unless you can write fluent machine code while standing on your head in a thunderstorm), let's look at how to cheat — to work up a half-baked idea into a tiny but operational computer game without any vast planning. You might call it computer doodling.

My wife, disgruntled by picking at her office, suggested a game where you had to steer small unfortunate non-uniform people through immense and swarming picket lines. Thus, one non-sober evening, the game of "Flying Pickets" came into being. Let's not deal with such politically sensitive matters but with the almost indistinguishable game called "Space Blockade" which I've just invented out of sheer cowardice.

A band of evil extraterrestrials hangs over the Earth. Our planet is doomed and must be evacuated. One by one Earth's brave little ships boost into space, only to perish miserably by collision with the aliens' invulnerable force screens . . . unless you steer between them.

Obviously this is dead easy unless the fiendish baddies keep on the move. One simple-minded way of doing this on my

COMPUTER

BY DAVID LANGFORD

TRE-80 is to make up a long string by adding up CHR graphics; you PRINT this, and because it is such a long string it first prints the top halves of all these invaders and then wraps round to the next line to print the bottom halves — giving them a sinister wriggling motion when they move as described below. Repeat to give three spaced-out rows of looming invaders, each

steered up through that lot is a mere "little moving blot" steered by the arrow keys; easy to arrange on any machine, using a function like INKEY to read in the steering instructions. You'll know what comes next: the ship starts at horizontal position X and vertical (measured from the top) position Y somewhere near bottom centre of the screen, and



now starting at the left-hand edge of the screen and reaching not all the way across.

Repeat the PRINT again and again for all three, stepping up the TAB function or equivalent to overprint and have these blockade lines shuffle a space to the right each time. When they reach the right-hand edge you can start them moving back again. These rows of monstrous Things sliding to and fro in the sky.

The simplest "Earth ship" to

move depending on which arrow key was last pressed.

If it was the up-arrow then the new Y must be made on less than the old one; the graphics blot on X,Y is turned off and that at X,Y+1 turned on . . . and so on in a loop until a different arrow key is pressed.

If you go straight up like that, the chances are that sooner or later you hit one of the Things in the sky, and are blown to smithereens. The program should test the new point X,Y on the display before turning it on



DEEP IN THE DARKEST RECESSES OF THE BUGS MICRO-SNAG ONE IS HELPING OUT WITH A GAME!

GRAAHK!



ARCADE

TIPS

MISSION (ALMOST) IMPOSSIBLE

Scramble was the first arcade machine to send you on a mission and quickly earned a big following.

Armed with a spaceship which fires bullets and drops bombs, the player is given differing stretches of terrain to cross and a variety of things to blow up.

The secret of the game is screen position. Where you are on the screen dictates how much manoeuvrability the craft has and how well it can avoid obstacles and hazards.

The screen background is rolling constantly forwards and your speed is regulated by a joystick-type lever which moves you up and down and backwards and forwards. Pushing the lever back enables your craft to "hover" against the background, until you come to the back of the screen.

The first screen gives a mountainous background with ground-to-air missiles, installations and fuel dumps. Fuel is the crucial consideration in Scramble, as without it, you will plummet from the sky. Extra fuel is obtained by



blowing up fuel dumps and on this first easy scenario the player should take his time and bomb as many dumps as possible.

Memorising screen positions is a vital part of achieving a good score as in the same situations, missiles fire at the same time.

The installations in the fourth wall can only be bombed (at start) and the screen closes up to leave a very narrow, vulnerable space at the top of the screen.

But it is the fifth wall, the maze, which causes the most problems, as it involves long vertical stretches which can only be negotiated by careful use of the joystick, moving as far forward as possible and then drifting back with the screen.

The flag for the first series of screens successfully completed can be earned by either shooting or crashing into the robot figure by the spaceship after the maze.

THE SUPER GALAXIANS

GALAGA

The Galaga race has arrived on the British arcade scene. In our December issue we warned of the coming invasion of a new improved Galaxian and now we can fill in a few more details of this new foe.

Like Galaxian the creatures fly in formation above the firing spaceship under your command, and swoop down to attack, firing bullets as they come.

Unlike their predecessors, the creatures first fly into formation from the edges of the screen, giving the player an extra opportunity to shoot them. They also swoop back up to join their comrades after an unsuccessful dive — disappointingly appearing under your craft.

The Saucers themselves, as the leaders of the creatures and must be hit twice to successfully kill them off. When they reach the bottom of the screen, they generate an energy cone and activate your spaceship, carrying it to the top of the screen. If you have to reserve spare spacecraft left, the game is over. If you do, then the challenge is to shoot the Galaga without hitting your own ship and so rescue it.

If you manage that, the second craft teams up with the first to fire in tandem, making a much more efficient defence force.

The first and second stage are the same but then you enter the first challenge stage with the 40 craft flying, without firing, across the screen — hit them all for a 10,000 bonus — very useful when you consider that 10,000 brings a new spaceship.

The second challenge stage really needs a tandem ship to achieve this and the third challenge stage makes the creatures fiercer still.

In later screens the droid ships flash red and split into three "scorpion" craft which swoop all over the screen.

Another feature of the game is that it is possible to develop a technique for almost continuous fire by flicking the fire button hand and foot. Plenty of scope for the good player and a succession of new challenges.

KNOW YOUR CREATURES

How many arcade creatures did you get right? We put a Taito space invaders table up for grabs for the person who could correctly name the machines which these nine arcade inhabitants come from.

- (A) Phoenix
- (B) Galaxian
- (C) Miss Grenda
- (D) Defender
- (E) Galaxian
- (F) Space Invader
- (G) Space Fury
- (H) Wizard of War
- (I) Maxman, Packman or Pac-man

The name of the winner will be announced in our March issue.



ACTION

CONFESSIONS OF AN ARCADE RODENT

Puckman with a Tim and Jerry theme is the essence of Mouse-trap.

In this mame-chase game, the player takes on the role of the mouse, and the villains are the cats.

The mouse has to run around the maze eating pieces of cheese with the cats chasing after him. There are dashes which our rodent hero can dash behind him to fend off the enemy.

The other reverse of the coin

is that the mouse is to eat a bone. Bones are dotted around the screen like the flashing energy dots in Puckman and have a similar effect — they turn the player into a dog for a short time and during that period he can turn the tables on the cats, which do their best to escape.

By and large it all seems very reminiscent of the Puckman game but there are a few extra features which add to the problems of being an arcade mouse.

Birds fly around the screen and will eat the mouse if they come across him. The mouse can escape the birds by hiding in the corners of the screen.

It is an all-action affair which builds logically on the success of Puckman but requires the player to think further ahead.

After finding that frogs make very acceptable screen heroes, the arcade industry is following this theme to its logical conclusion.

The cartoon heroes seem ideal participants of this new arcade genre which features, cheese, mice, cats and dogs — in short all the ingredients of a successful cartoon adventure.

GLOSS OVER THESE GHOSTS

Self-nourished addicts now have an arcade game based on their activities.

Following the craze for more down-to-earth themes on the arcade scene, games Crash Roller, which saved as well as scored, "Crash Decorator".

The game is similar to the Puckman/Macramé type chase game with ghost-like creatures chasing our intrepid D.U.Y. equipped though a series of interlocking roadways.

But while in the Macramé game, the idea is to eat the spurs, here the player must paint over the roadways.

It is more difficult than its predecessor although there are only two ghosts in this version. They act faster than their Puck-

man counterparts and slightly



VIDEO POOL

Take your cue from the U.S.

The American pool table evaded the native bar billiards from numerous public bars, many years ago.

But with the necessity of feeding coin space all around the bulky tables, many pubs found that they could not afford the space to house private pool tables.

But the video games industry came up with an electronic solution by fitting pool into arcade games cabinets.

Video Pool is already proving a popular addition to the arcade scene. Instead of using a cue, players have to perfect the skill of lining up a cross on the cue ball.

This technique has already been used in computer versions of snooker.

It needs a good eye to line up the cross so the cue ball is hit at the required angle.

For those who have not tried their hands at the game Americans snooker is better than snooker, the aim is to pocket your own balls while leaving your opponents' on the table.

The 15 balls are divided into two groups of seven, spots and stripes, and the black "11" ball which must be left to last.

The winner is the first player to pocket his own seven balls and then down the black.

CRASH ROLLER

man counterparts and slightly quicker than the painter.

To combat this, the painter can run to one of two bridges which are incorporated on the roadway. There he can grab a huge paint roller and turn the tables on his pursuers in an effort to paint over them. Bonus screens are collected for each ghost who is caught beneath the paint roller.

The game is further complicated by the random appearance of creatures who will mess up the decorator's headwork. A cat, bird or motor car will appear — in much the same way as it did in Puckman — but these do not just offer bonuses.

The cat, for example leaves

footprints in the pavement and must be painted flat and his footprints painted over. It is very easy to find yourself running these interruptions as a real decorator would any fellow criminal.

Bonuses are offered for clearing screens in a good time and a new screen appears to be fixed in another bright colour. The first screen for instance, is a loud green. An optional feature is provided in black holes that appear randomly in the roadway and the decorator can disappear down these.

The bridges are an interesting feature, in that you can run over and under them.



RUNS ON AN APPLE **BY MARK PELCZARSK**

Two World War I air races are locked in an aerial duel in the skies above France.

Discover the skills needed to loop-the-loop and come back on your opponent's tail. This is one of those two player shoot-'em-down games in which the screen is the sky and the paddles your controls.

Each of two players has an aeroplane, presented on the Hi-Res Apple screen which can be directed with the paddle knob. The button allows you to

```

5 REM DOGFIGHT - MARK PELCZARSK
  1, 1980
10 REMBEG
20 PORG 222,0,0 PORG 222,0
22 BA = 0:PC(1) = 0
23 PC(2) = 0
24 REMC
27 B = 0
28 R2 = 0
322 INPUT "YOUR NAME? "Y$
324 INPUT "OPPONENT'S NAME? "Y$

```

```

340 INPUT "PRESS 11-13? "Y$
370 B = B OR 0
390 SCALE = 0
395 REM
395 HCOLOR = BA:HPLOT 0,0 CALL
  420H
400 HORG = Y100 21: PRINT H$,
  "Y$
400 H11 = 20:Y11 = 120
405 H12 = 100:Y12 = 120
420 H11 = 100:Y11 = 0
405 FOR I = 1 TO 2: H2 = H11 +
  4: HCOLOR = PC(1)
405 H12 = 0:Y12 = 0
410 DRAW 1 AT H11,H12 NEXT I
420 Y100 25: PRINT "PRESS ANY KE
  Y TO START": GOTO 0
400 FOR I = 1 TO 2
500 J = 2 - I
510 REMBEG 1000
520 NEXT I

```

```

520 IF B# = 0 OR H11 = 0 OR H12
  0 = 0 THEN 4000
540 GOTO 500
5000 HCOLOR = BA: H2 = H11 + 4
5010 DRAW 1 AT H11,H12
5020 C = PBL 12 - 1
5030 IF C < 0 THEN H11 = H11 -
  3: H2 = H2
5040 IF C > 255 THEN H11 = H11
  + 1

```

```

1005 A = 240 + 1: GOTO 1120
1105 A = 240 + 1: GOTO 1120
1110 A = 140 + 2: GOTO 1120
1115 A = 0: GOTO 1120
1095 A = - 240 + 3: GOTO 1120
1110 A = - 140 + 4: GOTO 1120
1111 A = - 240 + 5: GOTO 1120
1112 A = - 240 + 6: GOTO 1120
1113 A = - 240 + 1: GOTO 1120

