MOBILITY MAPS: THE CHOICE OF SYMBOLS.

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A mobility map is one which gives sufficient information for independent pedestrian travel by a blind person. Maps can also be used for the teaching of environmental concepts and mobility skills. The map can take the form of verbal instructions, a brailled list of instructions or a tactual spatial map. The latter is often a map of a local area with the landmarks represented in an embossed notation. The translation from a visual map to a meaningful tactual one is not a trivial problem.

Maps can either be made centrally, locally by teachers and sighted volunteers or by blind people themselves. A central production system may justify a significant capital expenditure in order to obtain high quality reproduction and a relatively low unit cost when the cost of labour is taken into account (2). In Britain most mobility maps are made by local volunteers or teachers using various techniques which usually involve the vacuum-forming of plastic sheets. The most common methods for producing the master are:

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(i) A sheet of metal foil is manually embossed with a spurred wheel. Textures can be produced by gluing sandpaper to the upper surface of the foil (8).
(ii) A master is built up on transparent cellulose. Various thicknesses of string are used for line symbols; sandpapers, linoleum and fabrics are used for textures (6).
(iii) An improved version of the last method is to use rolled solder instead of string. Solder wire can be rolled to give a triangular cross-section which produces a good definition line (6).

The map designer has to decide on the type of information to show on the map. He also has to identify useful non-visual cues, such as gradient. In addition, where there is high information density, one form of representation may be superior to another. For example, in a street map the designer has to decide whether to use one line or two lines to represent a road; both systems are in common use and have advantages in specific cases but, in general, single line representation seems to be preferred where there is high information density.

The information has to be represented on the map with embossed symbols. Studies have been done, by the authors and others, to find sets of symbols which can be easily distinguished by touch (3,4). Ten line and 13 point symbols were found to be discriminable; the subjects included blind schoolchildren, adult braille readers and adult non-braille readers.

At a recent conference on mobility maps (1), it was suggested that the following features would require specific symbols on a mobility map:

(i) road
(ii) footpath
(iii) north edge of the map
(iv) traffic lights
(v) roundabout
(vi) bus stop
(vii) zebra crossing
(viii) steps
(ix) building
(x) entrance to building

A further study investigated the use of 14 symbols to represent environmental features used by the visually handicapped for orientation and navigation (5). These symbols were based on those in current use in Britain and the U.S.A. An experiment was conducted to discover how easily the chosen symbols could be associated with their meanings and how well the associations could be retained in the memory over a period of time. It was found that the subjects could locate and identify most of these symbols in the context of the map.

The designer of a tactual map has an additional degree of freedom since height variations offer an extra coding dimension. In the last experiment (5) multi-height symbols were used for steps (see Figure 2) and these symbols (steps up, steps down) were found to be the easiest to remember of the 14 symbols. A line, saw-tooth in cross-section, can be used to indicate direction since it will feel smooth in one direction and rough in the other (7). This line has the advantage that information about direction is contained along its whole length and the blind user is not required to learn the conventional visual arrow.

This type of line can be made by the metal foil and rolled solder methods. It has been suggested that a directional line could be useful for indicating gradient (5).

The set of symbols shown in Figures 1 and 2 is being used currently on mobility maps. The symbols have been adopted following extensive evaluation and appear to satisfy the two criteria considered most important for this application. First, they are readily discriminable by touch, and second the meaning of each symbol is readily learnt and relatively easily memorised over a significant time interval.

Should other mobility map-makers wish to assess these recommended symbols, the authors will be pleased to assist in the implementation. It is hoped that this type of continuing study will lead to an agreed set of standard symbols for mobility maps in the not too distant future.

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Feature	Elevation mm	Double-line symbol	Single-line symbol
Road	0.8		
Dual carriageway	0.8		
Footpath	0.8		
Railway	0.8		
North edge	0.8		
Roundabout	1.2		
Traffic lights	1.2		
Zebra crossing	1.2		
Signal-controlled crossing	1.2		
Footbridge	1.2		
Subway	0.6		
Good crossing point	0.6		
Bus stop	1.2		

Fig. 1 Symbols for mobility maps