STREET MOBILITY PROJECT
Other Useful Tools

COMPLEX CROSSING IN SWISS COTTAGE, LONDON

March 2017

STREET MOBILITY PROJECT TOOLKIT: MEASURING THE EFFECTS OF BUSY ROADS ON LOCAL PEOPLE

This document contains information about the tools that we have developed so that local government and local communities can assess community severance in their area.

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OTHER USEFUL TOOLS

In our Street Mobility and Network Accessibility project, we used a number of pre-existing tools to produce information about our case study areas. We also used this information to test the new tools that we developed, checking that what we found agreed with and/or added to the other information we had collected. These pre-existing tools are available from other organisations. Some need special expertise and some require payment. We are therefore not providing these tools on this website.

Since we cannot provide the tools themselves, we describe in this section what they are, why they are useful, and where you can find further information on them. The tools we describe here are street audits and space syntax.

1. STREET AUDITS

EXAMPLE OF ISSUES FOUND DURING STREET AUDITS: POOR LEGIBILITY AND LIGHTING

What it is

Street audits assess the quality of the pedestrian environment. Distinct from walkability,[1] which looks at the potential of an area for walking to places, street audits consider how pleasant and easy it is to walk in an area.

Why it is useful

Street audits can identify barriers to walking created by physical elements of the road, or by lack of provision for pedestrians. Using a formal audit tool means that data is collected in a uniform way. The data recording form is also a reminder of all the different aspects to consider and assess.

[1] See Walkability section of this toolkit, also available at www.ucl.ac.uk/street-mobility/toolkit

How to do it

The first step is to create a model of the pedestrian network representing the 'links' and road crossings that can be used by pedestrians:

- Links include pedestrian pavements along roads and streets, as well as 'cut throughs' (e.g. parks, shopping centres, stations, car parks). On main roads, the pavement on either side should be shown separately. For quieter streets, a single link can often be used to represent conditions on both sides of the street. Links are usually divided into a new section at each junction, but can be shorter if land uses or the pedestrian environment vary within that section.
- Crossings include signalised crossings ('pedestrian lights'), 'zebras' (non-signalised priority crossings), other crossing provisions (e.g. traffic islands) and likely locations for 'informal' crossing created by pedestrian 'desire lines' (e.g. near bus stops).

The second step is to assess the quality of the links and crossings using a systematic method, such as PERS.

Pedestrian Environment Review System (PERS)

PERS is a formal audit tool for assessing the quality of the pedestrian environment. This tool was developed by TRL (Transport Research Laboratory).[2] It assesses:

- 14 aspects of links (the pavement between one junction and the next): effective width, dropped kerbs, gradient, obstructions, permeability, legibility, lighting, tactile information, colour contrast, personal security, surface quality, user conflict, quality of the environment, and maintenance.
- 12 aspects of crossings: crossing provision, deviation from desire lines, performance, capacity, delay, legibility, legibility for sensory impaired people, dropped kerbs, gradient, obstructions, surface quality, and maintenance.
- Other, more specific, aspects of pedestrian infrastructure and environment: public spaces, public transport waiting areas, interchanges, and routes.

Each aspect is scored on a seven-point scale from -3 (worst) to +3 (best) conditions, with 0 for neutral. The overall scores for each link and crossing are obtained by using TRL's recommended weightings.[3] The PERS tool can be adjusted to local circumstances or to the objective of specific planned interventions by changing the weightings used to combine the attributes. For example, if the intervention is aimed at improving walking conditions for individuals with mobility restrictions, a higher weighting could be assigned to tactile information, colour contrast, and surface quality.

Street audits are labour-intensive. For example, it took a researcher one whole week to assess our 2km^2 study area of Finchley Road in London, which included 159 links and 57 crossings.[4]

Some third sector organisations (non-governmental organisations, NGOs) provide alternatives to PERS, involving local communities. Sustrans organises *Big Street Surveys*[5], enabling school children to explore their local area; Living Streets organises *Community Street Audits*.

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[2] Clark SD. *Identifying and prioritising walking investment through the PERS Audit Tool*. Walk 21, New York, 2009.

[3] A licence is required from TRL to use PERS. This currently costs £1,495+VAT. This payment provides access to the TRL software for recording the data and scoring and weighting the attributes, and to further documentation. Further information: https://trlsoftware.co.uk/products/street_auditing/pers

[4] The collection of data can also be simplified by using web-based images such as Bing Maps Streetside and Google Street View. These images can be used at a preliminary stage, to identify the main problems faced by pedestrians or the streets that have the worst conditions. The main stage of the audit, done on-site, can then collect information only about the attributes related to these main problems and in the streets identified on-line.

