

# Visualising London's Suburbs

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## 1. Introduction

Historically, London's suburbs are, "as old as the city itself" (Ackroyd 2000, p.727) but it is only recently that they have begun to assert themselves on the policy agenda alongside the metropolitan centre. In June 2007 the London Assembly's Planning and Spatial development Committee released a report noting the difficulties predicted for London's suburbs (GLA 2007). However, future development plans for London remain dominated by policy focusing on its core urban area despite evidence of economic stagnation, social exclusion and increasing congestion in the suburbs (Potts et. al., 2007). This is symptomatic of a planning culture that seems reluctant to acknowledge the distinctive contribution of the suburbs to the quality of urban life overall (Kochan 2007). The unspoken assumption is that the suburbs are able to 'look after themselves'. Yet if the challenges facing London's suburbia are not addressed they might face a significant decline.

The suburbs have a greater presence in the academic literature than in the policy debate. Bourne (1996) identified no fewer than ten common interpretative and explanatory approaches to the suburbs from a wide range of socio-economic and cultural perspectives. To name just three, the suburbs have been theorised as an efficient mechanism for capitalist accumulation (Harvey 1999: 122-123), historicised in terms of people's increasing preference for a suburban lifestyle (Clapson 1998) and portrayed as a rural arcadia (Rowley 2006: 195-208). The perspective adopted here, emphasises the historical nature of suburbs as nucleated settlements, addressing the potential of these places to continue as centres of social and economic vitality within emerging polycentric metropolitan regions. This approach is suggested by the morphology of London itself which is widely recognised as a city comprised of villages and sub-centres (Hillier 1999; GLA 2002).

In both the policy and academic arenas there is a need for the provision of more accessible information on Greater London's suburban town centres, to improve understanding of their distinctive characteristics as places to live and work within an extended metropolitan region. The EPSRC Successful Suburban Town Centres (SSTC) project at UCL seeks to meet this need by profiling town centres according to their socio-economic activity, morphological characteristics, commuting patterns and typical modes of transport use. The project draws on a range of methods for the spatial analysis of social and economic activities at various scales. The visualisation of urban form using spaces syntax methodology is of particular interest, enabling the spatial structure of streets and the layout of the buildings to be compared with information about the people who live and work in suburban centres.

This paper describes one phase of the project: the development of an internet based geo-visualisation

tool which facilitates visual comparisons of 20 suburban centres. The centres are located in London's outer suburbs, between the M25 and the north/south circular – London's inner and outer orbital roads, chosen because they underwent considerable development during the inter war periods (1919 to 1939). This represents the earliest major period of growth of those London's suburbs (Whitehand and Carr, 2001). The tool enables the user to explore a variety of map themes at consistent scales, enabling local knowledge about the suburban environment to be compiled using a comparative method of transitions to discover patterns within and between centres. The motivation behind the development of the geo-visualisation tool known as the town centre profiler tool was two-fold: firstly, to enable the development of a series of hypotheses to direct the analytical phase of the project, and secondly, to provide local planners with an enriched picture of the local neighbourhood and its suburban structure.

## 2. Methodology

### 2.1. Town Centre Profiler Development

The project's interest in uses of the town centre meant attention was paid to activity-generating land uses such as offices, shops and community facilities. A range of activity-generating mapping themes were identified from a diverse range of data sources, listed in Table 1 and 2. The data were processed automatically using MapBasic scripts to produce consistent geovisualisations across all the centres in terms of the scale of the area, ranges, colour scheme and the background map, which in turn ensured they could be directly compared to each other. Thematic maps produced for raw counts were classified according to the shape of the distribution using geometric or arithmetic progressions, percentage maps used a diverging colour palate (Brewer 2005). The aim was to reduce the false assumptions that can be derived from poorly drawn maps, whilst noting the documented limitations associated with using administrative data unit (Openshaw, 1984).

