LANDSCAPE SCALING USING STANDARD SURVEYING DATA
AN IMPLEMENTATION USING THE BBC MODEL 'B' MICRO

by

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ABSTRACT

This paper describes a project that was undertaken with three aims in mind. Firstly to illustrate that valuable working results could be obtained from a microcomputer; secondly that it could be incorporated into the existing departmental system (i.e. no extra work, no disruptions, no special preparation of data); and thirdly to show how this could be brought about by adequate error-trapping, and by attempting to program in a 'user friendly' fashion, aimed at enabling the completely 'computer naive' user to produce valuable results straight away. The author feels that this is a necessity if the use of the computer in archaeology is to spread.

PAPER

When a software house develops and markets a program a large and complex process is undertaken involving a great deal of time, effort and, especially, money. Understandably then, when they do this it is with a view towards high sales figures and healthy profit, achieved by the program being either useful to many or popular with many. Regrettably, as the market for specialised archaeologically-biased programs is so small, it is not going to be economic for a software house to cater for such a narrow outlet. This is not only true but disheartening, as the need for specialised programs goes further than simply solving any one in-hand problem.

Programs thus have to be written by either archaeologists or archaeologists with a tame computer person, and most of the work in this area is being done at Universities. The impact of these programs, their implications and potential is heavily dampened however, as they are usually implemented on mainframe computers of immense power, and similar price, which is obviously way beyond the reach of the average unit. No matter how impressive the results or time savings or other advantages, the benefits available through the use of the computer will neither be recognised nor spread if they are not available and approachable for the average 'computer naive' archaeologist.

The effect tends to be that archaeologists are aware that someone, somewhere, can do 'X' on a computer, but that is, for them, as far as it will go. They would not pursue the matter as they cannot share the benefits as they have no access to such a machine, and cannot realistically expect to obtain one. Even the cases where a small amount of time is set aside on the local University mainframe for the archaeological unit, or where there are facilities for units to post data and get the results via the post, are not really satisfactory. These would produce obvious delays in getting the results, which offsets the point of using the computer; or would mean that only an elite could use the computer, and only at one specific time, which is not helpful if there are questions that need

to be answered at any other time.

It seems logical therefore to examine the smaller and cheaper computers, and to ascertain their potential in serious applications. The argument usually launched against these smaller machines (the 'home-' or 'micro-' computers) are the sacrifices of speed and power. It would be naive to pretend that a micro could be a drop-in replacement for a mainframe, and worse than naive to try to use a micro to perform a mainframes job. However as wave after wave of new machines hit the high streets their specifications rise in pace with their sales, and the present situation is such that it is possible to implement some of the work that has been done on mainframes onto the micros, admittedly simplified, slowed down or slightly less elegant - but still a great improvement over not using any type of machine!

The thought of installing and commissioning a computer system would give most unit directors symptoms similar to those of the Aztec Two Step - trembling, fidgeting and a passion for visiting the toilet. Buying it, getting it installed, having somebody trained, the disruption and teething problems - all would add up to being more nuisance than it was worth. However, lets paint a rosier picture. Micros are (relatively) cheap, and the only installing needed is a token carrying over the threshold, and the commissioning boils down to flicking a switch. It is the software available that dictates how much anyone in the department needs to know about computing. If there were a supply of prompted, specialist, user friendly and error-trapped programs that they could load and use with no previous knowledge of computing, the need for any training is diminished. As time went by, and familiarity with the machine grew and the Frankenstein Complex wore off, people would attempt their own programs or modify other programs, to tailor them to more exactly fit their needs. What is needed is software in this mould, to get things started. If the same day the computer were sat upon the bench in the department it were producing results without disruption, this should sedate even the most agitated Aztec - and it could be possible. This is what I attempted to illustrate, and to emphasise the point that we need to write our own software, as we won't be catered for by others, and to tie this in with the point that users would soon wish to tailor a program to their own needs, I wrote the program using only the manuals supplied with the hardware, no other source of information was used, either for the programming or for the surveying. Hopefully this leaves the workings of the program open enough to be readily understood by others.

