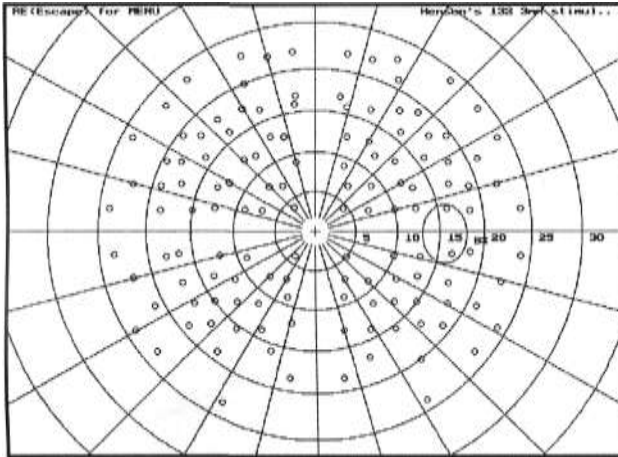# THE UMIST EYE SYSTEM IN PRACTICE

**Trevor Hopkins and Sally French-Teeling**[1]

Sample fields stimulus configuration set up by user

Two earlier articles made claims for an important future role for the PC Compatible in practice with particular reference to the **UMIST Eye System.** Although some of the routines have been used in embryo in UMIST in teaching since 1986 and in a hospital Orthoptics department back in 1987, it is only since 1990 that they have been used in practice.

### An Optometrist's View

I first saw the **UMIST Eye System** on one Wednesday lunchtime whilst at the Department of Optometry and Vision Sciences where I help to supervise one of the teaching clinics. I had heard about it before but never seen it in action. I was impressed, to the point where I decided to buy my first computer to try the system in my own practice, and see how it compared to the projection chart that I was using at the time.

Initially this required some re-arranging of the consulting room to accommodate the computer alongside the projector since I was not going to burn all my boats and jettison this. I had visions of what would happen on a busy day, with a book-full of appointments and a computer failure early in the morning!

I duly received the floppy disc containing the programme along with instructions for loading it onto my hard disc. This seemed idiot-proof and installation went smoothly. I tried it out on one of my staff, and found that it was simple to operate provided that I did my homework and memorised a few sequences of key operations. Reading the menu screen during an examination would be rather time consuming, and in the case of a real live patient might not be conducive to patient confidence in the practitioner ("He had to keep reading the instructions while he was testing my eyes!!!").

The first thing that I found was that when changing a line of letters to either a lower or higher acuity there was a "beep" from the computer. It seems that like all other writers of computer software Chris could not resist the lure of

the computer game, and had added sound effects. As we all know, the space invaders are not considered to be truly zapped unless the zapping is accompanied by beeps, whistles, howls and roars etc. This of course means that software writers have spent much of their formative years in establishments of dubious report. I therefore quickly learned how to turn the sound off, and tranquillity was restored.

So how does the system perform, and what do I think of it? Well shall we say that if I have to work in a consulting room that has either a standard test chart or a chart projector, I don't like it! I sit there wishing for my beloved computer system. For one thing it is so versatile it is scarcely believable.

During my standard examination routine I take the visions by displaying only one line of letters at a time. One can display multiple lines but over the years I have found so many patients insist on starting at the top of a Snellen chart and reading all the letters no matter what instructions they receive that only showing one line at a time saves a lot of confusion. Also it has the advantage that patient memory can be overcome. For example, if the patient can read 6/9 pt with the right eye, then by changing to the left eye and displaying for instance a 6/12 line, the letters in the line will be in a different configuration to the 6/12 line presented to the right eye, and if they can read that line with no problem, and the line
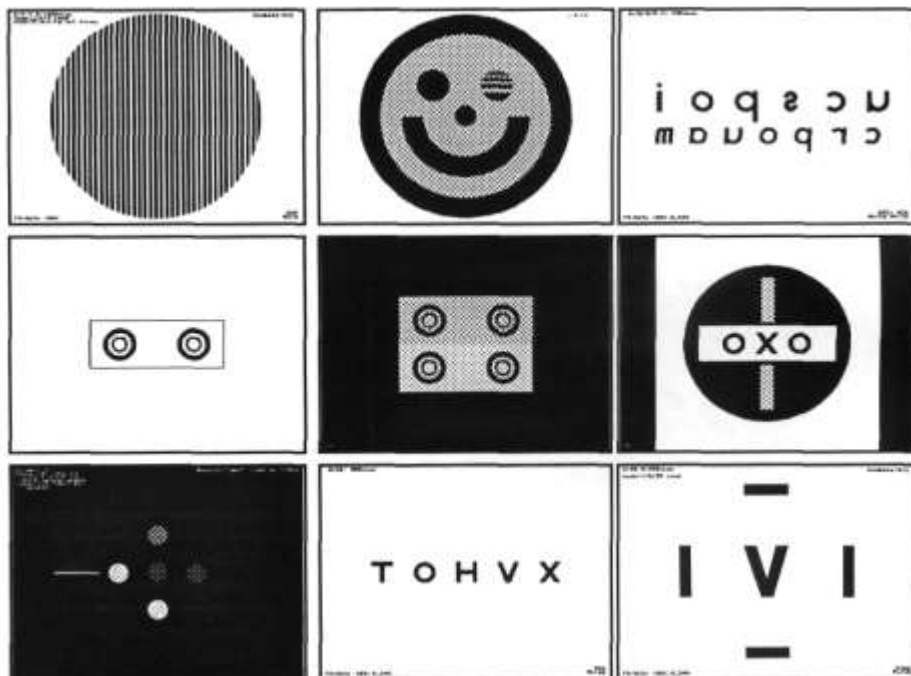
is changed to 6/9 then the new 6/9 line will be different from the previous one. Thus the patient does not have the chance to memorise any line of letters, and thus accurate visions and acuities can be obtained.