**Table 1.** Socio-economic mapping themes and associated data sources

<b>Data</b>	<b>Description</b>	<b>Areal Unit</b>	<b>Source</b>
<b>Socio-economic data</b>			
<b>Car Ownership</b>	Car or van ownership per household	Census output area	Census Table KS17
<b>Commuting patterns</b>	Contains journey-to-work flows within and between output areas in England	Census output area	2001 Census: Special Workplace Statistics (Level 3) Data were modified via a process known as <i>Small Cell Adjustment Methodology (SCAM)</i> . The SCAM process is a disclosure control mechanism. Cells with a 'small' value (0 to 3) are adjusted and given either a 0 or 3 to project individuals (ONS, 2001)
<b>Infrastructure</b>	Railways, Stations (Tube and Rail), A, B and minor roads, motorways and car parks	Polylines and points	Ordnance Survey Meridian and Address Layers 2
<b>Method of travel to work</b>	Usual population aged 16 to 74 and their method of travel to work. The method of travel to work is for the longest part, by distance, of the usual journey to work. The data was mapped for town as place of work and place of residence	Census output area	Census Table UV39 (Resident population) Census Table UV37 (Workplace population)
<b>Functional activity land uses</b>	Address Layer 2 is a product derived primarily from the Royal Mail postal address file (PAF), whereby	Points based on	Ordnance Survey Address Layer 2

Data	Description	Areal Unit	Source
	each postal address (delivery point) has been allocated a unique reference and national grid reference. Supplementary to these data Address Layer 2 also incorporates information about geographically derived address locations that do not have specific postal addresses	national grid coordinates (x,y).	
<b>Socio-economic classification of occupation</b>	Data for population aged 16 to 74 by their socio-economic classification, the replacement in the most recent census for social class based on occupation	Census output area	Census Table UV31 (Resident population) Census Table UV76 (Workplace population)

**Table 2.** Space Syntax mapping themes and associated data sources

<b>Space Syntax measures</b>			
<p>The axial map is used in space syntax analysis to represent and analyse all open public space as a continuous spatial network in order to measure how well connected each street space is to its surroundings. This is done by taking an accurate plan of a built up area and drawing the set of least and fewest lines that cover all the open space ensuring that lines intersect where adjacent spaces are contiguous. Space syntax analysis computes all the lines in the network according to their relative depth from each other. Depth increases with the number of changes of direction between lines, see Hillier, B. (2007).</p>			
<b>Choice</b>	<p>Segment analysis takes each axial line and breaks it into segments at the intersections between axial lines. Segment analysis is concerned with the angular properties of graphs by calculating the relative straightness (least angular deviation or 'angular depth') of <i>each</i> segment from <i>all</i> other segments in the system.</p> <p>Choice is calculated by counting the number of times each segment falls on the shortest path between all pairs of segments within a selected distance-radius where 'shortest path' refers to the path of least angular deviation or straightest route through the system.</p>	Segments	<p>The maps are sections extracted from the segment map of the Greater London area bounded by the M25.</p>