The choice of the program and the computer to use went hand in hand - both were ideal for the purpose. I wanted to show the potential of a small computer, and to attract attention to the project in general. To do this I wanted to use a graphics program, the glamorous face of computing, so I chose the surveying program as being not only pretty but functional, and the BBC computer as an easy computer to program with good graphics. A computer must be looked at not only in terms of what it can do, but also in terms of how easy it is to get it to do it. It might be possible to regulate the orbit of the Earth with your ZX81, but it might also require you to have a brain like Lex Luther to get it to do it. The BASIC on the BBC is extremely easy to use, the named procedures which can be called by name anywhere in the program, even by other procedures or by themselves, are a good example of the sophistication of the machine. When a new section of program needs to be written it can be appended to the existing program listing no matter when it should run in execution, as all that needs to be done is insert a line at the right place, calling the procedure. This means that the

programmer need not worry about which routine is at which line number, and that they do not need to be changed every time a modification is carried out. Further, parameters can be passed in the procedure calls, so that elegantly written programs can be quite compact, increasing free memeory space and execution speed. There is also (for purists) a renumber command. Development of software is thus practically curse-free. The program was not written to be the be all and end all of programs of this type, but to back up my argument, however in its relatively simple present state it is functional and fairly powerful, and certainly easy and chaos free to use. This fits in nicely with my Great Plan, as another reason for choosing surveying as the theme of the program was that I thought the sudden transition for the unsuspecting archaeologist from carefree troweller to micro-chip maniac would be somewhat ameliorated by the fact that the central concept of the program was something they were familiar with, and the whole process was visual and so easy to follow. It would spoil things therefore if it was anything but chaos free.

The choice of the BBC led me to think further along the lines of the spread of smaller computers in archaeological units. As it is the recommended education machine, if a graduate or school leaver had familiarity with a machine, the chances are that it would be the BBC machine. The price means that most units could afford at least one. If this was the case, as it takes only seconds to copy a program from one disc to another, and as devices that allow data transference down telephone lines (modems) can be obtained for about forty pounds, a network of co-operating units could be instigated. With a newsletter keeping them in touch about newly written or modified programs, all that a member would have to do is make a phone call to the number in the letter, and get a copy of the program straight away, as well as advice. If the software were written to be user friendly then any unit that bought a BBC machine could have access to a bank of software and feedback straight away, and start to make the machine work as soon as it was obtained. Even units without a modem could write to each other and mail discs back and forth. This would mean that all units would be lifted to the same 'level' of computing sophistication, and almost instantly profit from this, without buying or developing software, until they were ready to. If any machine fits the bill here it is the BBC computer with a host of add-ons available such as modems, PRESTEL and TELETEXT and TELESOFTWARE adaptors flooding the market. Unfortunately, (and perhaps, regarding the above, surprisingly) I do not get a commission.

The program allows the user to enter the heights from a survey of up to 500 heights into the computer, which can then be scaled in the vertical plane to accentuate and enhance subtle trends of the land. The survey is saved to disc automatically, and can be recalled on later operations of the program. Surveys larger than 500 points can be entered as portions of the whole site. There is provision for a printout of the entered heights, or the landscape at any scaling to be obtained. The heights once on the disc can be editted at will, without the need to re-enter them all.

The program auto-loads, and gives a few screens of introduction and instructions, designed to familiarise the user with pressing buttons associated with options offered. The main program is accessed when the user is ready, and they are then asked if they wish to re-call a site or create a new one. If they choose the former the sites on the disc are displayed and the user prompted to choose one. This is error-trapped as there are two files created for each site, one which contains the details of the site such as

lengths of the sides of the surveyed area, and the resolution of the survey (i.e. the gap between measurements, every meter, every five meters et cetera) which is listed under the survey site name; and another which contains the actual heights and is listed under DX and then as much of the site name as possible without the filename being over seven letters long. If the wrong file is picked (the DX- one) the user is prompted to try again. Misspelling is also accounted for, as is trying to load a program that is not a site. When an acceptable site is chosen the screen displays it at low magnification, and a menu is presented atop the screen offering various degrees of magnification. These are obtained by pressing the orange function key (f0 to f9) defined to give the desired magnification. There are eight set magnifications and one key which prompts for the users own magnification value, giving a compromise between ease of use and flexibility. The COPY key sends the current screen display to the printer. The last function key lists the entered heights and site details (to screen or to screen and printer, as desired) and allows the user to edit any heights incorrectly entered. Again the whole operation is error-trapped. The BREAK key re-RUNs the program after closing and locking all files. The horizontal cursor keys allow the rotation of the site (only in steps of 180°, effectively giving a view from either side of the landscape). To comply with my specification the program had to allow the heights to be entered with no doctoring, so it had to contend with the fact that some surveys are conducted in a fashion that a high reading equates with a high feature, and that some are the opposite of this. If the program could only draw in one of these modes, some of landscapes would be drawn inside-out. The change between the two is made by pressing a vertical cursor key and re-scaling. This is also useful in such instances where it is desirable to see the route the bottom of a ditch takes, and this can be easily obtained by inverting the landscape (effectively making the ditch into a ridge) and then scaling away.