```

DOG

```

5040 IF H12 = 0 THEN H11 = 100
  GOTO 1000
5050 IF H12 = 0 THEN H12 = 0
1000 ON H11 GOTO 1101,1102,1103
  ,1104,1105,1106,1107,1108,11
  09,1110,1111,1112,1113,1114,
  1115,1116
1101 A = 140 + - 2: GOTO 1120
1102 A = 140 + - 1: GOTO 1120
1103 A = 240 + - 0: GOTO 1120
1104 A = 240 + 0: GOTO 1120

```

```

1104 A = - 240 + - 0: GOTO 1120
1110 A = - 140 + - 0: GOTO 1120
1110 A = 0: GOTO 1120
1110 H11 = 110 + 0 + 0
1100 IF H12 > 255 THEN H12 = 0
  01 = 255
1140 IF H12 < 1 THEN H12 = 0
  0 = 255
1150 H11 = H11 + 0 + 0
1200 DRAW 0 AT H11,H12
1250 IF H2 = H11 = 1420 + 0: H2 =
  H2 + H11 = 1420 + 0: H2 =
  2550

```




FIGHT

2000 WEST L
 2000 HOLLAND- BA
 2000 FOR L = 1 TO 5
 2000 SCALE= L: DIM S(67 *20),T(

4118 17 LENGTH 104.20 - 7' TALL
140
4120 17 LENGTH 104.11 - 6' 7" TALL

0040 0010 00, 02, 04, 06, 08, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100

```

2040 00 = 1
2050 RETURN
2060 FOR N = 1 TO 2
2070 FOR L = 1 TO 3
2080 HENGLIN = L: HENGLIN = L: HENGLIN = L
    AT 1000:1000

```



RUNS ON A NASCOM II

The ancient game of Nim is brought in given a 20th Century feel by the addition of robots in place of marbles.

The robots are shot by the players and removed from the screen as the matchmakers are, in the game of Nim.

Based on the Android Nim game which is popular on the Tandy machine in America, Nimbot should find a receptive audience in the U.S.

Nimbot sets out the robots in the usual seven, five, three, two, one, and challenges you to shoot 1-3 from any column. If more than one is taken, then those removed must be adjacent, either vertically or horizontally.

The object of the game is to shoot the last robot, but the

strategy involved, in this game for people who can think ahead, makes sure it is not as simple as it appears.

Nim has already proved an ideal candidate for computerization, Nimbot makes it visually exciting as well.

The program will let you choose to go first or second and plays a tight game of Nim.

Remember to give plenty of thought to your opening moves, because these can be just as crucial as those played when the last few robots are nervously waiting to see which of their number will be shot next.

But don't feel too guilty if you shoot the last one, the Nascom will soon build up another three columns for you to tackle.

BY TERRY BROWN

AND KARL PARKER

```

10 REM ***
20 REM ***
30 DIM ***
40 REM ***
50 REM ***
60 REM ***
70 REM ***
80 REM ***
90 REM ***
100 CLS:WIDTH 255:HOME 4100:32000:CLS:AR 1000
110 DEF FN(IN)=NOT(IA AND N) OR NOT(IA OR N)
120 SOUND=3200:KEY=374:USER=4100:YOU=3000
130 DEF A:15:OUT 4:0
140 FOR A=3200 TO 3249:READ B:POKE A,B:NEXT
150 DATA 62:15:211:6:23:0:13:6
160 DATA 8:197:126:162:40:23:94:35
  
```



```

170 DATA 88,43,67,62,3,255,16,251
180 DATA 719,4,47,213,4,31,32,242
190 DATA 149,16,230,35,35,24,324,192
200 DATA 203,179,16,230,35,35,24,224
210 DATA 199,201
220 FOR A=3244 TO 3274:READ B:POKE A,B:NEXT
230 DATA 229,97,56,1,175,73,175,42,13,224,233
240 DEF=J(JJJ),Qq="
250 DATA " *ATN "
260 DATA " *TAN "
270 DATA "MIDJ,MIDPOINT"
280 DATA "TAN,POINTTAN"
290 DATA "r-o-y "
300 DATA " *ATN "
310 DATA " *TAN "
320 DATA " *ATN "
330 DATA " *TAN "
340 DATA " *MIDPOINT "
350 DATA " *BIN "
360 DATA " *r-o-y "
370 DATA " *TAN "
380 DATA "
ATN"
390 DATA " *TAN "
400 DATA " *ATN"
410 DATA " *TAN"
420 FOR A=0 TO 4
430 FOR A=0 TO 4:READ A4(A):NEXT
440 FOR A=0 TO 5:FOR B=0 TO 1:READ M1(A,B)
450 NEXT B,A
460 FOR A=0 TO 3
470 READ A1(A,0),A1(A,1),A2(A,0),A2(A,1)
480 NEXT
490 DATA 8,7,9,6,8,8,10,6,8,9,11,6,8,10,12,6
500 GOTO 100:KEY
510 CLS:SCREEN 7,7
520 PRINT "Do you want instructions ?(Y or N)"
530 A=USR10:IF A=0 THEN 530
540 IF A=ASC("Y") THEN GOSUB 1670:GOTO 560
550 IF A=ASC("N") THEN 530
560 M1)=7,M12)=3,M13)=3
570 CLS:A$=" NIMBOT Copyright (C) South East "
580 A$=A$+"London Software":A=0
590 A=A+1:POKE 3017,A:ASC(MID$(A$,A,1))
600 IF A=45 THEN 590

```



NIMBOT



```

610 FOR A=1 TO 15 STEP 5:FOR B=0 TO 4
620 SCREEN 1:A=0:PRINT A:GOTO:NEXT B
630 RESET:G=0:A=1+2+7:NEXT A
640 GOTO USER:KEY:SCREEN 10:7
650 PRINT "Do you want first shot ?Y or N?"
660 A=USR0:IF A=0 THEN G=0
670 IF A=ASC("N") THEN GOSUB 1820:GOTO 870
680 IF A=ASC("Y") THEN G=0
690 GOSUB 1830
700 FOR I=0 TO 4:DO:KEY:KEY
710 A=USR0:IF A=0 THEN GOSUB 1800:GOTO 710
720 B=A-19:IF B<0 OR B>2 THEN 710
730 POKE VDU+5+R*320+64+A
740 A=USR0:IF A=0 THEN GOSUB 1800:GOTO 740
750 IF A=0 THEN POKE VDU+5+R*320+64+32:GOTO 710
760 B=A-48:IF B<1 OR B>2 THEN 740
770 POKE VDU+5+R*320+192+A
780 A=USR0:IF A=0 THEN GOSUB 1800:GOTO 780
790 IF A=0 THEN POKE VDU+R*320+197+32:GOTO 740
800 IF A=13 THEN 780
810 GOSUB 1300:REM *** LOOK AT LINE
820 FOR VDU+R*320+69+32:POKE VDU+R*320+197+32
830 IF F=0 THEN 710
840 GOSUB 1440:REM *** TAKE SHOTS
850 IF N(1)=N(2)+N(3)=0 THEN 1230
860 POKE N(0)+32
870 A=N(1):A=FNX(N(2)):A=FNX(N(3))
880 IF A=0 THEN 700
890 FOR C=1 TO 200:GOSUB 1800:NEXT:GOTO 1130
900 S=0:FOR B=1 TO 5:FOR D=1 TO N(0)
910 X=N(1):Y=N(2):Z=N(3)
920 IF D=1 THEN B=X-0
930 IF D=2 THEN Y=Y-0
940 IF D=3 THEN Z=Z-0
950 A=X+A:FNX(Y):A=FNX(Z)
960 IF A=0 THEN S=S+1:S(0)=B:G=0:Z=D
970 NEXT D:B
980 B=INT(RND(1)+6+1)*S+B(0)-1:N=N*B(0)+1
990 FOR C=1 TO 200:GOSUB 1800:NEXT:GOTO 1130
1000 Y=Y+1 AND 7:IF Y THEN RETURN
1010 Y=INT(RND(1)+3+1)*X+INT(RND(1)+N(Y)+1)
1020 IF N(Y)=0 THEN 1000
1030 H=INT(RND(1)+3+1)
1040 FOR A=0 TO 3:SCREEN 52-S+H-5+Y-5+Y+A-4
1050 PRINT H:IN:GOTO:KEY:RETURN
1060 IF H<5 THEN GOTO:KEY:RETURN
1070 L=INT(RND(1)+6+1):POKE 3220+3
1080 DO:KEY:GOSUB 1870:G=0:FOR D=1 TO L
1090 POKE BF+RND(1)*20+20:POKE BF+1-3

```



```

1100 POKE 4F+2,0:1=USR(0)
1110 FOR A=1 TO RND(1)*20+15:NEXT
1120 NEXT:H=0:POKE 2220,2:GOTO 1040
1130 R=0:FOR A=1 TO 3:IF N(A)11 THEN X=A
1140 IF N(A)=X AND RND(1)>.5 THEN X=A
1150 NEXT:H=X-1:N=1
1160 GOSUB 1300:GOSUB 1440
1170 IF N(1)+N(2)+N(3) THEN 700
1180 SCREEN 15,7:PRINT "I'VE BEATEN YOU!!!!"
1190 FOR A=1 TO 3:2=USR(0):NEXT
1200 GOTO 1250
1210 SCREEN 15,7:PRINT "YOU'VE BEATEN ME!!!!"
1220 FOR A=1 TO 25:OUT 4,A AND 1:NEXT
1230 DOKE USER:KEY
1240 A=USR(0):IF A=ASC("V") THEN GOTO
1250 SCREEN 15,7:PRINT "Another game TRY OF ME!"
1260 DOKE USER:KEY
1270 A=USR(0):IF A=ASC("Y") THEN 560
1280 IF A=ASC("N") THEN 1270
1290 GOTO 2070
1300 H=2:GOSUB 1410:FOR A=1 TO 300:NEXT
1310 H=0:GOSUB 1410:FOR A=1 TO 300:NEXT
1320 IF N(H+1)+N THEN 1270
1330 RESTORE 1360
1340 FOR B=1 TO 8:READ H:GOSUB 1410:NEXT
1350 F=1:RETURN
1360 DATA 4,0,3,0,0,4,0,3,0
1370 RESTORE 1400
1380 FOR B=1 TO 8:READ H:GOSUB 1410:NEXT
1390 F=0:RETURN
1400 DATA 1,0,3,0,1,0,2,0
1410 FOR A=0 TO 1:SDROM 1,N*5+A+1
1420 PRINT H;H(A):NEXT A
1430 FOR A=1 TO 75:NEXT:RETURN
1440 H=2:GOSUB 1410:FOR A=1 TO 1000:NEXT
1450 FOR A=0 TO 3:1=A1(A,0):Y1=A1(A,1)+R*15
1460 X2=A2(A,0):Y2=A2(A,1)+R*15
1470 SET(X2,Y2)=RESET(X1,Y1)
1480 NEXT:GP=Y1*7+220+H+125:POKE GP,ASC(" ")
1490 FOR A=1 TO 1000:NEXT
1500 FOR Y=3 TO 1 STEP -1:IF N(Y)10 THEN 1520
1510 NEXT Y:GOTO 1580
1520 FOR X=1 TO N(Y)
1530 FOR A=0 TO 1:SCREEN 52-5+X-5+Y,3+Y-5+A+1
1540 IF Y#R+1 THEN H#3
1550 IF Y#R+1 THEN H#1
1560 IF Y#R+1 THEN H#4
1570 PRINT H;H(A):NEXT A,X,Y
1580 DOKE USER:SDROM:SF=13*236
1590 POKE SF+2,0:FOR A=32 TO 4 STEP -1