Following visions I perform retinoscopy using either the duochrome as a target, or in the case of young children one of the special moving displays available. I find most kids like the random coloured shapes that can be displayed. During subjective examination the system performs like a standard test chart, though as I have mentioned I only use a single line of letters at one time. One problem that arose during the early days was the lack of a good spot light in the system.

Apparently Chris French had tried this but was never able to get a bright enough spot to produce a visible streak using a standard Maddox Rod. However, I found that if I used a white rod, instead of the usual red one, and darkened the consulting room sufficiently, then the patients had no problems. And since I use the rotary prism in the refractor head to measure the revealed phoria all I needed was my pen torch to illuminate the scale of the prism. I have not found any problems in this area. I do have to admit however that fixation disparity by means of chromatic dissociation is perhaps not as good as that using polarisation.

There are also several features that can be used in this system that are certainly not available on any standard test chart or chart projector that I know of. The most impressive of these is the ability to vary the contrast of the targets, and thus use a form of contrast sensitivity as a routine procedure. There are two ways of doing this. It is possible to select from the menu the contrast option which allows the practitioner to set the contrast level of the targets to a selected value above the background illumination. This then means that the target letters or symbols will be presented to the patient at this contrast level, and it is possible to present a 6/60 letter at a contrast level that makes it only just about discernible to an emmetrope.

One quick method that I have used is to set a nominal contrast of about 10 per cent and present a 6/6 line of letters. I have found that a young emmetrope or a young corrected ametrope will be able to read this reasonably easily. However, an older person, who has good vision either with or without correction will find this difficult or even not possible. They may have to go up to about 6/9 or 6/12 before they can read letters at this low contrast level. Patients with media opacities find it even harder and I have had patients of this type who have only been able to read 6/18 or 6/24 under these conditions, even though under normal illumination and contrast they could get 6/9 or even 6/6.

It does help the practitioner to realise how patients who have what appears to be good visual acuity can really struggle under conditions of reduced visibility such as light mist etc or patients who have what appear to be very small opacities can have real problems due to reduced contrast from light scatter in their eyes.

A second way to measure visual performance under low contrast is to select the 'Single symbol with contrast' option from the menu. With this the patient is presented with one letter at a time. The size of this letter can be selected by the practitioner by using the Up or Down arrow keys on the keyboard. When a size of letter that is required is obtained the patient is asked to read it. If their answer is correct the practitioner presses the Enter key on the keyboard. The computer then presents another letter of the same size but at a slightly reduced contrast. If this is read correctly the procedure is repeated until an incorrect answer is given. When that happens the practitioner presses the Space Bar. The computer then presents a series of letters of the same size but at a slightly higher contrast. It will

2

then present a series of letters of the same size at this new contrast level. If all the answers are correct it will present a new series at the same size but at a lower contrast.

In other words the computer is automatically using a staircase method to obtain a threshold value of contrast sensitivity, that threshold regarded as having been reached when in a series of letters at a given contrast presented to a patient, half the answers were correct and the other half wrong.

It can be time consuming but for anyone interested in a bit of in-practice research it may well be a very useful tool. For greater precision, it is possible to use square-wave gratings. I realise that these are not considered as good as sine wave gratings but they are a lot better than nothing. The main problem here is that for gratings of high spatial frequency, the computer has to do a lot of work to produce the display, so an older computer like mine with only a 286 chip can take several seconds to produce each new screen display of such a grating. This just adds to the time taken in such a procedure.

There is also a colour vision test based on the City test, itself based upon the Farnsworth D15. This can be used at distance if required because it is possible to vary the size of the coloured discs. I found it useful as a quick screening test for people who are worried about a possible colour defect which might preclude them from future employment. (This of course pre-supposes that they are in the fortunate position of having found the possibility of future employment. It would appear that normal colour vision is not required to draw the dole!!!) The one thing I have not been able to do yet is to compare the results of the test with the results obtained on a standard City test. My feeling is, however, that it would compare favourably.

The one part of the programme that is really exciting and that I have not yet had a chance to get

into is the field screening section. There are several options to choose from. It is possible to set up a display of stimuli situated anywhere in the central field. The default number of stimuli is 60 but these can be either increased or decreased to suit the practitioner's requirement. Their position can also be varied by the practitioner. Thus they can be spread out over the whole area to be covered, or they can for instance be packed in closely around the macular. Perhaps, however, one may wish to investigate the region around the disc. They can all be moved to cover this area. Or then again they can be placed in the upper field, if one suspects a possible glaucotamous defect developing.

