always use a new disc, copy across the compiler, assembler and library files that will be needed and then use it to save all the various versions of the program as it is developed. Through bitter experience I have learned to save regularly, *SAM C* still has some bugs and it is easy with C to unintentionally write code that locks up so that the computer has to be reset. It is also wise to keep a back up of the source code files on another disc.

If you have Masterdos, it is well worth creating a Ramdisc and copying the library and runtime files needed to it. The time saved by loading files from the Ramdisc can be considerable and it saves a lot of frustration if you are re-compiling frequently when fine tuning some part of the program. But remember to always save source code text to floppy disc.

The game we are going to write is a simple version of the Minefield game. I'm sure everyone knows the game but just in case you don't, here's a very quick explanation. The idea is to clear a minefield marking the positions of all the mines, without hitting one. As each position is cleared, a clue is provided by showing the number of mines present in the surrounding eight positions.

The game will be built up in stages so that at each stage it can be compiled and tested. It is always wise to develop software in this way. Trying to sort out faults in large amounts of untested code is a nightmare. Before we start we need to do a bit of planning and work up a basic strategy.

Game Strategy

We will represent the minefield by a 2 dimensional array (*map [rows][cols]*), so that each position can be accessed by its row and column numbers. We will need a cursor which will be moved around using the cursor keys.

We will need to know the following information about each location of the minefield. Is there a mine here, has it been marked as a mine, how many mines surround it, has it already been checked. That's quite a lot of information to hold in a single cell of an array. We could use more than one array, we could even make them into a structure. But that would over complicate things so this is how we will do it. The number of surrounding mines can be between 0 and 8, we will use 15 to indicate a mine. When the location is checked we will add 16. If the location is marked as a mine we will add 32. (Note checked and marked are mutually exclusive states). Now we can quickly find any information by dividing by 16, using integer arithmetic this will give:-

0 = not checked
1 = already checked
2 = marked as a mine

The remainder after dividing by 16 i.e. value % 16 (Modulo 16) gives 0 to 15, indicating a mine if 15 or the number of surrounding mines if 0 to 8. We could have used 9 for a mine and then add 10 and 20 but using 16 has a good binary feel to it and leaves some spare numbers which might be needed as the game develops. It's always a good idea to keep some options open.

If the number of surrounding mines is calculated for every location at the start of the game, there will be a long delay before each game begins. So the number will be found when a location is checked and entered in the array for subsequent use.
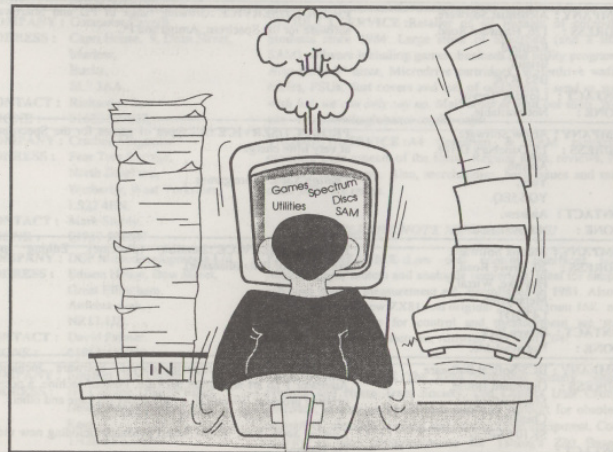
Below is a very high level structure for the game written in a form of

Find What You Need The Easy Way.

COMPANY :	Ace Software.	PRODUCT/SERVICE :Spectrum Software - over 2000 titles available on cassette and +3 Disc. All originals. Also books, and magazines. *Coming Soon.* Other software available for most 8-bit computers including C64, CPC, Atari ST, and Amiga.
ADDRESS :	18, West Street, Geddington, Northants, NN14 1HD.	
CONTACT :	Alan Cresswell.	
PHONE :	Not available.	