If the user decides to create a new site he is asked for a site name, when an acceptable one is entered the side lengths are asked for. These are checked to make sure the long side is actually longer than the short side, or that they are the same if the site is square. The step size between measurement is then entered, again checked to make sure they are not, say, longer than the actual side lengths, and then all the details entered are displayed with the option to change them if they are incorrect, or if there were over 500 points. If they are correct the program draws the grid the survey used and informs the user of the number of heights recorded. Prompted by co-ordinates, and informed of how many heights have been entered (continually updated) the heights are entered. This is tedious but mistakes can be editted out, so the boredom factor is catered for. Then the information is stored on disc automatically in the two files mentioned earlier. If there is already a site with that name on the disc to prevent over-writing the site name of the new site is changed and the user informed of this. If the disc is full or protected to inhibit writing to it, the user is prompted for a new disc, and the site is then stored on that. The site is still in the computer and can be manipulated as before, and can be re-called at any later date.

The program is a powerful tool and represents a method of interpreting the site akin to aerial photography at a fraction of the cost, with the advantages that the site can be scaled to enhance or reveal the more hidden details, possibly (it is to be hoped), correlations that might otherwise have been missed. It can also be used for such things as giving a three dimensional representation of

distributions of bones or artefacts, if the count for, say, bones was entered for each square of the survey, and the data treated as a landscape. The total number of bones could then be looked at in relation to the breakdown of bone types, with a landscape for each bone type, and all of them related back to the landscape of the site itself and its features and topography. Pottery could be treated in the same way, with counts and weights being entered and compared.

When scaling the landscape no ratio is given for the landscape to real life, the enhanced trends are simply followed up and down through the magnifications until they are spotted, and then they are sited on the grid, using the annotated scale along the sides of the survey. This pin points the feature, without having to know what the scaling ratio was. I am no mathematician, and if the system works without extra work load for no real benefit, I am happy to leave it be.

Diagrams 1, 2 and 3 show a section of a barrow at various magnifications, and diagrams 4 and 5 show the effects of inverting and rotating a landscape.

The program, as stated before, was not written to be the ultimate program of this type, and there are modifications that would enhance its operation, but they are such things as hidden line removal, the ability to handle larger sites, and real rotation, not improvements to the ease of use, friendliness, and speed with which real production can be achieved after introducing a newcomer to it, and this is the crux of the matter. Hopefully it can be seen from this simple program that real benefits are within reach for almost any unit, and that whilst marvelous work is being carried out on the mainframes, a clear and exciting way ahead for computers (and one that could be both rapid and far reaching) lies in the smaller machines in the smaller units.

If anyone would like a copy of the program, to run on a BBC model B with a single disc drive, compatible with a STAR DP8480 printer they only have to mail me a single sided, single density floppy disc and I will gladly give them a copy. I would like to hear from anyone with further ideas, questions or fire-arrow criticisms.

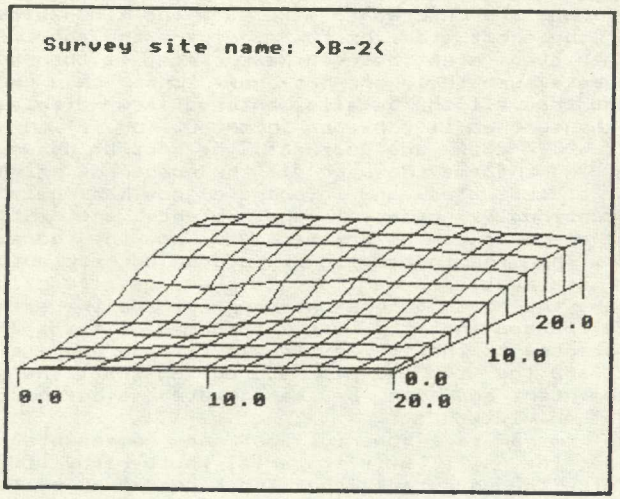

Diagram 1.

