TACTILE PAVING SITE SELECTION CRITERIA

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ABSTRACT

SURFACE Inclusive Design Research Centre at the University of Salford is currently conducting an EPSRC funded research, - I'DGO TOO (Inclusive Design for Getting Outdoors). The project is concerned with tactile paving whether it is inclusive as an indicator of access hazards for visually impaired people and other vulnerable population groups (e.g. older people). After an extensive literature review and pilot studies, research methodology of the project was established in the form of a model that calls for full characterization of the pedestrian, access hazards and any other contextual issues that affect performance of the pedestrian. This paper reports on the rigorous methodology that has been adopted to develop site selection and benchmarking criteria (both microscopic and macroscopic) for characterization of the pedestrian and access hazard environment. The process included reviewing databases and literature leading to selection of 54 short case study sites (rural and urban) across UK. These sites were will be observed and recorded over a period of 12 hours and benchmarked. 18 longitudinal study sites will be selected from the 54 sites and observed and recorded for a two year period (at different times of days, different days of week and in different seasons). The resulting data will be analysed to critically evaluate existing pedestrian environments and access hazards in terms of their design, execution and outcome. A series of site selection and benchmarking criteria that may be adopted for studies of a similar nature are given.

KEYWORDS: access hazards, benchmarking criteria, inclusive design, tactile paving.

INTRODUCTION

SURFACE Inclusive Design Research Centre at the University of Salford is currently conducting an EPSRC funded collaborative research - I'DGO TOO (Inclusive Design for Getting Outdoors) (I'DGO, 2007). The overall aim of the I'DGO Consortium is to addresses the demands, consequences and impacts of new policies and design strategies on older people's environments, and make specific recommendations to make them inclusive; thereby improving quality of life for older people, in such a way that it will become general practice in the years to come. SURFACE is currently investigating the use of tactile paving at road crossings and external steps. Tactile paving is used as an indicator of access hazards for vision impaired people. After an extensive literature review and pilot studies, the research methodology of the project was established in the form of a model that calls for full characterization of the pedestrian environment and access hazards and any other contextual issues that affect performance of pedestrians.

This paper reports on the methodology that has been adopted to develop site selection and benchmarking criteria (both microscopic and macroscopic) for characterization of the pedestrian and access hazard environment. The process included reviewing of Transport Research Laboratory (TRL) database, Local Transport Note (LTN) 1/95 and 2/95, which led to selection of 54 short case study sites (rural and urban) across UK. These short case study sites will be observed and recorded over a period of 12 hours and benchmarked. 18 longitudinal study sites will be selected from the 54 bench marked sites (1 in 3), observed and recorded for a two-year period (at different times of days, different days of week and in

different seasons). Collected data will be analysed critically to evaluate existing pedestrian environment and access hazards in terms of their design, execution and outcome.

TACTILE PAVING

Tactile paving provides a warning system for vision impaired people to aid their independent mobility in external environments. Since its introduction in the UK in the early 1990's tactile paving has become a key design feature in improving the accessibility of various public spaces. The advent of the Disability Discrimination Act (1995, 2005), with its requirements for inclusive design and equality of access to services, has increased the rate of installation of tactile paving. Tactile indicators are primarily intended for vision impaired people, but may be less suitable for older people where they are a potential trip hazard (Loo-Morrey 2005). Design, siting and laying criteria of tactile paving is currently embodied in various guidelines (DfT, 1998; 1995a & 1995b; LTNZ 2004), and these represent various benchmarks for pedestrian crossing design and construction. As various local authorities around the UK may interpret the benchmarks differently, there could be differences between various sites in each local area that need to be taken into account.

The research objectives are:

- To examine how blister and corduroy paving is designed, sited and laid;
- To examine older people's perceptions and approach in using tactile paving;
- To quantify the relationship between tactile paving design parameters, the biomechanics of ambulation and the risk of falling.

Whilst the objectives are relatively straightforward the factors that determine the risk of falling and the manner in which pedestrians tackle stairs and pedestrian crossings are quite complex. There has not been any study that integrates the process of pedestrian navigation through a pedestrian crossing, or stair, in the form of a model logically linking various acts and decisions involved (Maclennan, 2007). Both pedestrian crossings and stairs are seen as a hazard, which is confirmed by literatures (DfT, 1998; 2007a & 2007b; LTNZ 2004; Abbas 2008). The researchers, therefore, have decided to adapt an experiential prototyping approach: conducting a pilot study as part of the research methodology; developing a research toolkit; and a pedestrian crossing cognitive model (Figure 1). This approach will provide more cohesion in terms of focus between method and the objectives.