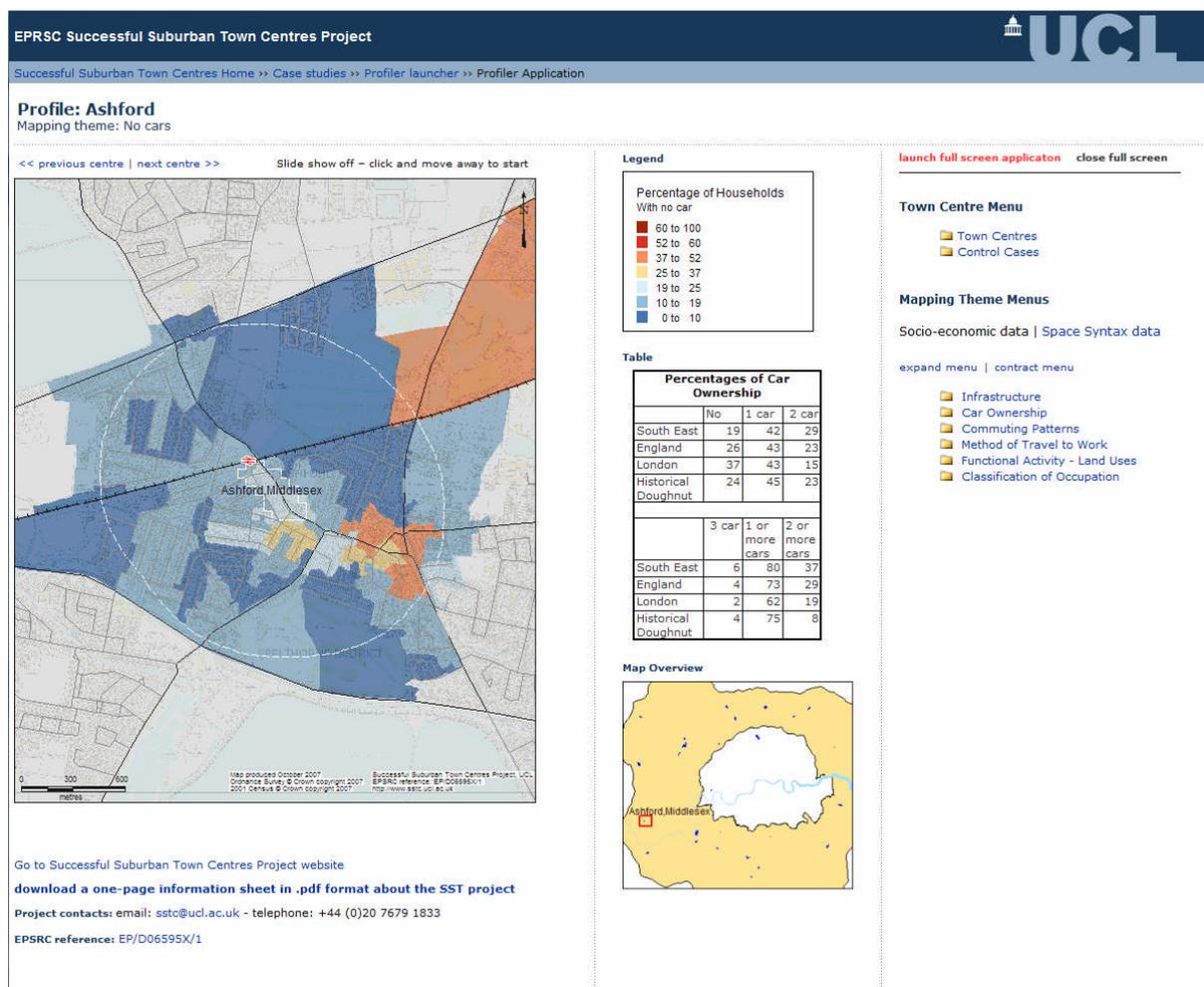
The script enabled the production of more than 1000 map images across 12 different mapping themes (each with a number of sub themes) for each of the 20 case studies, with a selection of different backgrounds. The static image outputs then became the primary composites of the internet profiling tool.

## 2.2. Development of internet based profiling tool

The principal purpose of the maps was to generate phenomena to assist in hypothesis exploration and formation. This stands opposed to the conventional approach of using maps to disseminate existing knowledge (MacEachren, 2004). This combined with the interdisciplinary nature of the project team meant that cartographic visualisations needed to be produced for exploratory analysis, but without reliance on GIS technology expertise, therefore interactive web mapping tools were not appropriate for the users. Due to the large number of visualisations it was not suitable to print them out for closer inspection; the volume of images would make this unwieldy. Neither was it realistic to view the images using an image viewer as this would reduce the flexibility the user would have. The most appropriate method to view the output images was considered to be a customised profiling tool for dissemination on the internet which would provide access to non-GIS users.

To develop the tool, a number of functional requirements were identified, with importance placed on usability. Firstly, the user has the ability to select a town centre and then browse through the mapping themes (vertical transitions). Secondly, the user must be able to select a mapping theme and then compare it across different town centres (horizontal transitions). This requirement was imperative because the project is interested in sets of relations across centres, as well as within. For this reason, it was decided to enable the user to view the chosen map theme as a slideshow which automatically scrolls through all of the town centres. The third key requirement was to separate the menus for the socio economic mapping themes and the space syntax menus, because they present very different types of information to the user. The fourth and final requirement was to enable the profiling application to be loaded full screen, for a resolution of 1280 by 1024, in the web browser (latest versions of Firefox and Internet Explorer); meaning it could be seen as an independent application, ensuring the size of the map images could be optimised sufficiently, to allow proper evaluation of the information. Noticeably, the decision on the resolution and implementation of the application breaks established guidelines for website development (Nielsen, 1999). However, the decision to break away from these standards meant we could to utilise the advantages of the browser's environment, whilst ensuring that our geo-visualisation tool remains effective.