COMPANY :	Adventure Probe.	PRODUCT/SERVICE :Publication of a long running monthly magazine for Adventurers. Also some software available.
ADDRESS :	52, Burford Road, Liverpool, L16 6AQ.	
CONTACT :	Barbara Gibb.	
PHONE :	0151 280 5616	

COMPANY :	The Adventure Workshop.	PRODUCT/SERVICE :Over 100 adventure games for the Spectrum. Available on tape and +3 disc. We sell adventures for both the Spectrum and Amstrad CPC computers and we convert games from one computer to the other. *Coming Soon.* We are always on the look-out for games for both machines and will convert and sell games from any author who wishes to contact us.
ADDRESS :	36, Grasmere Road, Royton, Oldham, Lancashire, OL2 6SR.	
CONTACT :	Philip Reynolds.	
PHONE :	0161 652 7565	

COMPANY :	Alchemist Software,	PRODUCT/SERVICE :Growing range of PD and Shareware software for the Spectrum, Amiga and PC.
ADDRESS :	126, Hayward Road, Redfield, Bristol, BS5 9QA.	
CONTACT :	Lloyd & Trevor	
PHONE :	Not available.	

COMPANY :	Arrow Software.	PRODUCT/SERVICE :All types of games for the Spectrum, at very little charge. *Coming Soon.* More games....
ADDRESS :	15, Danebury Drive, Acomb, York, YO2 5EQ.	
CONTACT :	Andrew.	
PHONE :	Not available.	

COMPANY :	Atomik Software.	PRODUCT/SERVICE :Samdisk (disczine). Editing and production of Blitz (disczine).
ADDRESS :	20, Grove Road, Hoylake, Wirral, Merseyside, L47 2DT.	
CONTACT :	Steven Pick.	
PHONE :	Not available.	

COMPANY :	BCS/Softcat Software.	PRODUCT/SERVICE :Spectrum/SAM Software including Animator 1 an art-animation package, Poster Machine, a poster printing program, Video DJ, a video titler package and others. *Coming Soon.* New 'video' based products including new video DJ Systems.
ADDRESS :	Grantham House, Macclesfield, Cheshire, SK10 3NP.	
CONTACT :		
PHONE :	01625 615379	

COMPANY :	Mr C.Box.	PRODUCT/SERVICE :External 720K floppy disc drive for the ZX Spectrum +3.
ADDRESS :	31, Stanley Street, Semilong, Northampton, NN2 6DD.	
CONTACT :	Christopher Box.	
PHONE :	Not available.	

COMPANY :	Chic Computer Club.	PRODUCT/SERVICE :General computer user group with special interest sections for many machines including the Spectrum. Also Spectrum PD Library, Book Library.
ADDRESS :	P.O.Box 121, Gerrards Cross, Bucks, SL9 9JP.	
CONTACT :		
PHONE :	01753 884473	

COMPANY :	Classix Enterprises.	PRODUCT/SERVICE :Classix fanzine, games finder service for Spectrum, C64, CPC and Amiga. Large selection of second hand software available for Spectrum. e-mail u9600169@bournemouth.ac.uk. *Coming Soon.* Classix Web pages. (we need willing contributers for Classix as well).
ADDRESS :	11, Finsbury Drive, Wrose, Bradford, West Yorks, BD2 1QA.	
CONTACT :	James Waddington .	
PHONE :	0336 776390 (pager)	

COMPANY :	CLP Computer Supplies.	PRODUCT/SERVICE :Mail Order computer supplies. Also do a 'In a Jiff' service for £1.99 which is handy for people who only want one item.
ADDRESS :	Units 7 & 8, Holland Way, Blandford, Dorset, DT11 7TA.	
CONTACT :	Simon Rigby.	
PHONE :	01258 459544	