```




```

1600 POKE B:A:POKE BF+1:128/A AND 255
1610 POKE GP:ASC("":2+USR(0)):POKE GP:ASC(" ")
1620 FOR B=1 TO 20:NEXT B:A
1630 FOR S=1 TO N:BF=13+35A
1640 POKE BF+1:30+POKE BF+2:POKE BF+3:0
1650 FOR A=1 TO 40:IF FEEL(GP+A)*92 THEN 1670
1660 POKE GP+A:ASC("-"):2+USR(0)::NEXT STOP
1670 FOR B=0 TO 4:J=47-5*N:(R+1)-S*R:Y=R+5-B+1
1680 SCREEN X,Y:PRINT D$:NEXT B
1690 BF=13+25A:FOR C=20 TO 1 STEP -1:
1700 POKE BF+C:POKE BF+1:50/C:BF=BF+2:NEXT
1710 DOKE BF:O=2+USR(0)
1720 FOR B=0 TO 4:J=47-5*N:(R+1)-S*R:Y=R+5-B+1
1730 SCREEN X,Y:PRINT D$:NEXT B
1740 FOR B=1 TO A:POKE GP+B:32:NEXT
1750 N(R+1)=N(R+1)-1:NEXT S:POKE GP:32
1760 FOR A=1 TO 1000:NEXT
1770 FOR A=2 TO 0 STEP -1:X1=A1(A:0)
1780 Y1=A1(A:1)+R+15:X2=A2(A:1)+R+15
1790 RESET(X2,Y2):SET(X1,Y1):NEXT
1800 H=0:GOTO 1410
1810 GOTO 1810
1820 SCREEN 10:7
1830 PRINT " "
1840 FOR Y=2 TO 1 STEP -1:FOR B=1 TO N(Y)
1850 FOR A=0 TO 4:SCREEN 52-5+X-5*Y-5*A+1
1860 PRINT AT(A):NEXT A:S,X,Y:RETURN
1870 CLS:PRINT "This is like the 7.5x3 match!"
1880 PRINT "sticks same."
1890 PRINT "It consists of 2 rows of robots."
1900 PRINT "The object is to shoot the last "
1910 PRINT "robot."
1920 PRINT "You choose how many to shoot from."
1930 PRINT "any row by"
1940 PRINT "typing the row number (1,2 or 3)"
1950 PRINT "then how many to shoot from that "
1960 PRINT "row."
1970 PRINT
1980 PRINT "There is a test tone on bit 0. "
1990 PRINT "port 4 "
2000 PRINT
2010 SCREEN 1:10
2020 PRINT "          Press space to continue"
2030 A=USR(0):IF A=32 THEN RETURN
2040 B=B+1 AND 43:IF B AND 32 THEN 2060
2050 OUT 4:1-INP(4)::GOTO 2010
2060 SCREEN 1:10:PRINT CHR$(27)::GOTO 2030
2070 CLS:END
0%

```


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ATOM



If you have grown tired of forever running and dodging from the merry tribes of aliens who make an honest crust by guesting in computer games, *Atom Hunt* will appeal to you.

In the game you are the dominant life-form and the poor alien is on the run.

It makes a nice change for the humans to be able to win so make the most of it.

The aim of this Acorn Atom game is to trap the alien in the top left hand corner of the screen by cutting his escape routes off by drawing lines around him.

If you miss your objective and mistakenly trap him elsewhere, penalty points are accrued. The aim is to get as low a score as possible.

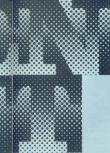
Your efforts are scored, commented upon and a new game is automatically restarted.

The alien emits a squeal through the Atom speaker when trapped or crushed.

Due to the printer used not having a hash (#) symbol, a 'F' sign has been substituted. This should be turned into a hash sign wherever it crops up.

No graphic modes are used and the game is written, mainly in machine code, so it only takes up 4.8K on the computer.

Line 17 will be of interest to Atom users as it is a routine which waits for the frame sync pulse to go low, before POKE-ing to the screen, thus avoiding the usual Atom screen noise.



1000; c
10010: PPS:J03.PPS:PPS:Z03.000
11P:412:P04:PPS-1:PPS-1:000-1:1-10000
12P:4120:2:010 P-1:P:423
100
17:PPS:LD00100:ST00002:BHE:PPS:LD0002:RTS
30:000:LD000:ST00000:LD00001:CH0000:000:001
20LD0000:CH0013:000:220:LD0007:ST0001:LD0000:ST0000
24LD0000:LD0000:ST0000:J00:PPS:LD0000:LD0000:Y:CH0004:000:220
20LD0001:ST0007:LD0000:ST0000:LD00127:ST0000:J00:PPS
27ST0000:000:Y
20LD0000:000:ST0000:RTS
30:220:J00:000
70:001:LD000:ST00000:LD00001:CH0007:BHE:002
P0LD0000:CH0013:000:220
P0LD0007:ST0000:LD0000:ST0000:LD0000:ST0000:J00:PPS
P0LD0000:LD0000:Y:CH0004:000:220:LD0001:ST0007:LD0000:ST0000
70LD0000:ST0000:J00:PPS:ST0000:000:Y:LD0000:000:ST0000:RTS
00:220:J00:000
100:002:LD000:ST00000:LD00001:CH0007:BHE:003
100LD0000:CH0000:000:220:LD0007:ST0001:LD0000:ST0000:LD0000
104LD0000:ST0000:J00:PPS:LD0000:LD0000:Y:CH0004:000:220
104LD0001:ST0007:LD0000:ST0000:LD00127:ST0000:J00:PPS
107ST0000:000:Y:LD0000:000:ST0000:RTS

Runs on an Acorn Atom in 4.5K

By John Kirk

[illegible]

the vic centre

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RULES ON A TANDY TRS-80 IN 15M

BT MUI CHUWET

[illegible]

To reach the final of a Grand Prix race you must first experience a gruelling qualifying round in which several close rounds.

You control a Formula One car, aiming to complete one lap of the international race track in the shortest possible time. The car travels at top speed on the straight sections of the circuit, but you must steer it round the corners, some of them sharp bends.

When the car is steered to the right or left it automatically slows down so a good tactic to employ is to maneuver the car as little as possible to keep at the highest speed you can without crashing.

If your steering fails you then you end up off the track and crash into the walls. Don't despair; if that happens, you find the seconds will tick quickly every building up your final lap time, but you don't have to start the lap again.

You will need a TOS-90 Level II with 512K memory to run this program.

To control the car you use the arrow keys to turn the steering wheel to right or left, but those are all you can use. There is no accelerator or brake for you to take advantage of, you have to rely on your steering to see you through. Be careful not to keep one of the arrow keys depressed because if you do the car will continue turning.

An auto-lap feature written into this program comes near the end of the lap. When you reach the finish line the lap record (time for you to beat) is displayed on the left of the screen, while on the right hand side of the screen, your own lap time is shown to see if an auto-sprint of speed is needed!

[illegible]

[illegible][illegible]

GRAND PRIX

RUNS ON A

SHARP MZ-80K

IN 22K

BY TONY WINDIBANK

The words, "Dr Livingstone, I presume", immortalized reporter Stanley's search for the missing African explorer.

Dr Livingstone is lost in darkest Africa again in this Sharp game but no message has been heard from him for five years. His rescue is your objective in Dr Livingstone, but the African jungle holds many dangers and the porters are a notoriously fickle bunch.

You take the part of journalist Henry Morton Stanley, charged with the job of equipping an expedition to find the great man. To cover expenses you have 150,000 ounces which should be used to purchase food, medicine, beads, guns, ammunition and for the hiring of porters.

The dangers include: wild animals, diseases, unfriendly tribes and treacherous rivers.

The variables used in the game are: D = number of porters; F = the number of medical boxes; C = number of cures (an African coin); G = number of boxes of beads; E = food packs; H = number of guns; K = boxes of ammunition.

The main subroutines are shown by ROMs and are:

- Native tribe routine — lines 1300-1820.
- Disease routine — lines 1830-1920.
- Wild animal routine — lines 1930-2180.
- River delay routine — lines 2180-2860.
- Witch doctor routine — lines 2860-3490.
- Perfect week routine — lines 3490-3590.

The game can be made harder by setting the minimum number of porters 150 and offering lines 360 and 930.

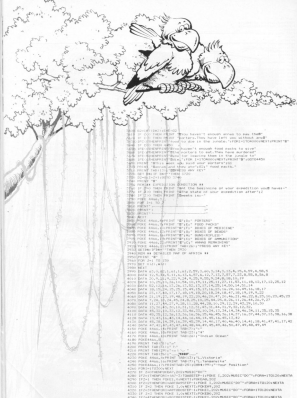




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1630 DATA 2561,2562,2563,2564,2565,2566,2567,2568,2569,2570,2571,2572,2573,2574,2575,2576,2577,2578,2579,2580,2581,2582,2583,2584,2585,2586,2587,2588,2589,2590,2591,2592,2593,2594,2595,2596,2597,2598,2599,2600
1640 DATA 2601,2602,2603,2604,2605,2606,2607,2608,2609,2610,2611,2612,2613,2614,2615,2616,
```



[illegible]

COSMOS LANDING

The Terrain enemy is keeping your planet under constant observation but the drone supply ships must get through.

The drone ships have to be landed in secret on the planet's surface, but because of the Terrain threat the landing site is constantly moving.

You must land as many of your robot fleet as possible on the planet, using a radio control guidance system. Don't forget that you are operating

the descending drone and not the hovering base.

A choice of descent speeds ranges from hard to easy (1-3) and when you finish you receive a score and an assessment of your performance. The game runs quicker than most Sinclair Z88 programs on the main part of the game is tightly packed from line 183.

Be prepared for some criticism if your drones crash on the planet's surface instead of the base.

RUNS ON A SINCLAIR ZX81 WITH 16K RAM PACK

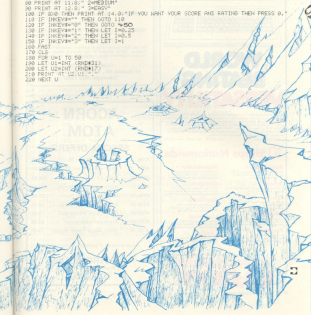
BY JAMES WILKINSON AND JOHN STANTON



```

1 LET P=0
2 LET Q=0
3 PRINT "DO YOU WANT INSTRUCTIONS?"
4 IF INKEY$="" THEN GOTO 7
5 IF INKEY$="Y" THEN GOSUB 2000
6 CLS
7 LET S=ORND(.5)-(CRND(.5)
8 IF S=0 THEN GOTO 12
9 LET A = INT (ORND*255)+2
10 LET S=0
11 LET Q=0
12 LET T=INT (RND*255)
13 PRINT AT 5,6:"INPUT DIFFICULTY."
14 PRINT AT 10,6:" 1=HARD"
15 PRINT AT 11,6:" 2=MEDIUM"
16 PRINT AT 12,6:" 3=EASY"
17 IF Q=0 THEN PRINT AT 14,6:"IF YOU WANT YOUR SCORE AND EATING THEN PRESS 0."
18 IF INKEY$="" THEN GOTO 112
19 IF INKEY$="0" THEN GOTO 7-50
20 IF INKEY$="1" THEN LET S=0.25
21 IF INKEY$="2" THEN LET S=0.5
22 IF INKEY$="3" THEN LET S=1
23 PRINT
24 CLS
25 FOR U=1 TO 50
26 LET U2=INT (RND*100)
27 LET U2=INT (RND*17)
28 PRINT AT U2,U2:" "
29 NEXT U

```