The choice is almost unlimited. It is possible to alter the level of intensity of both the background and the stimuli, so that supra-thresholding techniques are easily possible. The stimuli can be presented singly or in groups of up to five at one time. The one reason that I have not as yet done much in this area is that to do it with patients as routine is going to require a video splitter and a second VDU of perhaps a larger size than my present 14 inch model. This would then stand on a separate table on which was also fixed a head rest.

Two points worthy of mention are firstly it is possible to select the eye to screen distance from the Visual Fields Menu. The computer will then alter everything to match this distance. Secondly, there is also the facility to dump all field data to a printer so that a permanent hard copy of the results can be obtained. And of course all data can also be saved to disk.

I have been using the UMIST system now for getting on for two years and am now on my fifth version. Over this time I have been in close touch with its designer, Chris French, and have suggested possible changes based on my experience with it in day to day optometric practice. The point has now been reached when I feel

I could recommend it to other practitioners. However, this is just the beginning of the story. Computer technology is moving ahead at an incredible rate. I feel it is just the first generation of computer systems for clinical optometry. Who can guess what the future will bring?

There has, however, been one disappointment with the system. When I first started using it I expected a lot of "Oohs" and "Ahs" from patients. Their reaction? "Oh I see you are computerised now. Everything seems to be computerized these days. Have you got any good games on it yet?" How quickly the miraculous becomes mundane!

**A Computer-Phobe's View**
My first contact with computers was as a student in the 70s. Taught by an unsympathetic lecturer (my future husband) it was then that I realised I was a computer-phobe. A few years ago with the 90s almost upon us I felt the need to confront my fears if only to produce figures for the accountant, word-process letters for GPs and Bank Managers, and address those myriad features of everyday life that force themselves upon a working mother in practice.

I was aghast to find that the PC made me itch and brought my face out in spots! My husband's cavalier diagnosis that this was just the hysterical response of a neurotic extrovert trying to avoid modern technology proved inaccurate. I solved the problem by buying an expensive, £100 VDU filter with an earth lead and found I could now face the monitor in reasonable comfort although even today lengthy word-processing sessions with my face in close proximity to the screen can lead to irritation.

Naturally, when my husband asked me to act as a guinea pig and try out "French Letters" (father of the present **UMIST Eye System**) I was less than enthusiastic. Being a computer-

widow as well as computer-phobe had reinforced my negative view! Despite this, I decided to have a go. I already had a conventional test chart and chart projection systems.

Even if I wasn't enthusiastic over the invasion of my consulting room by these alien machines my patients proved to be very interested and impressed.

Like Trevor I have been able to influence the system's design - for example, eliminating some dreadful, illegible dark-blue menu screens that Chris fancied.

I see quite a high proportion of young patients and having "Sm-eye-ly face" to catch their attention has proved very effective. As he flashes different colours and winks at them, he also makes various "computer game" noises which holds their attention, although at first it did nothing for the optometrist's concentration while carrying out retinoscopy. The facility for producing lower case letters has also been very useful with our younger patients.

The ability to generate random letters also helps to increase the accuracy of the VA records, by eradicating the problem of patients memorising the letter sequences.

Initially I had problems with the spot light brightness as I could not get an adequate Maddox Rod image, especially with the older patients. However, by darkening my room sufficiently I have since found no problems with the standard, red Maddox Rod. (I am told that colour monitors vary in brightness.)

I use the system with two monitors, one for the patient viewed through a mirror, and one for myself so I am not peering at the patient monitor to read the menus. However, with usage one quickly memorises the key sequences to generate duochromes, cross-cyl targets etc. I also find the two monitor arrangement particularly convenient because I can then easily use my PC for pricing, printing up reminders and maintaining patient records.

Despite my prejudices against the system initially I have been converted and now find it a very useful and invaluable tool in my consulting room giving it much better versatility than my chart projector.

Like Trevor's my computer is an 80286 AT and just over three years old. It is a slower model than his and I feel I now need a faster machine. This would also enable me to take proper advantage of the more revolutionary features of the system which have recently been added. I am told this means a modern 486 with perhaps a third monitor.

### Future Prognosis

I wouldn't say that my aversion to computers is completely eradicated but my confidence continues to grow. Successful computer interaction is undoubtedly therapeutic as one progresses from the simplest system features to the more advanced. I found it best not to try to run before I could walk but to progress gradually. (In psychologist's jargon I am told this conforms to the "systematic desensitisation" paradigm!) I certainly find I am more relaxed these days towards the cables, printers and other computer-paraphernalia that litter the children's rooms at home. Perhaps I am ready for the next stage at work!

### Availability

The **UMIST Eye System** is available from UMIST. Full details may be obtained by writing to "UMIST Eye System, Optometry & Vision Sciences, UMIST, PO Box 88, Manchester, M60 1QD." It is not available for use in the USA.