COMPANY :	Computer Cavern.	PRODUCT/SERVICE :Retailer of all formats of computer products since 1984. Large stock of Spectrum (and a little SAM) software including games, business and utility programs. Also stock 3" discs, Microdrive cartridges, Waferdrive wafas, cables, PSUs, dust covers and lots of odd items - *send us your wish list, we can only say no.* Mail order or visit our shop. Web site - http://wwlu.globanet.co.uk/~capri
ADDRESS :	Capri House, 9, Dean Street, Marlow, Bucks, SL7 3AA.	
CONTACT :	Richard or Sue.	
PHONE :	01628 891022,	

COMPANY :	Crashed Magazine.	PRODUCT/SERVICE :A4 Spectrum & SAM magazine covering wide aspects of the scene. Regular news, reviews, PD roundup, interviews. Also, merchandise, back-issues and mail order software range. *PLEASE NOTE NEW ADDRESS!*
ADDRESS :	Pear Tree Cottage, North Deighton, Wetherby, West Yorkshire, LS22 4EN.	
CONTACT :	Mark Sturdy.	
PHONE :	01937 582837	

COMPANY :	DCP Microdevelopments Ltd.	PRODUCT/SERVICE :Low cost control interfaces with relays, stepper motors and analogue converters. Ideal for simple robotics, control measurement etc. Established in 1981. Also a number of brand new ZX81 and original ZX Spectrum 16K are available. Interfaces for control and measurement are still available for ZX81, Spectrum, Amstrad CPC and C64!
ADDRESS :	Edison House, Bow Street, Great Ellingham, Attleborough, NR17 1JB.	
CONTACT :	David Palmer.	
PHONE :	01953 457800	

COMPANY :	Einstein User Group.	PRODUCT/SERVICE :The RPM Historical Society, Steam Printing and Horse Tram Society, Old Copiers User Group. Software, magazines/newsletters and user support for obsolete computers, obsolete printing and reprographic equipment. Core activity is user group/magazine for Tatung's Z80 Based, Einstein Computer.
ADDRESS :	Ivy Cottage, Church Road, New Romney, Kent, TN28 8TY.	
CONTACT :	A.E.Adams.	
PHONE :	Not available.	

COMPANY :	Express Software.	PRODUCT/SERVICE :Graffixmas clipart pack for 48/128 Spectrum. Available on tape or PLUS D disc.
ADDRESS :	7, Manor Drive, Merriott, Somerset, TA16 5NT.	
CONTACT :	Richard Coles	
PHONE :	Not available.	

