New Aids for the Blind and Deaf-Blind

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The general public tends to assume that blind people are those without sight. However about 85% of the registered blind in the UK have some useful vision. The usefulness of residual vision depends on more than the visual acuity; for instance the field of vision is very important (see Figs 1, 2 & 3). There are over 120,000 registered blind and about another 80,000 whose vision is such that they could be registered. About 80% of the blind are over sixty years old.

(insert Figures 1, 2 & 3)

The main technological development for those with residual vision has been closed-circuit television reading aids. These devices usually provide variable magnification, enhanced contrast and image reversal (white letters on a black background). The disadvantages are the cost (from £650 to £3000) and the weight of the machines (typically 25 Kg). Despite these disadvantages they have proved to be very useful aids for those whose needs have not been met by conventional optical aids.

The blind have severe problems with mobility particularly in unknown environments. The traditional aids are the guide dog and the long cane, which have about 3000 and 10,000 users in the UK. One of the problems with the long cane is that it does not provide information about obstacles at head height eg overhanging branches or lorry wing mirrors. A number of electronic aids have been developed to provide extra information to the blind pedestrian. Unfortunately most aids have been developed by engineers who have not first systematically studied the information required by a blind pedestrian, and the optimum method of displaying this information to the human.

Aids for access to written information have either audio or tactual output for users with no useful residual vision. Probably the most useful technical aid is the cassette tape

recorder. The main disadvantages are the user's inability to vary the speed, and the lack of a good indexing system. The variable speed problem will be partially solved with the increasing availability of inexpensive 'compressed speech' modules. These devices correct the pitch changes which result from increasing the speed. Blind professionals have the need for faster speeds, but many elderly blind people find the existing recordings too fast. The indexing problem is not so easily solved. What is required is an inexpensive system so that the blind user can input a number or keyword, and the machine will then automatically find the information; such systems exist but they are prohibitively expensive.

A variety of devices with speech output are now commercially available. The speech can be spelled, compiled or synthetic. Spelled speech is when the output is character by character; the advantage is the very low cost but the quality is unacceptably low for any application involving prolonged listening. With compiled speech the machine has a limited vocabulary of whole words, and then spells out words not in the vocabulary. A vocabulary of 8000 words and their plurals copes with over 90% of most texts. Synthetic speech is where the machine approximates a human speaker. The output quality is dependent on the size of the computer program. High quality synthetic speech systems are still very expensive. A reading machine with optical character recognition and synthetic speech output costs in the region of £19,000; costed over five years, it would be cheaper to employ a sighted reader. However the cost of such machines should decrease significantly over the next few years.

The best known communication medium for the blind is braille where dots are embossed on paper or plastic. Braille utilises a six dot cell giving sixty-four possible combinations. One of the disadvantages of braille is the considerable bulk which is typically twenty times that of the print version. To reduce this bulk, a number of contractions and abbreviations are used which result in 25% saving in space. There is an acute shortage of people skilled in transcribing text to contracted braille. Therefore a number of computer-based systems have been developed to translate text to contracted braille. Such systems mean that

a typist with no knowledge of braille can produce documents in both ink-print and contracted braille from a single typing operation (Fig. 4).

(insert Figure 4 here)

Computer-based systems are significantly cheaper than manual transcription for information which already exists in digital form. For instance two major banks use an automated system to produce statments of account in braille (Fig 5). Since the system is totally automated it also minimises the risk of an error in the braille version.

(insert Figure 5 here)

Braille has not been superceded by other forms of non-visual media despite numerous predictions to the contrary; braille is still supreme in its use for reference and technical material. Another important aspect is that a blind person can write braille without having to invest in expensive equipment. A number of systems have been developed for storing braille digitally on cassette or floppy disc. The braille is output on a transitory display such as an array of pins which can be raised to represent the braille characters. The decreasing cost of microprocessors has permitted the introduction of sophisticated searching and editing facilities. These devices are little used in the UK since the cheapest device still costs over £3000.

A number of devices have been developed for converting printed characters to some form of tactual output. Most of these devices do not recognise the characters but present some form of tactual display which has to be recognised by the human reader. The most widely used device is the Optacon which gives a ten-times enlarged tactual image of the letter being scanned. The advantage of this device is that it can be used on any printed or typewritten material. The disadvantages are the considerable training and practice required to reach speeds of 50 words per minute, and the cost of about £2000.

As mentioned earlier most of the registered blind have residual