```
230 PRINT AT 21.0:"30*GRAPHICS SHIFT 5"  
240 SLOW  
250 LET B=(A+3)-(A+5)+B+(A+2 AND A+5)  
260 LET A=A+5  
270 LET T=T+((B/EVEN="0")-(B/EVEN="1"))  
280 LET T=T+(T+5)-(T+25)  
290 PRINT AT 5.1:"C")"
```

```
300 PRINT AT 20.0:"SPACE (3*(SHIFT 0))(SHIFT 4)SPACE"  
310 PRINT AT 20.0:"  
320 LET S=S+1  
330 IF S=20 THEN GOTO 350  
340 GOTO 250  
350 IF T=4+2 THEN GOTO 380  
360 PRINT AT 5.5:"YOU HAVE CRASHED"  
370 GOTO 400  
380 PRINT AT 5.7:"SAFE LANDING"  
390 LET P=P+1  
400 LET S=S+1  
410 IF S=10 THEN GOTO 450  
420 PRINT AT 5.1:"C")"
```

```
425 PAUSE 200
```

```
430 CLS
```

```
440 GOTO 20
```

```
450 CLS
```

```
460 PRINT "YOU LANDED SAFELY "P" TIMES OUT OF 10
```

```
470 LET W=(P/50+50)
```

```
480 IF W=10 THEN LET D1="SUPREME COMMANDER OF THE WORLD" PILOTS ASSOCIATIONS
```

```
490 IF W=7 AND W=10 THEN LET D1="SUPREME AIR FLEET COMMANDER"
```

```
500 IF W=5 AND W=8 THEN LET D1="PROFESSIONAL AIRCRAFT LANDER"
```

```
510 IF W=3 AND W=6 THEN LET D1="AMATEUR AIRCRAFT LANDER"
```

```
520 IF W=1 AND W=4 THEN LET D1="AM GLAD THIS IS ONLY A COMPUTER SIMULATION"
```

```
530 IF W=2 THEN LET D1="DANGEROUS UNCOORDINATED IDIOT"
```

```
540 IF W=1 AND W=4 THEN GOTO PRINTER
```

```
540 IF W=1 AND W=4 THEN GOTO 560
```

```
550 PRINT "YOUR RATING IS "P"/10
```

```
560 PRINT AT 5.6:"ANOTHER GO?"
```

```
570 IF (KEY = "Y") THEN 520
```

```
580 RUN
```

```
585 CLS
```

```
590 PRINT AT 5.0:"COSMOS LANDING"
```

```
600 PRINT AT 5.5:"YOU ARE IN CHARGE OF THE STARSHIP ASTRON":
```

```
610 PRINT"YOU HAVE JUST SUCCESSFULLY COMPLETED YOUR MISSION IN THE OUTER":
```

```
620 PRINT"LIMITS THE GALAXY"
```

```
630 PRINT AT 6.0:"HAVING RECENTLY LANDED SAFELY YOURSELF YOU MUST LAND YOUR "
```

```
640 PRINT"RAID CONTROLLED DRONES ONTO THE CONSTANTLY MOVING LANDING"
```

```
650 PRINT"PLATFORM"
```

```
660 PRINT"TO OPERATE THE RADIO SIGNAL PRESS 1 FOR"
```

```
665 PRINT" LEFT AND 8 FOR RIGHT"
```

```
670 PRINT" THERE ARE THREE DIFFERENT LANDING SPEEDS"
```

```
680 PRINT" DEPENDING ON HOW SKILLED YOU ARE"
```

```
690 PRINT"YOU HAVE TEN DRONES TO LAND"
```

```
700 PAUSE 40000
```

```
710 RETURN
```

```
READY.
```

BAD KING JOHN

We live in an era of living room economists, expounding their views on what's going wrong with the country and how they would put it right.

Bad King John is a game which will give you a chance to put your economic theories to the test on a computer model of a single agricultural society.

Bad King John is the medieval lord of a small island with a population of just a few thousand. To win the trust of the people he must stay on the throne for 10 years.

The task is made more complicated by the need to keep the population under 3,500 for this period, for rebellion is in the air and if the population rises above this figure the peasants will revolt and overthrow you.

But weighed against this, you must remember that should more than 30% starve the remaining populace will revolt and bring the monarchy down.

So keep a careful eye on the harvest and the livestock which are prone to rot and plague respectively.

The variables are: Y = years on throne; TI and TS = date; P = population; C = corn; L = livestock; E = corn to sow; F = tons of corn to feed people; FL = tons of corn to feed livestock; SL = livestock to slaughter; MP = compare with P; H = harvest corn; I = looting.



RUNS ON A 32 Column Pet in 3K

By JOHN MYATT

```

1  Y=0
2  IT=INT(RND*(174000+.5))
3  TS=1000
4  PS=1000 C=100 L=00
5  PRINT"INSTRUCTIONS(Y=0)"
6  GETM SPAN="THEIR
7  SPAN=Y"THEENDOSUB0000
8
9  20 PRINT"TIME YEAR:100:(TS+TT)
10 P=INT(P)
11 L=INT(L)
12 C=INT(C)
13
14 PRINT"POPULATION:"P
15 PRINT"ALL LIVESTOCK:"L
16 PRINT"ATONS CORN:"C PRINT"R
17 FORI=1TO(P/10)PRINT"R"NEXT
18 PRINT"R" PRINT"R"
19 FORI=1TO(L/10)PRINT"R"NEXT
20 PRINT"R" PRINT"R"
21 FORI=1TO(C/10)
22 PRINT"R"
23 NEXT
24 PRINT"R"
25 INPUT"ATONS CORN TO SOW:"S
26 C=C+S
27 INPUT"ATONS TO FEED:"F
28 C=C-F
29 INPUT"ATONS TO FEED LIVESTOCK:"FL
30 C=C-FL
31 IF C<0 THEN C=0
32 PRINT"EVN HAVEN'T GOT THAT MUCH!"GOTO54
33 C=C+F+FL+S GOTO55
34 INPUT"LIVESTOCK TO SLAUGHTER:"SL
35 L=L-SL
36 IF L<0
37 SL=P
38 IF SL=0 THEN P=10
39 P=P*P/(P+.1) + (C*SL+.1) + (.5) + (SL*10)
40 IF C<0 THEN C=0
41 IF L<0 THEN L=0
42 L=L+FL/10 + (P/10) * (RND(1)+.5)
43 H=8*RND(1)*70
44 SPAN=OTHERH+3*2
45 H=INT(H)
46 PRINT"HARVEST:"H" TONS"
47 SPAN=(S*2)ORH*5+10ANDNOTH*5+0ANDS*0 THEN PRINT"R BAD YEAR!"R
48 IF H<10ANDH*5+40 THEN PRINT"R AVERAGE YEAR!"
49 IF H<5 THEN PRINT"R A GOOD YEAR!"

```

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First there was Invaders, then came Asteroids, and now DEFEND!!

Carrying on in the same tradition, Defend! is a fast, arcade type action game, complete with sound effects. Every scorepoint counts at you fast and furious. If you succeed in shooting them down before they get past ships, you must still get yourself through a minefield slower (but at least they don't shoot at you) and finally, if you emerge unscathed, you must navigate a tunnel in order to get yourself completely out of danger. An enthralling game with excellent graphics, personalisation of highest scores and points topped. One of its best features is the "drop" and immediate control the player has over the manoeuvrability of his ship which includes diagonal movement. A high score language, of course, for speed. A matter of taste, but we think it beats Invaders and Asteroids. Suitable for TRS-80 Models I and II and all Genie models.

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Adventure

So far we have seen how to create a network, fill it with objects, and decide the player's response. Movement was by typing "N" for "GO NORTH" etc. Now we will progress so that we can use a two word response.

The first problem is that the main, if not only "moving" verb is "GO", length 3. Our standard substring length is to be 3. This can be padded out, too.

```
IF LEN (R26) = 2 THEN LET R26 = R26 + " "
and must be done before R46 is set or an error will result.
```

How can verbs be categorized? "GO" will change a location, "TAKE" or "DROP" will change the inventory and location number of an object, whilst other verbs may have varying and less standard effects. Therefore, for the purposes of Adventure programming, verbs can be placed into one of three categories: Moving verbs; Possession verbs; Others.

Of these (moving verbs) is fundamentally different in that the word following, will be a direction and not necessarily a noun. To speed up the string searches it will pay to have a separate direction string from the main string and only search the directions if a moving verb is detected. So:

```
LET W36 = "NORSQUEASWESCOOT"
```

Referring to the simple network in Figure 2, we previously entered the cottage from the forest by typing "N" which was found in exit string (R23) = "NE", i.e. using a compass bearing. It would provide variety and add elegance to be able to reply "GO COTTAGE" (even if not fantastic English). The player would have to be supplied information on a clue to the existence of such a cottage, either in the location descriptions (L30) and (L32) or by a "help" clue.

"COTTAGE" must now be assigned a direction code: north = N south = S cottage = X

I have used X for the cottage rather than G to demonstrate flexibility, since more than one exit with the same first letter

Variable Description Name	Value in the program (unless indicated)
R16	Input string
R26	1st word input
R36	2nd word input
R46	1st 3 letters of R26
R56	Length R26
R66	Character
L1	Current location no. this exit cannot exceed R56
R7	No. of letters called R56
L2	No. of letters used in search
L3	Index variable for string to be searched
L35	Index variable for strings being sought
R76	Exit string
R86	Room string
R96	Location string
R106	Direction code string
R116	Room objects for current display
R126	Object description
R136	Object location
L14 (N)	Object description
L15 (N)	Exit from location
R166	Dead characters
Length calculations: column 1 = 13 for COTTAGE $13 - 11 = 2$ (2 = 13 - 11 = 2) and code = NORSQUEASWESCOOT	

TABLE 1. Use of variable names used so far and their uses in example described.

R1 (Input)	1 line	Fig. 2. Simplified network of location strings (actual positions of words in location strings, objects and locations, independently numbered)
R2 (Exit)	1 line	
L1 (Exit)	1 character	
L2 (Exit)	1 line	
R7	1 line	

may occur. Exit strings read:
LET R30 = "NE" : LET R36 = "NE"

Next establish a direction code string that aligns arithmetically with the direction string W36:
LET W46 = "RSEWE"

With these strings together with the string search subroutine previously explained, it all fits together as shown below.

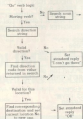


Figure 2

WHAT'S IN A PYRAMID

What's in a pyramid? Quite a lot if you compare Scott Adams' Pyramid of Doom with the Tandy version of Adventure Pyramid.

The former follows the usual Scott Adams split screen format while the latter has a continuously scrolling display with a rather verbose narrative style. When the player moves to a new location a response like "... you are standing at the west end of a large chamber. A rough stone staircase leads up behind you ..." is apt to leave him rather confused, especially if he has just re-entered the chamber from the opposite direction. Has he turned around, or, is there a staircase behind him and in front? It was all too much for me after a while, but it seems you either like it or you don't. My wife set up the hours making maps and notes — she even took the bird-stare and status-box in her stride! Some heavy typing is required in this game, as — unlike most Adventures — nearly all instructions must be entered in full. ("Inventory" seems such a long word after a while!)

Pyramid of Doom has some different parts, but on the whole is easy enough to give the novice sufficient encouragement to persevere — once he has got inside! The player isn't left with quite the same feeling of lofty galleries and vast chambers that "Pyramid" conveys, because the display is more "compartmentalised". Nevertheless the layout of the interior is both credible and interesting. Mervyn tension is created by the unexpected appearance of a small named, who proceeds to follow the player around, is he as sinister as he seems?

There is humor to be found in the Throne Room — but don't hang around too long! And don't be fooled by an apparently innocent score — eliminate the culprit (Scott Adams can count even if he can't spell!)

Pyramid is published by Tandy Machines and runs on the TRS-80 and Video Game.

Pyramid of Doom by Scott Adams is published by Adventure International and runs on the TRS-80, Models I & II, Video Game, Apple and Pet.

ZX 80/81 HARDWARE/SOFTWARE

ZX KEYBOARD

A full size keyboard for the 80/81. The keyboard has all the 80/81 functions on the keys, and will greatly increase your programming speed. It is fitted with push type keys as in larger computers. The keyboard has been specially designed for the Sinclair computer and is supplied ready-built. It also has facilities for 4 extra buttons which could be used for on/off switch, reset, etc. £27.95



4K GRAPHICS ROM

The 4K Graphic module is our latest ZX81 accessory. This module, unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you 448 extra pre-programmed graphics, your normal graphic set contains 64. This means that you now have 512 graphics and with there inverse 1024. This now turns the 81 into a very powerful computer, with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there; it also has a spare holder on the board which will accept a further 4K of ROM/RAM. IT NEEDS NO EXTRA POWER AND WORKS FROM YOUR NORMAL POWER SUPPLY. £27.95

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of a 16K Ram. Full instructions included. All memory expansions plug into the user port at the rear of the computer. 16K RAM £42.95 16K KIT £32.95

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CENTPEDE. This is the first implementation of the popular arcade game on any micro anywhere. Never mind your invaders, etc., this is positively shining, the speed at which this runs makes ZX invaders look like a game of simple snip. £4.95.

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Kit Korner

FIT FOR FILE 13

Over the past couple of weeks a number of people have come to me with home-built kits which should really have been considered in for file 13, i.e. the bin.

These kits are not necessarily computers but can be the add-ons, such as video boards, F.R.A.'s, extra memory boards and the like which can either be supplied by the computer manufacturers or by a separate firm. They are often badly designed or are so complex that a good deal of hard wiring is required. It is this exercise that can be the downfall of many a good computer construction.

The boards that I have seen have been coated with a solder mask to prevent shorts on the

ing, bending up the wire and then stripping you can ensure, as with resistors, that the component fits neatly in. Be very careful that you do not crimp the wire too much or accidentally cut it if you are stripping with cutters or a knife. Again, double check that the link is good, either by a physical test — by trying to lift the wire off the board — or by a continuity test.

As a general rule, the nearer the board appears, the more reliable it is. This may be only because it requires more care and attention to produce one. Wires which meander about the board are unsightly and are prone to physical stresses and strains, whereas a connection made tight on the top of the board looks good and is difficult to interfere with.

It must be remembered that any links that must be made, unless otherwise specified, must be made after completed construction. As well as using all of the available resources, I try to put in the shortest links first, gradually building up to the longest, which on some boards may be from one end to the other. Take care not to hide any of the shorter leads by laying them off, if possible, flat on the board. Not only does it look pretty but also it is easy to follow.

If you are not able to use single-stranded wire I can suggest a few points that will help to ensure similarly good results as if you had. When measuring the spacing of the holes allow about an extra 2 or 3mm after stripping. Tin the twisted strands as usual and insert the ends into the holes. If the length is not quite right strip a little more off or start again, depending on whether you are long or short.

The wire should be slightly loose in between the holes now. When you come to solder the first end, hold it still in the hole and secure in position. At the other end grab the tinned end and, as you solder, pull it through gently. The insulation should soften and fold back against the top of the board. The wire should now be taut. The procedure in all the

other aspects of construction are the same though.

When lines, such as those for power and external devices and control, are required to be taken off the board the most professional way is by an edge connector. However, many kits do not come supplied with these and they are sometimes expensive options.

The alternative to soldering directly into the board is to put single- or double-sided pins in the board and solder to these. This means that, so long as the job has been done neatly enough, the wires can be removed without moving the board if it has been screwed down. This, I have found, is the most cost-effective of all the options. It may also be improved by sleeving the connections with P.V.C. or silicon.

Last, but not least, our February grille goes to a number of companies who modify computer boards. I must congratulate them for such a difficult job well done. The boards I have seen have mostly been U.L.C.10's but there are other conversions on the market for other makes. The worst one had been modified for increased memory for the screen in order to attach a high-resolution graphics board.

The bottom of this board looked like a plate of Italian spaghetti. The wires were very tight gauge encoiled. By very tight I mean 38 or 40 gauge. Somehow the board did work. However, there was no way of protecting the bottom of the board while in use and eventually there was one wire which came adrift. If only the company had sprayed the board with a P.C.B. layer of oil would have been well.

Despite this setback the machine works perfectly now, with no problems except those of the programmer. He keeps forgetting that he now has 6K of screen memory so that his graphics just take up a quarter of the display!

BY KEITH MOTT



circuit. This, unfortunately, can be counter-productive as it is difficult to see whether or not there are any open-circuit tracks around the pads. On the other hand it does help considerably the heavy-handed constructor who is liable to splash solder about the place.

When making hard-wired links on the board I prefer to use single-core, P.V.C. insulated conductor as this can be easily straightened and can be bent at right-angles, unlike the multi-stranded types. I use 18/3mm gauge. I also make use of as many colours as possible and take note of where I have used them. This helps tremendously in tracing out the circuit later on.

By measuring the hole spac-

Make the most of your Sinclair ZX Computer...

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The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users.

Sinclair has undertaken to publish the most elegant of these as pre-arranged cassettes. Each program is carefully tested for content and quality, and then grouped with other programs to form a single-subject cassette.

Each cassette costs £1.95 (including VAT and p&p) and comes complete with full instructions. Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 - it fitted with a replacement 8K BASIC ROM.

Some of the more elaborate programs can be run only on a Sinclair ZX Personal Computer equipped with a 16K-byte add-on RAM pack.

This RAM pack and the replacement ROM are described below. And the descriptions of each cassette indicate if and when hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available in ZX80 versions as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX80 are now available on a ZX81 - including the ability to run most of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack

The 16K-byte RAM pack provides 16 times more memory in one complete module. Compatible with the ZX80 and the ZX81, it also used for program storage on two datasets. The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.



Cassette 1 - Games

For ZX81 (and ZX80 with 8K BASIC ROM)

CRASH! - your space craft's mission is to pick up a very valuable cargo that is orbiting around a star. **SCOTCH** - puzzle surrounded by 40 of the stars. How quickly can you spot and shoot them when they appear?

METEORS - your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

LIFE - J.H. Conway's 'Game of Life' has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WORLD PAIR - your travel document is on a submarine hunt. The depth changes are noted, but must be fixed with precision.

GOLF - what's your handicap? It's a tricky matter that you control the strength of your shots.

Cassette 2 - Junior Education: 9-11-year-olds

For ZX81 and 16K RAM pack

CRASH! - simple addition - with the added attraction of a car crash if you get it wrong.

MULTIPLY - long multiplications with five levels of difficulty. If the answer's wrong - the solution is explained.

TRANS - multiplication tests against the computer. The winner's time reaches the starship log.

PRAC/THINK - fractions explained at three levels of difficulty. A comparison test completes the program.

ADDITION - addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation. **DIVISION** - with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

PELLING - up to 50 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 - Business and Household

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

TELEPHONE - setup your own computerized telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

NOTE PAD - a powerful, computer system for storing and

entering everyday information. Use it as a diary, a calendar, a reminder system, or a calculator.

BANK ACCOUNT - sophisticated financial recording system with comprehensive documentation. Use it at home to keep track of where the money goes, and at work for expenses, departmental budgets, etc.

Cassette 4 - Games

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

115M/LANDMIN - bring the laser module down these orbit too soft landing. You control attitude and orbital direction - but watch the fuel gauge! The screen displays your flight status - digitally and graphically.

TRIDENT - a dice version of Backgammon.

COMBAT - you're on a missile space mission. The laser only 10 minutes but the alarm level automated through. Can you take 12 of them with you?

NUMBERS - on patrol, your laptop detects a pack of 10 numbers. Can you drop-change them before they escape you?

135M/80-AKOR - the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best?

MATCH - in answer to a telephone call, you're answered on the search area on 140 cubic kilometers of deep space. Can you find the astronaut before his life support system fails in 10 hours time?

Cassette 5 - Junior Education: 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS - area, arithmetic with three levels of difficulty, and gives your score out of 10.

PALEONTO - non-understanding of how dinosaurs theory with a series of graphic examples.

VOLUMES - 'yes' or 'no' answers from the computer to a series of order volume calculations.

WEBAES - what's the average height of your class? The average shows on your display. The average pocket money of your friends? The computer plots a bar chart, and displays the mean from **MEAN**.

BASES - convert from decimal (base 10) to other bases of your choice in the range 1 to 16.

TEMP - addition, multiplication - and their combinations.

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23	Cassette 3 - Business and Household		£1.95		
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Sounds

BY DAVID ANNAL

Sound is an important selling feature of many of the new generation of microcomputers but it has not always been taken for granted.

Producing sound from a Pet, for example, is a simple process but many readers will not have realized, for example, that the Nibbles Pet game in the November issue, incorporated sound.

This method of generating sound was seen on several of the first and second generation microcomputers. Computers now mostly use dedicated chips producing 3 or 4 notes at the same time, controlled by specially invented Basic words such as "Note", "Tempo" and the like. Examples include the Don, Atari, Sharp, and the new BBC computer. Note production is simple, eg. to play the note middle C one might simply enter a Basic line — IS MUSIC C.

Many computers exist with no such refined system and it is these to which we direct our attention this month. Most, such as the Pet, have the necessary peripheral interface adapters (PIA), or versatile interface adapters (VIA), built in. If not, they can be added quite simply and memory addressed. To make matters clear, addresses given below are those used in the Pet but the principle involved is the same with any computer. A Basic POKE statement puts the number after the comma into the memory before the comma.

Information to be turned to sound and amplified comes down a single wire in the form of a series of "1"s and "0"s. The waveform and "tone" can be altered by the ratio of the number of "1"s to "0"s and their distribution. The frequency of the sound heard is governed by the speed of their production.

A simple way of achieving this, and the method employed in the Pet, is shown in diagram 1. The eight bit register is filled with a pattern of "0"s and "1"s, in the example shown, it would be

10 REM PROGRAM 1 — SINGLE NOTE

```
30 POKE 50467, 15
30 POKE 50468, 75
40 POKE 50469, 117
50 FOR B=1 TO 1000: NEXT B
60 POKE 50467, 0
READY
```

10 REM PROGRAM 2 — TT