COMPANY : Fairweather and Beeton. **ADDRESS :** 46, High Road West, Felixstowe, Suffolk, IP11 9JE. **CONTACT :** Alf Fairweather. **PHONE :** 01394 273178	**PRODUCT/SERVICE :**'The Thing Monthly' fanzine incorporating 'Your Thinclair', information about emulators, the net and it's free. *Coming Soon.* A special fifth anniversary issue.
CONTACT : Flexibase Services. **ADDRESS :** 20, The Parklands, Droitwich Spa, Worcs, WR9 7DG. **CONTACT :** David Wornham. **PHONE :** Not available.	**PRODUCT/SERVICE :**Software for safety - interactive and multi-choice quizzes on crime prevention, personal safety and road safety. Versions available for Spectrum PLUS D, +3, SAM, and the PC.
COMPANY : Format Publications. **ADDRESS :** 34, Bourton Road, Gloucester, GL4 0LE. **CONTACT :** Jenny Bundock. **PHONE :** 01452 412572	**PRODUCT/SERVICE :**Well, we had to include ourselves didn't we. Still, just for the record, here is what we do. Monthly magazine, everything for the Spectrum, SAM and (when we can) other Z80 computers. Wide range of software, hardware and technical support for the Spectrum and SAM. Fast efficient SAM repair service. Organizers of the twice yearly Gloucester shows. Publishers of this directory. Nice people too...
COMPANY : Fountain PD. **ADDRESS :** 11, Camel Road, Silvertown, London, E16 2DE. **CONTACT :** Dave Fountain. **PHONE :** 0171 4765915	**PRODUCT/SERVICE :**Importer and retail distributor of PD Software to UK PD Libraries and other services. Ex-commercial games distributor. *Coming Soon.* News agency service.
COMPANY : Fred Publishing. 5, Ivanhoe Drive, Ashby De La Zouch, Leicestershire, LE65 2LT. **CONTACT :** Darren Wileman. **PHONE :** 01530 416207	**PRODUCT/SERVICE :**'Fred' - A monthly SAM disc magazine. Superb range of SAM software including licenced conversions like Lemmings etc. Also stock a wide range of SAM software from a variety of publishers. *Coming Soon.* More new games for SAM. See us at the Gloucester shows.
CONTACT : Galaxy Software. **ADDRESS :** 43, Gwydir Street, Toxteth, Liverpool, L8 3TJ. **CONTACT :** Leon Brown. **PHONE :** 0151 728 9084	**PRODUCT/SERVICE :**Spectrum software, also Hammer PD library and Eight Bit Alliance user group.
COMPANY : Grafix Wizards. **ADDRESS :** 5, Helmsley Drive, Eastwood, Notts, NG16 3RS. **CONTACT :** Jonathan Cauldwell. **PHONE :** Not available.	**PRODUCT/SERVICE :**Spectrum arcade games, turbo basic compiler and other utilities. *Coming Soon.* Death Trap 3 - a 1 or 2 player split screen arcade game.
COMPANY : W.Hall & Sons. **ADDRESS :** 147, Gladstone Street, Winsford, Cheshire, CW7 4AU. **CONTACT :** Bill Hall. **PHONE :** 01606 551925	**PRODUCT/SERVICE :**Software package to convert Spectrum into a Video titling character generator. Established in 1985 this package was the first video titling software for any home computer.

COMPANY : Hilton Computer Services Ltd., 143, Kingfisher Drive, Guildford, Surrey, GU4 7EY. **CONTACT :** Jack Gibbons. **PHONE :** 01483 826375	**PRODUCT/SERVICE :**Personal Banking System for ZX81, Spectrum (tape, microdrive or disc), CPC, BBC, QL, PC, SAM. Also PBS Budget Module, Personal Filing System for SAM. *Coming Soon.* Data Entry Toolkit for SAM, useful entry, validation, display routines + read/write records using keyed serial/random access files (incl. hard disc). Also Hilton's Casino, gambling games collection. Do you feel lucky!
COMPANY : Holdfast Computing. **ADDRESS :** Park View, Queenhill, Upton-on-Severn, Worcs, WR8 0RE. **CONTACT :** Guy Inchbold. **PHONE :** 01684 594728	**PRODUCT/SERVICE :**Early learning Joypad, also used for special needs. Joy-stick compatible. We can also supply a range of SAM cables to order, and (if you can afford it!) provide professional technical documentation services.
COMPANY : HS Computers. **ADDRESS :** Unit 2 The Orchard, Warton, Preston, Lancs, PR4 1BE. **CONTACT :** Bill Harrison. **PHONE :** 01772 632686	**PRODUCT/SERVICE :**Computer Repairs (All Spectrum range).
COMPANY : IEBA. **ADDRESS :** c/o Harrowden, 39, High Street, Sutton, Ely, Cambs, CB6 2RA. **CONTACT :** Brian Watson. **PHONE :** 01353 777006	**PRODUCT/SERVICE :**The IEBA (the Independent Eight Bit Association) is a cross-format association devoted to the promotion of the benefits of 8 Bit computing. It is non profit making, and run by a committee or representatives from the principal 8 Bit computers. *Coming Soon.* National 'contact' campaign to find the 8-bit users who do not know what support is still available to them.
COMPANY : J & P Electronics Ltd., **ADDRESS :** Unit 45 Meadowmill Estate, Dixon St, Kidderminster, DY10 1HH. **CONTACT :** J.E.Price. **PHONE :** 01562 753893	**PRODUCT/SERVICE :**Computer, Monitor, Printer Repairs. Some amateur Radio Software for Spectrum.
COMPANY : Kobrahsoft Software. **ADDRESS :** Pleasant View, Hulme Lake, Hulme, Longton, Stoke-on-Trent, ST3 5BH. **CONTACT :** Mr Cope. **PHONE :** 01782 305244	**PRODUCT/SERVICE :**We sell a wide range of Spectrum and SAM Software and utility programs.
COMPANY : MDL Software. **ADDRESS :** Holmrigg, Wester Essendy, Blairgowrie, Perthshire, PH10 6RD. **CONTACT :** Douglas Young. **PHONE :** 01250 884309	**PRODUCT/SERVICE :**Disc Magazines Sam2Sam and Daft Games: X-Sights 1 and 2, Addiction. Compilation discs and Several (10+) Volumes of Screens discs (over 100 products).
COMPANY : Micro Spec Software. **ADDRESS :** 22, Bond Street, Innerleithen, Peeblesshire, EH44 6HW. **CONTACT :** Jamie Smith. **PHONE :** 01896 830560	**PRODUCT/SERVICE :**Both games and educational software on 3"disc and tape. My software isn't PD but very low cost.