[5] www.sustrans.org.uk/our-services/who-we-work/teachers/big-street-survey

Community Street Audits
Living Streets, a charity that promotes walking, organises Community Street Audits, to evaluate the quality of streets from the viewpoint of the people who use them. The audits involve small groups of local residents, traders, councillors and officers. The resulting reports have been used to secure funding to put improvements in place, as well as contributing to master plans for longer term projects. Costs are variable but on average, a Community Street Audit costs around £7,500.[6]

CASE STUDY: USING STREET AUDITS TO IDENTIFY BARRIERS TO WALKING IN FINCHLEY ROAD

Finchley Road is a busy 3-lane road in North London. In the UCL Street Mobility project, we focused on the section of the road crossing the neighbourhood of South Hampstead. Street audits were conducted to identify and assess barriers to walking that were not directly related to road traffic.

Case study

The first stage of the audits was to construct a model of the pedestrian network. This included 133 links (pedestrian pavements or paths) and 57 crossings (designated crossing facilities or 'desire lines' where people crossed the road although it was not a formal crossing). These links and crossings were then assessed using the Pedestrian Environment Review System (PERS). This system scores every link and crossing on a seven-point scale, from -3 (worst) to +3 (best) conditions, with 0 for neutral.
The audits identified problems faced by pedestrians when using crossings. For example, the image on the cover of this section shows a signalised crossing that is complex to use because the road must be crossed in numerous stages, and the various crossing points are not aligned.

The audits also identified several problems for pedestrians walking along Finchley Road, including obstructions and user conflict near crowded and narrow areas such as at bus stops and entrances to underground stations, as shown in the photograph below left.

OBSTRUCTIONS AND USER CONFLICT IN FINCHLEY ROAD (LEFT)

POOR QUALITY LINKS IN THE NORTHWEST PART OF THE STUDY AREA (RIGHT)

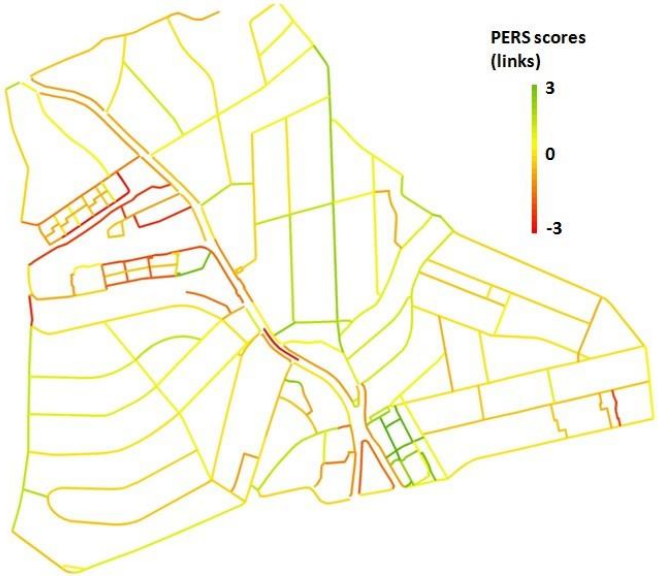
IMAGE © UCL STREET MOBILITY PROJECT

The availability and quality of the links (or footpaths) are particularly poor in the north-west part of the study area, due to the presence of several railway lines, car parking areas and large "big box"

[6] Further information: Contact Richard Mullis on 020 7377 4909 or Richard.Mullis@livingstreets.org.uk or visit https://www.livingstreets.org.uk/what-we-do/projects/community-street-audits.

stores. All the pedestrian links in this area have low PERS scores. The photograph above right shows an example of these links, with evident problems of poor cleanliness, legibility, and lighting, as well as issues of personal security. The clustering of these poor quality links in this area represents an additional community severance effect, compounding the severance caused by high motorised traffic levels along Finchley Road itself.

Overall, the quality of pedestrian links is highly variable, as shown in the map below. Some links have fairly high positive scores, while others have negative scores approaching the minimum of -3.