DESIGN CRITERIA

The design criteria comprise two classes of indicators - macroscopic and microscopic. The macroscopic indicators place the study areas in context, whilst the microscopic indicators capture the setting and physical characteristics of each site (pedestrian crossing/stair) within each study area. The selection criteria represent:

- A benchmark, i.e. examples or a range of sites that demonstrate a range of physical design characteristics that may, or may not, enhance pedestrian safety;
- Assessment, or rating scales, and / or factors;
- The picture throughout UK comprising urban and rural planning schemes that have tied to them pedestrian, traffic and other information.

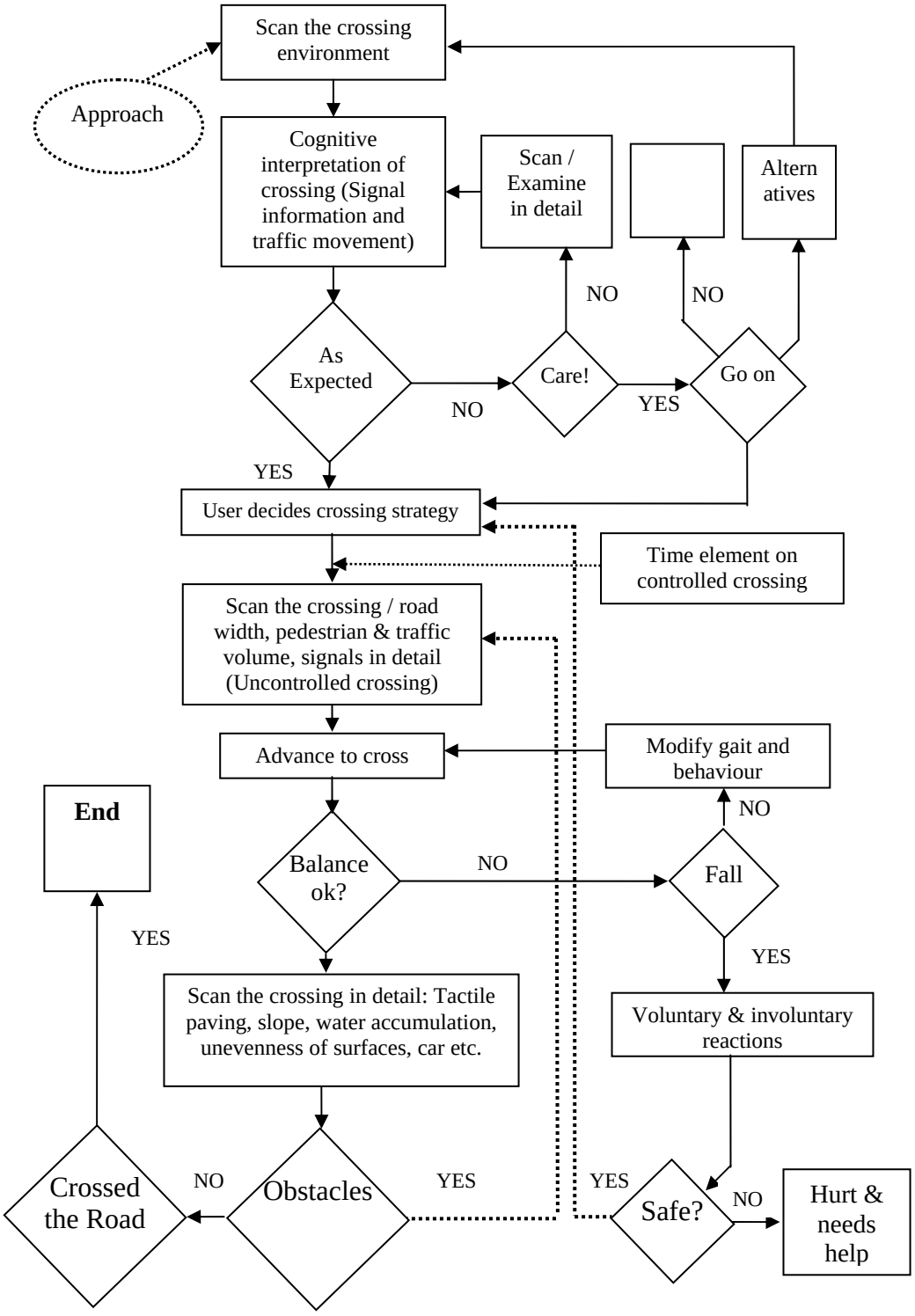

Figure 1. Pedestrian crossing cognitive model (Faruk. M, 2008)

AVAILABLE INFORMATION

The sample site selection criteria align with the TRL Database Criteria and Framework'. It allows the outline of a sample to be formed with appropriate macroscopic/microscopic mix.