COMPANY : Mira Software. **ADDRESS :** 48, Lodge Close, Marston, Oxford, OX3 0QP. **CONTACT :** Stephen Lee. **PHONE :** 01865 204706	**PRODUCT/SERVICE :** Skyplot Program, Fortran Compiler, Pascal Compiler, Modula-2 Compiler (All for Sinclair Spectrum). *Coming Soon.* MiraCalc spreadsheet/programming language for the PCs.
COMPANY : Mungus Software. **ADDRESS :** Moorview, Leigh Road, Chulmleigh, North Devon, EX18 7BL. **CONTACT :** Stephen McGreal. **PHONE :** Not available.	**PRODUCT/SERVICE :** Games with Quazar surround support. Current games available are Blokker, Puzzle Game with Quazar support. Impostors, Lemmings style puzzle/platform game with Quazar support.
COMPANY : Outlet Computer Club. **ADDRESS :** 34, Saltersgate Drive, Birstall, Leicester, LE4 3FF. **CONTACT :** Ron Cavers. **PHONE :** Not available.	**PRODUCT/SERVICE :** A monthly disc magazine for hobbyists - containing programs/articles/letters/demos/hints & tips/short routines etc., The disc is available for DISCiPLE, PLUS D, +3 and PC. Published monthly since September 1987. emil ron-cavers@virgin.net
COMPANY : Quazar, **ADDRESS :** 204, Lamond Drive, St. Andrews, Fife, Scotland, KY16 8RR. **CONTACT :** Colin Piggot. **PHONE :** Not available.	**PRODUCT/SERVICE :** Hardware and software for the SAM including the Quazar Surround Soundcard - 16 Bit surround sound! Plus the latest software release: 'Stratosphere' - a stunning 3d wireframe game. *Coming Soon.* More software (especially games).
COMPANY : Revelation Software. **ADDRESS :** 45, Buddle Lane, Exeter, EX4 1JS. **CONTACT :** Frank Broughton. **PHONE :** Not available.	**PRODUCT/SERVICE :** One of the largest range of both games and serious software for the SAM. *Coming Soon.* We are urgently looking for good programmers - both machine code and Basic. If you have the talent - we have some good ideas.
CONTACT : Retro Classix, **ADDRESS :** 4, Chatterton Avenue, Ermine West, Lincoln, LN1 3TB. **CONTACT :** Graham Howden. **PHONE :** 0171 7336576	**PRODUCT/SERVICE :** Fully illustrated monthly magazine covering Spectrum and all formats of early classic micros, plus a regularly updated catalogue with 1000's of items for sale.
COMPANY : SAM PD. **ADDRESS :** 18, Mill Lane, Skelmersdale, Lancashire, WN8 8RH. **CONTACT :** Derek Morgan. **PHONE :** 01695 731163.	**PRODUCT/SERVICE :** The largest range of SAM PD software there is. Quick and reliable service with the very latest items available. Also F9 Software - non-PD software. See us at the Gloucester shows.
COMPANY : Saturn Software. **ADDRESS :** 5, Ivanhoe Drive, Ashby De La Zouch, Leicestershire, LE65 2LT. **CONTACT :** Darren Wileman. **PHONE :** 01530 416207.	**PRODUCT/SERVICE :** Network Sigma - bi-monthly disc magazine for SAM. Easy Disc - File Utility, Driver Icons I + II. Also software publishing, currently publishing MDL Softwares titles. - See FRED entry for details of FRED disczine.