```
20 A=50467: B=50468: C=50469
30 B=200
30 POKE A, 15: POKE B, 37
40 FOR B=1 TO 8
50 FOR T=1 TO 200 STEP 3
60 POKE C, B-T
70 NEXT T
80 NEXT B
90 POKE A, 0
READY
```

Address	Function
50467	Register Mode. 16-Free running under timer control
50468	Main Shift Register
50469	Delay No. for timer countdown

the decimal No. 15. A control location is set so that the register is now shifted one place to the right under the influence of a timing circuit.

Each bit on reaching the end of the register is returned and inserted back at the beginning again but it also passes down the output line at the same time.

In simple terms, each "1" represents a voltage of 5V and each "0" a drop to 0V, so in our example, the output would be high for four shifts and then low for four shifts. This pattern is repeated as the register goes round and round and results in a square wave output (figure 2).

The frequency of sound output

Diagram 1: Shift register in address 50468



is made to vary by introducing a time delay before each shift takes place. In the case of musical sounds, the delays are very short and one set on the chip itself, which counts down from a preset number in one of its timing registers.

Each time the loop reaches zero, the main register is shifted by one bit and the process is then repeated. We now have control of the pitch of the note produced by varying this delay number. The higher the number, the longer the delay in counting down, the slower the rate of stepping and thus the lower the note produced.

To obtain sound, the output line (C0) from pin M of User Port on Pet is simply connected to an amplifier such as that described in issue two and an earth return made to digital ground (pin 50). It can be taken direct to your 80-Pi but, in order to protect your computer from any short circuits or surges, it is always advisable to insert a resistance in series with the output line — one of 100K will suffice here.

Program 1 should be very easy to follow. First, in line 30, the VIA shift register is made free running under timer control as discussed above (several options exist but this is the most useful). Next, the shift register is filled with a pattern of "0001111" = 15dec. Finally the delay loop countdown is set at 117 to give a note of C. The delay in line 50 is a Basic one and governs how long the note will sound before it is turned off again, in line 60. Note that the control of the shift register is built into the VIA chip (in this case a 6522) and so any computer can control it — only the memory locations allocated to the various control registers will be different.

What does Program 2 do? All kinds of effects are possible by using Basic to alter the byte in the shift register and the delay number.

A tick back to the Nibbles game on page 47, of the November issue. Note lines 70, 300, 400, 540 and 680. These lines should now be crystal clear!

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Graphics



BY GARRY MARSHALL

Good graphics add playability to games which are hung around a theme. And the more detail which can be included in a drawing, the more believable the game will be.

High resolution displays can be achieved with several micro-computers. These include Apple II and the Acorn Atom. The Apple II with AppleLink gives a resolution of 280 dots horizontally and 192 vertically, while the Acorn Atom with a full complement of RAM provides a resolution of 256 by 192. The high resolution graphics commands available on these micros include commands for moving the "drawing head" to any position on the screen, and for drawing a line from the current position to a position specified in the command.



The following program causes a rectangle to be drawn near the centre of the screen with an Apple.

```
10 HGR2
20 HCOLOR = 3
30 HPLOT 62, 60
40 HPLOT TO 60, 160
50 HPLOT TO 160, 160
60 HPLOT TO 160, 60
70 HPLOT TO 60, 60
80 END
```

Line 10 sets the high resolution graphics mode, line 20 sets the plotting colour to white, and line 30 plots a dot at the position in column 62 and row 60. Lines 40 to 70 cause the sides of the

Good graphics are so often the mark of a good game. So many computer games are given life by being hung around a theme — whether a detective, you against the aliens struggle, or a tactical weapons scenario.

The more detail you can put into a graphical representation of the theme the more accurate the final result can be. High-resolution graphics in a popular aplice with computer games players. In this column we look at this facility on the Apple and Acorn Atom.

rectangle to be drawn. The location of the rectangle on the screen is shown in Figure 1.

In similar fashion, an Acorn will draw a rectangle with this program.

```
10 CLEAR 4
20 MOVE 60, 60
40 DRAW 62, 160
50 DRAW 160, 160
60 DRAW 160, 60
70 DRAW 60, 60
80 END
```

Each line of this program is broadly equivalent to the line with the same number in the Apple program. There is no need to specify the plotting colour as the DRAW command automatically produces a white line. The point in row 60 and column 60 is at the bottom left of the screen with the Atom as opposed to the top left with the Apple.

Now, just as we have drawn a rectangle by joining four points together, we can draw any shape by joining a sufficiently large number of points. The same points we use, the same accurate the drawing will be. Outline programs for drawing any shape are given below. The Apple program requires the number of points to be joined to be given in the first data statement in line 40 while the points themselves must be specified in the data statement of line 110. Other data statements can be included if necessary.

```
10 HGR2
20 HCOLOR = 3
30 READ N
```

```
40 DATA
50 READ X, Y
60 HPLOT X, Y
70 FOR I = 1 TO N
80 READ X, Y
90 HPLOT TO X, Y
100 NEXT I
110 DATA
120 END
```

A broadly equivalent program for the Atom is given below. Since Acorn Basic does not possess READ and DATA statements, the program uses INPUT commands so that the number of points and the points themselves must be entered when the programme is run.

```
10 INPUT N
20 DIM X(N), Y(N)
30 FOR I = 1 TO N
```



```
40 INPUT A, B
50 X(N) = A, Y(N) = B
60 NEXT I
70 CLEAR 4
80 MOVE X(0), Y(0)
90 FOR I = 1 TO N
100 DRAW X(I), Y(I)
110 NEXT I
120 END
```

Figure 2 shows a drawing produced in the way described by these programs. It can be tedious to feed all the points which have to be joined. A digitiser is useful to obtain the points in as painless a way as possible. There is a digitiser for the Apple.

CONVERTING PROGRAMS

There is little more frustrating than reading about a marvellous game which is unavailable on your particular microcomputer.

And, unless you are familiar with the other machine's Basic, modifying the game to suit your computer is a daunting task.

Hardware and software vary so much that there are no general rules for converting programs; the conversion process may require anything from minor changes in syntax up to almost a complete rewrite, and the documentation provided may be anything from a bare program listing to a full explanation of the purpose of every section.

Manuals are usually available separately from the disks or cassettes which sell the machines, and if you intend to convert a lot of programs you will find it very useful

to have many computer manuals.

In many cases the only changes needed, will be to the display on the screen. These changes will be needed because the memory addresses, the graphics characters, and the number of rows and columns on the screen differ among the various models of computer available. If you have the machine-dependent information on graphics and screen formats, which can be obtained from the manuals, and understand the techniques of memory-mapped screens explained in Gerry Marshall's Graphics series, you should have little difficulty in converting most programs.

Hardware differences, such as input from a joystick or light pen, or sound output, can cause difficulties. If you do not have these features on your computer, sound output can be omitted and joystick or light pen input replaced by input from the keyboard, but such changes may destroy the point of a game. If you do have similar hardware

features the conversion is often straightforward, although you may sometimes have a lot of work to do because of the different software features available for controlling these peripherals.

Most dialects of Basic have a common core which varies little from machine to machine. Most of the differences are in the instructions for controlling special features, such as joysticks and colour graphics.

There are few differences in the syntax and operation of the most frequently used Basic statements and it is usually quite easy to make any changes that are necessary. Apart from special-purpose instructions used for controlling peripherals the only instructions likely to cause any difficulty are POKE, PEEK and USR.

The commonest use of PEEK and POKE is in memory-mapped graphics. Other uses may be concerned with the computer's firmware (the built-in machine code programs in ROM that control the operation of the computer). In this case you will have to find out what the instructions are

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doing and replace them with instructions to perform the same task on your own computer.

Some programs include machine code subroutines that are POKE'd into memory and accessed by the **USR** or **CALL** instructions. Unless you are familiar with machine code or assembly language you are unlikely to be able to use such machine code subroutines, even if your computer contains the same microprocessor as the machine the routine was written for. Machine code subroutines often use the ROM routines, and even if they do not may use means of memory that are not free on a different model of computer.

Although I have concentrated on the difficulties that can arise in converting programs, most of these difficulties occur only occasionally. Once you have got used to converting graphics from one screen format to another you will be able to convert many programs that you would otherwise not be able to use. However, you should be aware of the difficulties, particularly those because that you cannot convert, as this will save you much time.

NUMBER CRUNCHING

Many mathematical problems and puzzles appear at first sight to be suitable for computer solutions as they seem to be solvable by massive amounts of simple calculations even if you don't know the mathematical methods for solving the problems directly.

However, Basic works very slowly: although the result of a simple addition or multiplication may appear to be printed instantly, hundreds of thousands of such calculations will take hours. Thus it is usually necessary to reduce the amount of calculation needed, and it is often possible to do this with only elementary mathematics.

Let us look at the problem of finding whole number solutions of the equation:

$$A^3 = B^3 + C^3$$

There are, in fact, an infinite number of solutions, so we need to fix an upper limit to the solu-



tions we are considering, say $A=100$. The obvious way to start is to test all triplets A,B,C less than 100, using something like the following:

```
10 FOR A = 1 TO 100
20 FOR B = 1 TO 100
30 FOR C = 1 TO 100
40 IF A^3 = B^3 + C^3 THEN 60
50 PRINT A,B,C
60 NEXT C
70 NEXT B
80 NEXT A
```

However, this took six-and-a-half minutes to find the smallest solution, $A=3$, $B=3$, $C=4$, and would take almost three hours to run to completion. It will also produce each solution twice (e.g. as well as $A=3$, $B=3$, $C=4$, it gives $A=3$, $B=4$, $C=3$, which is not really distinct).

We can make the program much faster, and eliminate the redundant solutions, by noting that A must be greater than B or C and we can arbitrarily choose to have $B < C$. Thus we need only test those cases where $A < 9$ and $B < C$. This could be done by inserting two extra tests between lines 30 and 40, but it can be done more efficiently by modifying the limits in the **FOR** ... **NEXT** loops. If lines 10-30 are replaced by:

```
10 FOR A = 3 TO 100
20 FOR B = 1 TO A-1
30 FOR C = 1 TO B-1
```

the running time will be reduced to 27 minutes, which is over six times as fast as the first version.

The problem does have a mathematical solution which can be derived very simply, although the details of the derivation make it too long to include here. The details of the solution can be found in almost any book on elementary number theory, and does not require any

special mathematical knowledge for its understanding.

The solution is that all values of A,B,C satisfying

$$A^3 = B^3 + C^3$$

can be found from the equations

$$A = P^3 + Q^3$$

$$B = 2P^2Q$$

$$C = P^3 - Q^3$$

It is easy to see that this does give solutions, since

$$A^3 = (P^3 + Q^3)^3$$

$$= P^9 + 3P^2P^2Q^3 + Q^9$$

while

$$B^3 + C^3 = (2P^2Q)^3 + (P^3 - Q^3)^3$$

$$= 4P^6Q^3 + P^9 -$$

$$3P^2P^2Q^3 + Q^9$$

$$= P^9 + 3P^2P^2Q^3 + Q^9$$

The less straightforward part of the derivation is in the proof that these formulae do actually give all solutions.

It is a simple matter to write a program to produce solutions from the formulae above:

```
10 FOR P = 2 TO 1000
20 FOR Q = 1 TO P-1
30 LET A = P^3 + Q^3
40 LET B = 2P^2Q
50 LET C = P^3 - Q^3
60 PRINT A,B,C
70 NEXT Q
80 NEXT P
```

When this program is run the solutions about up the screen too fast to read; values less than 100 come out in a few seconds, and within half an hour the program is giving solutions with six digits.

This shows the enormous advantage that can be gained by using a little simple mathematics to solve a problem, rather than relying on the "brute force and ignorance" method of the first program above, which will produce the answer but may tie up your computer for hours or even days.

THINK THINGS OUT IN 3-D

South Senae is a mind-boggling name for a game which requires you to think in three dimensions.

From the Milton Bradley stable, South Senae is a double game. Firstly there is a 3-D version of the Connect Four game and secondly a "maze" game. The object of the former is to place four of your counters in a row on one level of the frame, or to place four counters in a row on different levels.

Altogether there are four layers of the frame in which to place your counters with a total of 16 spaces. The counters you play with are actually square shaped cubes which slot into each space.

Remember to check the counters on the bottom level of the cube's section which are difficult to see when they have been built upon. When one of you finally wins a victory tune plays.

In the second game your task is to follow a pre-programmed "maze" pattern which is formed on each level of the frame. The computer controlled display tells you when you have made an incorrect move and you can only continue your turn if you have moved into the correct space.

You can take consolation in the knowledge that the maze only follows a vertical and horizontal path, it won't go diagonals and once it has reached one level it will not descend again.

The winner of the game is the first person to reach the end of the maze. Sometimes you might have to use your opponent's counters as a scaffold to climb to the right level in the maze. Each player is given the same number of moves to complete the maze.

South Senae is scheduled to be on sale in most large toy shops from July of this year and will cost £11.99.



CHRISTMAS 1982



The British toy industry spends January and early February smelting its plans for the coming year. Here we present a selection of electronic games and toys which will be competing for our attentions next Christmas.

MINUTE MUNCHMEN

Last year's arcade successes are this year's toys. The Pac-Man type game seems to be following in the trend set by Space Invaders and appearing in every conceivable format.

From Adam Imports comes Mini Munchmen which can be played on the tea-screens that also doubles up as a watch. About the same size as an average calculator the clock has full functions, including a stop watch, an alarm, day timer, day and date.

There has been a plethora of hand-held Munchmen type games but this is the first to be used in the pocket watch format.

The game itself works closely to the original version with the player in control of a munchman who rovers around the screen eating dots as he goes.

Mini Munchmen's makers, Adam Imports anticipate supplies

should filter into the shops in March retailing for about £18.

In the same series, is a golf game which will also cost £18.

This game again is unique for the range. You control a golfer who has to swing his way through a nine hole course. It has little features incorporated into the game to give the player more information, like figures displaying the distance the ball is away from the hole he is playing.

Adam Imports say that the skill of the game is pressing the button at the correct time when the golf club is on the backswing.

CHIPS ARE CHILD'S PLAY

A treat for children with a taste for music will be at store end-year.

On a touch sensory surface, children can learn to play and sing along to their favourite stories with this new electronic toy. The microprocessor hidden inside the toy memorises the tunes and when the correct coloured button is pressed the corresponding note is emitted. Called the Musical Story Book, the toy has two different volumes and an automatic shut-down device, acting as a power saver in case of forgetful children — who leave it on.

Coming in a square shaped case, the board consists of 84 keys which represent the notes

SOUPED-UP SPACE INVADERS

A sophisticated space invaders hand-held game will grace shop shelves later in the year keeping the craze lingering on.

Called Alien Attack, the object is to shoot down as many aliens as you can. You have three firing ships fitted with beams to blast at your attackers. At the start of the game the aliens move into the corners of the LCD screen and home in on your space ships, firing beams as they fly. The



"muzzies" come in waves of six, but once you destroy those there is no let up — another batch will be instantly sent on the rampage.

There are two skill levels and many different speeds to master.

Alien Attack is one of Peter Pan Playthings' new toys for 1982. It was originally released in America and is made by US toy firm Coleco. The game does however fall at the top end of the price range retailing at around the £30 mark.

played. At the top of the eight columns the letter of the note is stamped in large letters making it easy for the child to read.

With the actual toy comes a selection of cards on which the stories are written. As you play the tune the child reads the card following a "read" map consisting of lines linked up by circles containing the correct musical notes.

Included in the list of musical stories are Happy Birthday and It's a Blackbird's.

Peter Pan Playthings is the firm behind this toy and has assigned it a price of £78. It is due in the shops in July and will off one nice volt battery which is not included in the package.

LEARN THE SECRETS OF THE DARK TOWER

Leading a band of warriors to overthrow the forces of the benign king who has stolen a people's precious stories is the theme of a new concept in games.

Dark Tower is a unique idea combining a traditional board game with an electronic game. The centerpiece is the tower itself which is mounted in the middle of the playing board. That is the microprocessor controlled part of the game. At the front of the tower is a large "window" which acts as a screen and shows each player what is happening to his troops.

On the board are marked four citadels containing a lord, a sanctuary, a tower and ruins which each player occupies for the duration of the game. The ultimate aim is to attack the Dark Tower and oust the evil benign king.

But to do that you must find three keys made of brass, silver and gold and give the sides of the keys. These vital objects are

hidden in each of the citadels that move at your speed so you have to move around each citadel in a clockwise direction to obtain the treasures.

You use plastic models to represent the characters involved in the game and move them around the board.

At the beginning of the game, each of the four players is allocated 10 warriors, 30 bags of gold and 25 food rations. Anything can happen to you as your troops and you must watch out for hidden dangers which might betray you and your soldiers. Like the fire-breathing dragon which you could run into, or the fatal player that can cut off half your army. Sometimes you will inevitably have to set to battle with some of the other lords in pursuit of their keys.

Throughout your military campaign you must keep an eye on how many food rations you have left for your warriors. Hungry warriors won't do much good in an exhausting battle.



You can replenish your supplies in the houses using your gold, and you can even happen to bring the price down if it's too high.

To make a move in the game you must press one of the buttons on the tower's control console — there are 12 in all — to indicate where you want to move to. After you have pressed a button a response and further directions will flash up on the screen for you to follow. The tower's screen round so that only the player whose turn it is can see what the window reveals.

Once you have found the keys you still can't rush in and storm the tower. First you have to solve the riddle of the keys to only then will the portals open allowing you to try again. If you win the tower plays a victory tune and the retrieved sceptre is held high in triumph. Before marching into battle make sure you have enough troops to stand a good chance of success.

This Milton Bradley game has the potential to be one of the most sought after of 1982, and is certainly one of the most imaginative of this year's batch of new launches. It will be on shelves in the year for £20 from most large toy shops.

A GAME TO SINK YOUR TEETH INTO

Your blood will start to curdle when you sink your teeth into Dracula.

When your fingers touch the chilly casing of the electronic game Dracula, you are transported by the plot of a haunted house. You have to find your way through the house avoiding the obvious dangers of coffins which could contain coustings of Dracula, and that particularly poisonous type of bat which flies in huge numbers through haunted houses.

Dracula is an extension of the range which Adam Imports brought out last year. It will be available in a plastic casing, consisting of a flat console where the control push buttons are located and a screen for the player to look at displaying the action of the game.

The object of Dracula is to steer clear of the Dracula symbol, for obvious reasons. If you get too close to his lair...

Unfortunately, it won't be at the shops until July at the earliest and is due to retail at just under the £20 mark.

Autobuster is the new, improved version of Adam Imports' Auto Wars. It is in the same vein as that game but follows the misde game Scrabble. On the horizontal display you see an undulating lunar surface which constantly changes as your spaceship flies above.

Various alien space craft and creatures fly towards you at intermittent periods. You score points by successfully shooting down the enemy ships and by blasting the ground bases.

Autobuster is also expected to sell for just under £20 and should be on shop shelves at about the same time as Dracula.

MAGNUS' MICRO RIVAL

Precise snapping back answers to general knowledge questions from a keyword list which would give Magnus Magnusson a run for his money.

Joining in the Microvised test of general knowledge, this new toy is designed for the entire family. Altogether there are 10 different subjects for you to answer questions on when you play Family Challenge. This microchip controlled game poses a total of 1000 questions and contains a number of special features.

You can begin the game's play on any question you choose by pressing the selection button, so if you don't fancy your chances on the one first posed you can pick another.

If there are several difficult questions in a row you can set the fast forward button to advance the process quickly. Lights and sound help brighten it.

The U.K. distributor is Peter Pan Playthings of Peterborough and the game will retail at around the £20 mark. Family Challenge is the big brother of Master Challenge also made by Peter Pan.

A booklet of mock questions for Master Challenge is also available. Altogether there are 1000 questions based on popular television quiz programmes like *Jeopardy*, *Family Mastermind* and *4 Questions of Sport All for £5.75*.

The booklet contains your questions and can be used with the new game. Family Challenge is battery run, but there are not supplied with the toy.



ISREVIEWSRE

QUEST FOR HIDDEN PLUNDER

PIRATE ISLAND

Pirates are common inhabitants of adventure games and as every schoolboy knows, where there are pirates, treasure is never far away.

Supplied on a C12 cassette, *Pirate Island* loads in two parts corresponding to the two memory banks of the Acorn and during the second load instructions are presented on the screen.

This gives you something to look at while waiting for the cassette to finish the load.

The object of this fast and exciting game, is to collect various items of treasure and transport them back to your ship while avoiding many obstacles and hazards placed in your path.

In common with other adventure games, the computer recognises commands typed in English such as "North", "Up", "Eat the Sandwich" and so on.

The machine replies with "I can't" or "I don't understand" if the command is not recognised or incorrectly phrased, and allows another attempt.

There is a small screen flash after each input, but it is of very short duration and after a short while becomes unobtrusive.

Altogether there are over 30 locations and more than 35 objects which will be required during your hunt for treasure. This is achieved by using only five bits per character instead of the usual eight, thus making the program appear larger than the 12K. Watch out for poisonous darts, crocodiles, gophers and of course, pirates.



Useful things to pick up are a tinder box, pieces of eight, a knife and a green eyed golden idol.

Pirate Island is an easy and compulsive game to play, but requires skill and a certain amount of luck to get the best score which is shown at the end of the game. Yes, the best score, 18 out of 18, is possible!

The program is written in machine code and uses up the whole 12K RAM of the expanded Acorn Atom, it is available from Hopesoft of Newbury in Berks. An excellent piece of software it is well worth the £8.75 price-tag.

CRACKING GRAPHICS

SPACE EGGS & SPACE WARRIORS

The space theme lingers on in two Apple discs, *Space Eggs* and *Space Warriors*.

The two discs represent all that's good and all that's bad, in games software. They concentrate on needless destruction,

A three part space ship splits up, giving you three attempts at destroying the eggs. Unlike the usual games, when you destroy an egg a space thing appears out of it with a number on it. The number indicates the points awarded if you hit it.

Unfortunately the space thing moves very erratically, usually in the direction of your space ship. If it touches you then that's it.

Space Warrior involves the exciting joystick to move a starship that is surrounded by a force field. Attacking space craft are destroyed by firing up the space ship and pushing the fire button. Again the space craft follow erratic paths making defence difficult.

Marvellous graphics and a familiar space battle theme, the games rely purely on speed and reactions but they seem to give hours of enjoyment to those in early teens and younger.

Both are available from Pete and Pam Computers for £12.95 each, to run on an Apple II. For *Space Eggs* you need 48K memory and 12K for *Space Warrior*.

but use fantastic graphics.

Space Eggs can be found in the arcades under the name *Moss Overts*.

The game is a variation of the usual space invaders theme whereby the player has a joystick type control to move the space ship from left to right, and a fire button. Three levels of difficulty are present.

WHISKED INTO ACTION

ARCADE SCRAMBLE

There's plenty of action when your craft takes to the skies in *Arcade Scramble*. And the good graphics make this arcade spin-off a cut above most others.

The mission theme which gives *Scramble* a big arcade following is recreated with plenty of hazards for the player's plane.

You have six controls which use the arrow keys or letter keys if you wish to alter your altitude, give forward and reverse movement, drop bombs and fire your guns.

The game is written in machine language, and after loading it via the system command and seeing the title page you are given a cross section representation of the enemy territory with mountains, valleys, rocket launching pads, ack-ack pads, forts, munition dumps and fuel tanks.

Your plane flies across the screen whilst the ground unfolds beneath you from right to left. Using the controls, bomb the enemy posts without flying into the landscape. Further hazards include enemy missiles, clusters of bombs in the air which you must avoid and attack from enemy gun posts. Without warning, enemy aircraft appear to interrupt you and you either have to dodge or shoot them down.

The game is not difficult to learn but does take some practice to achieve a satisfactory score. Should you have a suitable amplifier connected the game provides arcade type sound effects.

The game runs on a TRS-80 Model I and a Video Games and the cassette costs £9.95 from Katusen City Systems.



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DOWN TO BASIC DOWN

BY MOWA NORRIS

GIVE LUCK A CHANCE

Most games involve some element of "chance" or "luck". This element of chance is introduced into a game by actions such as rolling dice, shuffling cards or spinning a wheel.

For any such action, we know that each of the possible outcomes is equally likely to occur. When you roll a die, you may get a 1, 2, 3, 4, 5 or 6. The chance of getting a "1" is no different from that of getting any other of the numbers. By the action of rolling the dice, you are selecting one of the numbers at random. I will now show you how you can introduce this idea of chance in your programs.

In Basic, there is a function RND which selects numbers in the range of 0 to 1 (not including 1) at random. Every time the computer encounters ("RND" in a basic program, it will select another number between 0 and 1. To illustrate this, try running the following program:

```
10 FOR I = 1 TO 20
20 PRINT RND
30 NEXT I
40 END
```

A list of 20 numbers, each in the range of 0 to 1, will be printed. They will appear to be selected randomly in that they will not follow any obvious pattern. In fact, these numbers have been generated by the computer using a mathematical rule which produces a list of numbers with this property of "randomness". This mathematical rule is called a "Pseudo-Random Number Generator" — meaning that it generates numbers that appear to be random.

Different computers use different Pseudo-Random Number Generators. As a result, the operation and format of the RND function varies slightly from one

computer system to another. On many systems you have to include a value in brackets after "RND" — for example, RND(1). The operation of the RND function will depend upon the value given in brackets.

Later, I will give some examples of the effects of different values for some of the popular personal computers that adopt this format. For the moment, it suffices to say that on most of these systems replacing line 20 of the previous program with

```
20 PRINT RND(1)
```

should give a program that will generate a list of random numbers — each lying between 0 and 1.

THE ROLE OF THE DIE

How can you use this function RND to simulate rolling a die in a game? The function RND provides us with a number in the range 0 to 1. We require some way of converting this to one of the digits 1, 2, 3, 4, 5 or 6. Let's examine the conversion process step by step.

If RND gives a number in the range 0 to 1 (not including 1), then $6 \times \text{RND}$ will give a number in the range 0 to 6 (not including 6). By adding on 1, we would then have a number in the range 1 to 7 (not including 7).

For example if RND would give 0.217872; then $6 \times \text{RND}$ would give 1.30724; and $6 \times \text{RND} + 1$ would give 2.30724.

By using $6 \times \text{RND} + 1$ we can generate numbers in the desired

range, however, we are only interested in the "integer part" of these numbers i.e. the part before the decimal point.

In Basic, there is a function INT that provides the "integer part" of a given number.

$\text{INT}(3.25)$ is 3 as 3.25 can be expressed as $3 + 0.25$.

$\text{INT}(-2.6)$ is -3 as -2.6 can be expressed as $-3 + 0.4$.

From the second of the examples above, you can see that the function INT is not quite as straightforward when dealing with negative numbers. However, in our case, we are only interested in positive numbers. When the value is positive, the operation of INT can be described as returning the part of the number before the decimal point and ignoring the rest.

The following program will simulate rolling a die 20 times and print a list of outcomes.

```
10 FOR I = 1 TO 20
20 PRINT INT(6*RND + 1)
30 NEXT I
40 END
```

A similar program could be produced to simulate a roulette wheel by using $\text{INT}(30 \times \text{RND})$ — remember, the possible outcomes are 0, 1, 2, ... 36.

Clearly, these programs are not of much interest on their own. Later in the series I will show how they can be included in a games-playing program.

If you try running the previous programs more than once, you will find that they always produce the same output. A computer game would soon become very boring if it always used the same random numbers each



time-it run. We need to be able to adapt the Pseudo-Random Number Generator so that it will generate a different sequence of random numbers each time we use it.

It is this aspect of Pseudo-Random Number Generators that tends to vary greatly from one system to another. I will describe the most common alternatives.

In those systems where the function is simply expressed as "RND", there will be a keyword RANDOMIZE or RAND that can be included in a program before the first RND function. The inclusion of a line containing the appropriate keyword will result in a different set of random numbers being generated each time the program is run.

On the Sinclair 2081, my program for "tossing a die" could be adapted to:

```
10 RAND
20 FOR I = 1 TO 20
30 PRINT INT (6*RND+1)
40 NEXT I
50 END
```

When I introduced systems that used the format RND (I), I noted that the operation of the Pseudo-Random Number Generator depended upon the value inside the brackets.

On the Commodore Pet, a program using RND(I) will produce the same random number sequence each time the program is run, whereas RND(I) will result in a different sequence each time the program is run.

On the Atari, the use of RND(I) will produce a different sequence of random numbers each time the program is run. Rather than being used to generate a

sequence of random numbers, RND(I) returns the value of the most recently generated random number.

It is a great pity that all the systems are so inconsistent!

There are situations when you will wish to select alternative sections of your program depending upon the data input or, perhaps, the value of a random number. Such selections can be made by using an IF statement to test whether a specified condition is true. If the condition is true, then a "jump" is made to a particular section of the program. To illustrate the use of an IF statement I will consider a very simple example.

TOSSING A COIN

How can we write a program to simulate tossing a coin — the possible outcomes being a "tail" or a "head"?

The function RND selects a number between 0 and 1 at random. It is equally likely that the number will be in the lower half of the range or the upper half of the range. Similarly, when you toss a coin, it is equally likely that the outcome will be a "tail" or a "head". We may therefore decide that if the random number is in the lower half of the range, it represents a "tail", and if it is in the upper half of the range, it represents a "head".

Our program would therefore take the form:

```
IF RND < .5 THEN
  print "TAILS"
```

otherwise
print "HEADS"

end

We therefore have two alternative sections in the program — either we print the message "TAILS" or we print the message "HEADS". If the condition that RND < .5 is true, then we print "TAILS".

```
30 IF RND < .5 THEN 40
30 PRINT "HEADS"
30 GOTO 50
40 PRINT "TAILS"
50 END
```

If the condition RND < .5 is true, then the computer will "jump" ahead to line 40. If the condition is not true, then the jump will be ignored and the computer will continue, as normal, with the following line — in the above example it will go to line 50.

In the case where "HEADS" is printed, the computer must "jump" over line 40 — otherwise the message "TAILS" would also be printed. This is achieved by using a GOTO statement. A GOTO statement simply specifies the line number the computer will "jump" to.

The IF statement is sometimes referred to as a "conditional jump" while the GOTO statement is sometimes referred to as an "unconditional jump".

NEXT ISSUE SOLVING PROBLEMS

I have briefly introduced the IF and GOTO statements. Next month, I will describe the use and format of these statements in more detail.

The programs discussed so far have been very simple. You have the knowledge to write reasonably complex programs — it is now just a matter of gaining experience in using that knowledge.

I will work through the steps involved in developing a program for a specified problem next issue.

NEXT ISSUE



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Can you save Middle Earth by rescuing Frodo from Shelob's lair . . . ?

Tolkien's

LORD OF THE RINGS

Lord of the Rings is an entirely new type of game, combining a little of the principles of the 'Adventure' type of game, using words as spells, etc.; a little of the 'Quest' principle of moving around the 'rooms'; plus actual graphics showing the various levels, walls, doors, monsters and yourself. Frodo.

The appeal of the game is that it combines skill and chance, so that though developing strategies are important, there is no guarantee that having learnt a strategy it will work twice!

The game is an adaptation of Tolkien's books 'The Lord of the Rings', itself words actually being taken from the book as are the characters.

Tolkien enthusiasts will not need convincing of the necessity of saving Middle Earth by escaping from Shelob's Lair; those without this background knowledge will have to play a few games before they become addicted!

In your quest to cast the ring into the Crack of Doom to

destroy it, you will travel along and dangerous road. The Lair is on many levels, so you must find the stairs, and towers of the clever masters, monsters and dwarfs which can detect you from a distance and run for your gold, which you need to buy. There are secret tunnels, monsters' tombs and the like.

During your travels you can meet Shelob herself, a Flay Baring Lord of the Nazgûl, a Hobbit Hit-Top-Owl, a Home-At from the Far Harad, Heaving Goblins, a Howling Warg, a Banner-Wight and all those characters of the great world.

The game, though many to actually play is complicated in itself with many and varied happenings along the way. But to advantage in that all the time you can see and manipulate yourself in eight different directions.

Peter and Margaret Hall have developed and produced a most absorbing, and certainly addictive, game . . .

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Or you can battle through the Enchanted Forest to rescue the Princess . . . ?

SWORDS AND SORCERY

Swords and Sorcery sets you out on a quest to rescue the princess held by the wicked Necromancer, taking through many separate adventures and meeting many strange beings on the way to the castle — if you never get there!

This program is randomly based, so it is not the same old thing time after time.

Off you go through the Old Forest with just a sword and a few provisions, and if you are lucky, assistance from a Dwarf as well as counsel from the Great Oracle.

If you meet up with the Wraith, hang on to her, as she is a great guide through the forest as well as helping to fight the dreaded Trolls. But be careful not to upset her as she can easily turn her magical power onto you with a curse!

If you time to time you will meet orcs, goblins and snakes. Sometimes you will be taken but other times you will get away.

Food is most important to you, but you could be lucky in finding some in the forest and also be lucky in finding the magic talisman which will ward off the wicked Necromancer.

The Satyrs are restless, to be avoided, but the real enemy is

the spider, for if you don't run from him — and fast, it's the end for you!

The Dragon is most important, and you can either run or fight, but to get a decent fighting ability (just to enable you to fight your way back after rescuing the Princess, you have to fight).

Run from the Goblins, or you will be enslaved, to be sold or freed only on payment of a ransom.

More battles in the form of the Trolls, which come in two versions including the warrior truly which are your big risk at all times, and an enchanted sword.

All the way through are degrees of your ability, which is either diminished or increased depending on the action you are taking at the time.

Eventually you could make it to the castle and even rescue the princess, but then you're gobsmacked, you have to fight your way back again!

It's a fantastic game, which can be played over and over again, such entertainment, and so do not confuse with others.

128.00

These programs are entirely different from each other in play and format. Both sell 100 for Video Cassettes and 150-00. The two for £172.00.

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