The TRL Database is taken as being representative as it is based on 1106 Urban and 1203 Rural Planning Schemes.

The 2001 Census contains (Population Census UK, 2001) demographic details such as population density, which lines up with the even distribution of schemes. Within each main urban district such as London or Manchester there are areas that could be classified as Rural (i.e. below 15 persons per hectare) whilst others would be more Urban (i.e. greater than 20 persons per hectare). It is argued that the denser the area (coupled with land use) the greater would be the number of pedestrians and vehicles and therefore potential conflicts. As macroscopic criteria can be aligned with census, locations and planning schemes, a simplified list of macroscopic factors are:

- Demographics;
- Land Use;
- Urban planning form;
- Geographical location;
- Topography.

Table 1. Population density (Per Hectare)

	Southern Region		**Central Region**		**Northern Region**	
High Density	Euston Westminster	100 50				
Medium Density	Brighton	65.0	Liverpool	43.84	Tyneside	41.0
	East Bourne	45.0	Birmingham	43.55	Edinburgh	37.65
	Oxford	45.0	York	43.0	Dundee	33.45
	Reading		Leeds	40.0	Aberdeen	32.3
	Southampton	41.8	Sheffield	39.0	Glasgow	31.71
	Hastings	39.7	Manchester	38.4		
Low Density	Cheam	20.0	Kirk Thorpe	14.33	Inverness	20.56
					Aviemore	4.5

Demographics, land use and location combine well (Table 1). These are also influenced by topography categorized as Extreme (Edinburgh); Mixture (Leeds / Manchester / Inverness) and Even (London). The design of the sample therefore needs to provide a reasonable distribution between the ranges of each factor described. This distribution can be applied across the entire sample. Demographics and land use therefore represent two of the obvious macroscopic criteria. An examination of the Census reveals that the population density of urban areas in England varies from about 30 - 50 persons per hectare and from 15 - 40 persons per hectare in Scotland.

One can argue that the urban demographics of the UK are almost homogeneous except for parts of the South. The Central region varies from the 15 - 46 (persons per hectare) whilst the North including Scotland varies from 4.5 – 41 (persons per hectare). To determine whether population density, geographical location and land use will be significant in terms of variations in the microscopic data then the following areas as highlighted in the table would be suitable for the study:

South/Density: 50-100: Sites in London would comprise three areas such as Euston (Camden), Westminster representing mid range density and outlying suburb of Cheam as Urban/ Rural. The sites also represent all land use types. Planning layout and building forms are mixed because of the age, higher density of population with predominantly diversified ethnic communities compared with Central and Northern Regions.

Central / Density: 39–49: Leeds and Manchester / Salford comprising the Central Business District (CBD) areas that are formed by the central pedestrian precincts bounded by access roads for pedestrian drop off by public transport, or private vehicles. Other town centres with more residential land use has also been included within the study. This district also includes the village of Kirk Thorpe, which is more rural in character with a true village centre.

North / Density: 20-38: Edinburgh and Inverness, comprising CBD areas that are consolidated along the main vehicular access roads, some of which are restricted to private vehicles during shopping and business hours. The planning form of the city is a network with various accessible areas situated along the main roads of the network. Aviemore is included as a true rural area, within reach of Inverness on one of the main access roads, but a village containing a significant retirement community.

Low Density / Rural: As the Planning Scheme distribution is relatively even for each region, other than London the Rural Areas are defined as those where the population density is 20 persons per hectare or less. The Rural Areas therefore relate proportionately to the overall urban population rate for each region.

Associated with each of the sites above, we have obtained information on the following factors from the TRL database and interviews with the Local Authority Transport Engineers on an overall local planning scheme basis: vehicular flow; pedestrian flow; and pedestrian accidents per annum. These factors can also be broken down into microscopic form which is site specific and can be used to benchmark sites and the selection of the final 18 sites.

SITE SPECIFIC FACTORS

The microscopic factors are seen as being site specific. The factors are represented in LTN 1/95 and 2/95 (DfT, 1995a; 1995b). Each one of these factors may not be present at every site, so the same approach as that used with the macroscopic factors is required, but this time on a site to site basis. It is essential therefore that all the microscopic criteria are covered across each region in turn.