COMPANY : SD Microsystems. **ADDRESS :** PO Box 24, Attleborough, Norfolk, NR17 1HL. **CONTACT :** Steve. **PHONE :** 01953 483750.	**PRODUCT/SERVICE :** Software and supplies for Amstrad CPC's, PCWs and Dos PC's including the 1512/1640 range. Cheap Spectrum manuals, 3" discs, ribbons etc.,
COMPANY : SD Software. **ADDRESS :** 70, Rainhall Road, Barnoldswick, Lancashire, BB8 6AB. **CONTACT :** Nev Young. **PHONE :** Not available.	**PRODUCT/SERVICE :** SAM IDE hard disc interface. SAM software including Specmaker and PC Suite. Spectrum software for DISCiPLE and PLUS D.
COMPANY : Sintech GBR. **ADDRESS :** Gastackerstr. 23, 70794 Filderstadt, GERMANY. **CONTACT :** Thomas Eberle. **PHONE :** 0049 711 775033	**PRODUCT/SERVICE :** Spectrum software from Ocean, US Gold and Codemasters, also new software from Eastern Europe. Many games and some very good new utilities like PROMETHUS (assembler), SQ-TRACKER (AY-Sound-tracker), Also sell all kinds of used hardware. *Coming Soon.* OCTOPUSSY (James Bond Action Adventure), MB-Soundface (8-Bit DA-Interface for playing music samples).
COMPANY : SPC (Spectrum and SAM Profi Club). **ADDRESS :** Wolfgang and Monika Haller, Im Tannenforst 10, D-51069 Koln, GERMANY. **CONTACT :** Wolfgang and Monika Haller. **PHONE :** 0049 221 685946	**PRODUCT/SERVICE :** Monthly paper mag with 16 pages A5 for Spectrum and SAM. Very large PD service for Spectrum. Club repair service for Spectrum and Spectrum hardware. Help on request, ie for using PD programs written in German.
COMPANY : Steves Software. **ADDRESS :** 7, Narrow Close, Histon, Cambridge, CB4 4XX. **CONTACT :** Steve Nutting. **PHONE :** 01223 235150	**PRODUCT/SERVICE :** Specialists in Desk Top Publishing software for the SAM. Also clipart collections, photo scanning, and printer software.
COMPANY : Sword Software. **ADDRESS :** 19, Great Leaze, Cadbury Heath, Bristol. BS15 5AT. **CONTACT :** Gary Pearman. **PHONE :** 0117 9832522	**PRODUCT/SERVICE :** Adventure games for all Spectrums, Public Domain for the Amiga. Can supply spare +2/+3 keyborads/keys and many other spares such as IC's (Z80A, 4116's, etc.)
COMPANY : Tasman Software. **ADDRESS :** Hilton Court, 2, North Hill Road, Leeds, LS6 2EN. **CONTACT :** Robin Thomson. **PHONE :** 0113 243 8301	**PRODUCT/SERVICE :** Tasword Two (48k), Tasword +2 and Tasword +3 word processing programs for the appropriate .
COMPANY : TIS. **ADDRESS :** 76, Church Street, Larkhall, ML9 1HE. **CONTACT :** Craig. **PHONE :** 01698 883334	**PRODUCT/SERVICE :** Service Manuals and Info (including all versions of Spectrum).