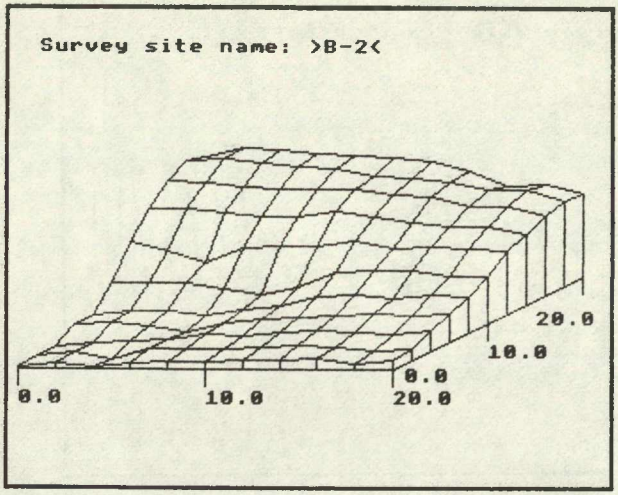

Diagram 2.

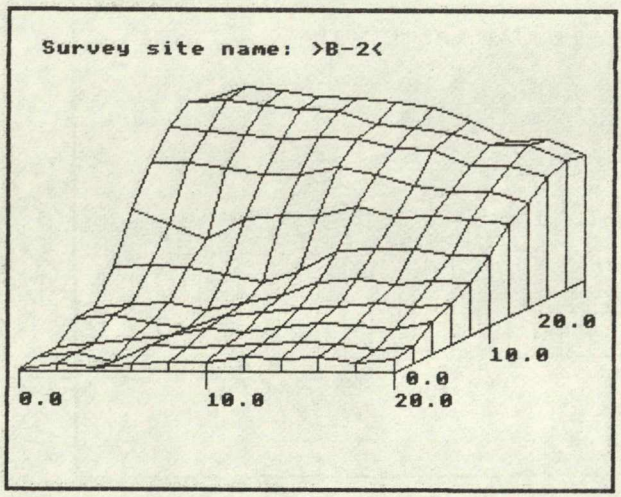

Diagram 3.

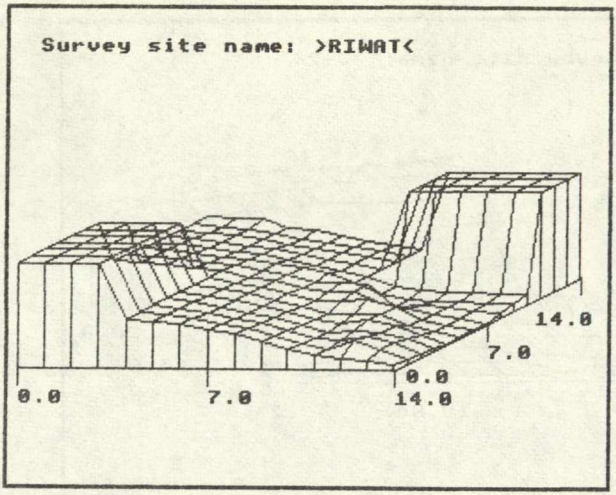

Diagram 4.

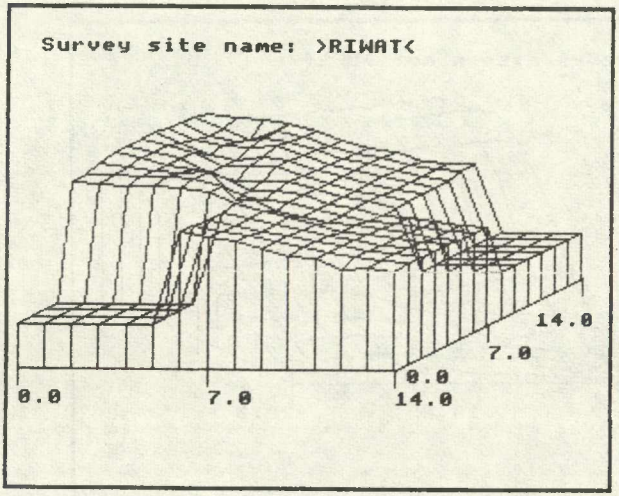

Diagram 5.

ACKNOWLEDGEMENTS

The only source of reference used in the development of the program has been the manual supplied with the machine: THE BBC MICROCOMPUTER USER GUIDE, Coll, J. published by the British Broadcasting Corporation 1982. The diagrams are presented through the kind permission of the site directors, Dr. Patricia Phillips and Dr. Robin Dennell. My admiration goes out to those few who lived with the program and myself in the early days and without whose cajolery disguised as encouragement I might have settled for less. These include the Rowdy Trowel, Erdol and the Sheriff.