The framework of the research in relation to the actual sites requires short case studies of 54 sites distributed over the three regions. 18 longitudinal studies selected from the 54 (1:3) being sites that are of most interest. These 18 sites will be observed and recorded for 2.5 hours interview period per site, once a month, over the 18 months. The selection of 18 significant sites will be based on a rigorous analysis of the 54 sites with distinct trends and relationships established. The aggregate of sites in each region is presented in Table 2. Each region will cover all seven types of pedestrian crossings (as defined by the Department for Transport), and the following major microscopic factors will be included:

- Refuge and extended kerb side crossing aids;
- Carriageway types;
- Carriageway junction and intersection types;
- Proximity to public transport drop off point;
- Proximity and frequency of seating;
- Signage;
- Desire Lines;
- Capacity of pavements in terms of their effective width making allowances for landscaping and street furniture;
- Pavement material, width, surface and condition;
- Lighting;
- Pedestrian Flow and Crossing Time – measured;
- Vehicle Flow – measured;
- Designed crossing interval and signal sequence timing gathered from interviews with traffic engineers.
- Tactile paving types in terms of type, contrast, condition, layout etc.
- Pedestrian Crossing physical characteristics that would include warning devices (audible/visual/tactile), width and length, ramping, paving materials, guarding, refuge islands, etc. extracted directly from LTN documents. (Each site may not contain all the features mentioned above. But these would definitely help us to select each site and also to rate them against the benchmark – whether good, bad or average.
- Condition of crossing and degree of maintenance
- Access and Mobility Code considerations
- Drainage
- Other.

Table 2. Selected sites for I'DGO TOO

Region	**Local Area**	**Population Density (per Hectare)**	**No. of Sites and Ref. Nos.**
Southern	Camden/Euston	100	6 sites i.e. 5 crossings and 1 stair.
Southern	Greenwich	50	5 sites i.e. 4 crossings and 1 stair.
Southern	Surrey	<20	3 sites
Central	Salford	35.33	4 sites i.e. 3 crossings and 1 stair.
Central	Manchester Downtown	38.4	8 sites i.e. 6 crossings and 2 stairs.
Central	Stockport	46.13	3 sites i.e. 2 crossings and 1 stair.
Central	Marple	>22.13	2 sites
Central	Leeds Downtown	40.59	5 sites i.e. 4 crossings and 1 stair.
Central	Armley (Leeds)	<40.59	2 sites
Central	Kirk Thorpe (near Wakefield Leeds)	14.33	2 sites

Northern	Edinburgh Downtown	37.65	5 sites i.e. 3 crossings and 2 stairs.
Northern	Currie – Edinburgh Local Area	<37.65	2 sites
Northern	Balerno	<37.65	2 sites
Northern	Aviemore – Highland Rural	4.5	2 sites
Northern	Inverness Downtown	20.56	3 sites i.e. 2 crossings and 1 stair.

SITE INFORMATION, CHARACTERISTICS AND ASSESSMENT SYSTEM

Each site will be measured in accordance with a site checklist and recorded electronically in AutoCAD Design Data (DWG) format with all the concerned factors being included. A complete photographic record of each site will also be kept. The ideal version of each crossing and stair type will be benchmarked from LTN 1/95, LTN 2/95 and Part M of the Building Regulations (Approved Document M, 2004). A rating system based on a combination of Pedestrian Environment Review System Version 2 (TRL 2006) and the LTNZ 1/95 Pedestrian Network Planning and Facilities Design Guide (Dept. of Land and Transport New Zealand 2007) will be used. It is intended that this rating system will be refined by a Delphi Group of Transport Engineers. Each site will then be rated in a similar manner so that they can be compared with the Benchmark, and then correlated with the results of on site interviews and/or questionnaires. The stairs will be assessed in a similar way. The rating system is in the process of being developed.

CONCLUSION

This paper has presented the methodology that has been adopted to develop site selection and benchmarking criteria (both microscopic and macroscopic) for characterization of the pedestrian environment and access hazards for I'DGO TOO. The process included reviewing of TRL database, LTN 1/95 and LTN 2/95, which eventually led to selection of 54 short case study sites (rural and urban) across UK. These sites are to be observed / recorded over a period of 12 hours and benchmarked. 18 longitudinal study sites will be selected from the 54 benchmarked sites and will be observed / recorded for a two year period (at different times of days, different days of week and in different seasons). Analysis to critically evaluate existing pedestrian and access hazard environment in terms of their design, execution and outcome will be made. The site selection and benchmarking criteria presented in this paper could be adopted for studies of similar nature.

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