PERS SCORES OF PEDESTRIAN LINKS IN THE FINCHLEY ROAD STUDY AREA

2. SPACE SYNTAX

What it is

A key driver of pedestrian movement around towns and cities is the structure and connectivity of streets. These are the spaces that people occupy and move through, and where we come into contact with one another. This form of contact is essential for social interaction and for economic transactions. The structuring of space – the result of urban and architectural design – is therefore very important for how people, businesses and communities function and interact. The spatial structure can improve social function and the experience of street spaces, but can also cause it to fail if poorly designed. Space syntax is a set of research methods that aims to represent and quantify these structural properties of space. It is used to investigate the relationship between design and social function. Space syntax street network modelling in the context of this toolkit is used to analyse street layouts and likely pedestrian movement patterns. It can also be used to predict the impact of urban design changes on movement flows[7] and social engagement. Space syntax research has led to new, fundamental understanding of the relationship between urban design, infrastructure and walkability,[7] use of public space, and longer term social outcomes.[8] For assessing community severance, space syntax can be used to measure potential accessibility, which can be compared with actual patterns of use.[9]

[7] Space Syntax Ltd. Comparative study of space use patterns following the re-design of the public space. *Space Syntax Ltd*. 2004.

[8] Vaughan L, Arbaci S, The challenges of understanding urban segregation. *Built Environment*. 2011;37:128-138.

[9] For an example, see the Video surveys section of this toolkit, also available at www.ucl.ac.uk/street-mobility/toolkit.

Why it is useful

Space syntax methods[10,11] can be used to analyse the structure of street networks. This shows which roads and pathways are most important for both street activity and movement through the area. This method of spatial analysis considers the geometry and connectivity of the network as independent variables in shaping pedestrian and motorised transport. It considers only the configuration of the street network, not any other factors that might encourage or discourage pedestrian travel.

Space syntax theories of the interaction between people and space suggests that the way people move through urban streets depends on how streets are related to each other in a network, and the way that people think about, and thus move through this network. Other assessments of street networks use distance along possible routes, proximity to destinations, or the number of junctions in a specified area amongst other measures. Space syntax considers the local street network within the larger spatial context. For example, movement and networks within one area are affected by how these networks connect to the street network of the wider urban area.

Further information

The software for space syntax analysis can be downloaded for free from www.spacesyntax.net/software/, but it requires some expertise in interpreting the results. If you are interested in the walkability model (which incorporates space syntax), contact Dr Ashley Dhanani at the UCL Space Syntax Laboratory: ashley.dhanani@ucl.ac.uk.

Local authorities generally already have access to the data that are needed for space syntax analysis, such as the Ordnance Survey Integrated Transport Network and Open Roads datasets. Services can also be commissioned from external agencies, such as Space Syntax Ltd. (www.spacesyntax.net).

CASE STUDY: USE OF SPACE SYNTAX NETWORK ANALYSIS IN WOODBERRY DOWN

This case study describes one of many applications of space syntax network analysis. In this instance: to plan camera placement for pedestrian and vehicular observations across a neighbourhood.

Space syntax network analysis methods were used in several ways during the Street Mobility project, including as part of the walkability modelling and in planning observational studies. One key application was to analyse accessibility patterns in the street network. Space syntax analysis measures the 'centrality' of networks by using software to measure the shortest routes between origins and destinations. The results from the analysis show which streets are most likely to be travelled along. The following section describes how space syntax was used in planning camera positions for recording the movement of pedestrians and vehicles.

In the Woodberry Down case study area, in North London, video cameras were used to record vehicular and pedestrian flow, as well as pedestrian characteristics and behaviours. The aim of the cameras was to record the busy main street and the surrounding streets, to understand how flows and behaviour varied based on the street characteristics. Space syntax analysis identified a range of different street types, based on their importance for flows of people in the case study area.

[10] Hillier B, et al. Metric and topo-geometric properties of urban street networks: Some convergences, divergences and new results. *Journal of Space Syntax*. 2010;1:258-279.

[11] Hillier B, Vaughan L. The city as one thing. *Progress in Planning*; 67:205-230.

As the image below shows, the space syntax analysis highlighted the routes that were most central, and cameras were then positioned to cover these streets as they were most likely to experience high pedestrian numbers. Back street locations, marked blue on the map, were also chosen as they were likely to have fewer pedestrians. This allowed the cameras to record behaviours across a range of street types. This method of choosing camera locations can be used for smaller areas, such as the Woodberry Down case study, for larger areas such as boroughs, or even across entire cities.

WOODBERRY DOWN CASE STUDY SPACE SYNTAX ANALYSIS

COLOURATION: RED (HIGH CENTRALITY) TO BLUE (LOW CENTRALITY)