The website was developed using a mixture of client side JavaScript's, server side PHP scripts, and a template HTML page. The resultant user selection compiles the interactive html webpage. A screenshot of the developed town centre profiling tool is included in Figure 1. The use of the browser's environment for the dissemination seemed natural, because it is easy to implement and allows the dissemination of the final output over the internet beyond the specific use of the project.



**Fig. 1: Screenshot of interactive town centres profiling tool**

### **3. Discussion**

The building of local knowledge is essential to a project of this type. A tool such as the one described provides a mechanism for building knowledge by compiling abstract data sources into a coherent and structured interface. With the rise in Web 2.0 and its user friendly mapping facilities such as Google Maps or Microsoft Virtual Earth, the use of static map images may be considered by some to be outmoded. However, whilst the town centre profiler is not providing the high level of interaction with the map it has a number of advantages over using the recently emerging interactive web mapping interfaces.

Creating the maps as images which are then made available to users enables the GIS expert to maintain control of the content, design and scale at which the visualisations are produced. This means they are not merely visually aesthetic but portray relevant information (Monmonier, 1996). A primary motivator for its development was to enable non-GIS users to visually critique and explore a large quantity of information in a user friendly manner. As David Unwin noted in 2005, "In software, the idea of user friendliness is usually equated with interface design, but the concept should also be used in relation to how well the tools provided map into the users perceptions and expectations of what needs to be done with them" (page 683). This tool was built specifically for a clear purpose.

The simplicity of the application provides one advantage to the user and their quest for knowledge. The tool is essentially an interactive atlas of maps, where the menu options are a multidimensional index. The maps themselves cannot be changed, they are static, and this ensures the user considers in detail the actual content of the maps and their meaning. The profiler carefully considers the end use of the maps and the types of functionality required to make them useful, whilst limiting functionality found in a traditional GIS such as panning, zooming, classifying themes and changing colours. This is because the interaction of the map itself would detract away from the content and meaning for non expert users. This is especially important as our project team comprised of researchers from various academic backgrounds. These reasons, combined with the large number of centres, scattered across a regional spatial extent and diverse range of mapping themes, provided the impetus for the slideshow functionality with its gradual transitions enables horizontal comparison across each of the town centres. This enables similarities and differences to be visually examined. Such transitions in a web GIS would be messy and difficult to implement and control, and introduce more complexity than necessary into the system.

What is more, because the images are all produced at the same scale, the application controls the extents of the map making it much easier for the user to move around the different centres; ensuring all centres and map themes conform to conventional standards and by corollary this encourages sensible interpretations and hypotheses to be developed. The profiler was used successfully in a number of project workshops to provoke thought and facilitate potential ideas to be investigated in depth for each of the 20 centres. We were able to reinforce one of the initial hypotheses that suburban centres are not merely sleepy residential commuter towns reliant on the urban centre. The visualisations showed a wider range of activity generating land uses prevalent in our centres and their local hinterland. Additionally we were able to hypothesise that local patterns of movement and integration play an important role in generating activity. The visualisations have enabled the project team to demonstrate a need to understand suburbs as 'multi-dimensional' places characterised in part by the complexity of their relations with other places, rather than by a particular relationship to a single central place.

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## **Biography**

### **Catherine Emma Jones**

Kate (Catherine) Jones has an MSc in Geographical Information Systems from UCL and spent three years working on a Knowledge Transfer Partnership between Camden Primary Care Trust (PCT) and UCL Department of Geography implementing GIS and Geodemographic tools for health care. She will shortly be submitting her doctorate to the Department of Geography at UCL. She is currently a research associate on the SSTC project at UCL.

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### **Sam Griffiths**

Sam Griffiths has expertise in space syntax, urban morphology and historical methods. His academic background is in urban history and he has recently completed writing-up his doctoral thesis on the urban transformation of nineteenth-century Sheffield. He is currently working in the Bartlett School of Graduate Studies as a Research Fellow on the EPSRC Towards Successful Suburban Town Centres project.

### **Dr Laura Vaughan**

Laura Vaughan is Senior Lecturer in Urban and Suburban Settlement Patterns and Co-Director of the MSc Advanced Architectural Studies, Bartlett School of Graduate Studies, UCL. She has written widely on urban and suburban settlement patterns, with a focus on space syntax as a method for fine grain analysis of built form. Currently she is Principal Investigator on an EPSRC grant - 'Towards Successful Suburban Town Centres: a study of the relationship between morphology, sociability, economics and accessibility'.