

Mapping the Experience of Space

Dynamic urban analysis

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ABSTRACT

This paper aims to contribute to the discussion and our understanding of time-based mapping of visual information. Our approach is to enhance the traditional contextual static analysis through the acknowledgement of the body and the senses as key indicators of perceptual spatial experience. The time-based mapping paradigms have produced different ways of designing space by leveraging perceptual and other sensorial understanding, leading to the formation of variables (or parameters) which at the same time turn themselves as catalysts for other variables. The potential for a constantly evolving reinterpretation of the perceptual experience and for associated paradigm to shift suggest a multiplicity of design possibilities for urban areas that also need to adapt to the new requirements of contemporary living. In essence, the paper will bring to light the deployment of tools (digital and analogue) to turn static invisible data to dynamic visible data. In other words, we want to explore how the data can be treated as a generative system, enabling students and tutors alike to experience space which accounts for sensory performances and behaviours within the space.

KEYWORDS: Time-based design processes; dynamic data visualization; digital pedagogies, phenomenology, design process.

Introduction and background

We start by discussing briefly background and related work first on representation of dynamic, time-based data and then on information visualization. A central theme within this paper is the recognition of the manner in which we experience architecture and space which is heavily influenced by the response of our senses. It has long been recognised that this experience is likely to be significantly affected by perceptions of scale, rhythm, materials, lighting and colour (Rasmussen 1964). As discussed further in the paper, theories and methodologies drawn from phenomenology can be extremely useful in trying to capture that experience at a human scale. Within the study of architecture, methods have often been developed with the aim of recording and emphasising the visual impact of urban landscapes (Cullen 1961). Cullen advocated an approach to recording our experience of the existing built environment, which encouraged participants to stop as they navigated a landscape or a building and to sketch those features which participants felt they have most influenced their affective response to that environment. Cullen's elicitation methods can bring forth information which is extremely useful to understand the reason participants

stop to pause and consider elements of a landscape—elements which may not be immediately recognizable or perceived as being important through traditional architectural drawings. Nevertheless, these methods have limitations. For example, they do little to capture a wider experience of space and do not necessarily encourage or facilitate respondents to consciously and explicitly to attempt recording the manner in which non-visual senses may be stimulated by an environment.

Researchers at the SENSEeable City LAB from MIT Media Lab have created partnerships with entities that manage large urban systems which under routine operations generate large data streams (Rojas, F., Kloeckl, K., and Ratti, C. 2008). They have developed innovative ways of interpreting the data and inferring urban activity as it happens in real-time. Their "Real-Time Rome" project consisted of an analysis of data streams originating from Italy's largest cellphone network and GPS locations of the public transport bus and taxi fleets. The project's objective was the exploration of how to use real-time data for the better planning and management of cities with the main audience being planners and architects. A year later, Real-time Rome was succeeded by the WikiCity project in which their work with real-time data

was taken further, exploring a way in which combinations of data streams could be turned into effective tools for citizens to support the decision making process when following their goals and activities in the city.

Theories drawn from the fields of information visualization and visual communication tend to emphasise and draw attention to the juxtaposition of different kinds of data. This is matched with a corresponding desire to represent that data in a visual manner can often produce an experience akin to what might term 'enlightenment'. Theories of information visualisation have developed over the past 20 years, and that development has taken place across multiple disciplines as well as within specific disciplines to increase our understanding and to inform the application of the theories in diverse domains. Before we become overly concerned with the extent to which computing technology can influence the way we develop ideas of visualisation within current built environment projects, it is worthwhile to take a step back and consider how 'visualisation' can, and has been, used to successfully present information and data in a manner which is illuminating and immediate to the user. This way enables to appreciate how successful design of the often computer-dependent approaches taken nowadays in the built environment relies on a more basic understanding of visual communication to ensure its success. A key point to consider in any method of information visualisation is the resulting effect in users' minds after looking at a diagram, picture or other types of images (Spence 2007, page 5). When desired result has been acquired in the mind of the observer, rather than as a result of text or statistical analysis, we can

say that 'insight' has been acquired. Classic examples often cited within Information Visualisation texts include Harry Beck's London Underground map, John Snow's mapping of London's cholera outbreak in 1854, and Charles Joseph Minard's mapping of Napoleon's ill-fated army marching towards Moscow (Spence 2007). These are excellent examples of situations where an abstract approach (in the case of the Underground map) or an unusual approach to medical science (in the case of work by Snow), led directly to greater levels of insightful understanding.

This paper takes the potential of real time mapping and visualization as a point of departure to discuss and rethink traditional urban site analysis and design. The aim and scope of this paper is to provide new visualization tools which could be implemented with widely available software programmes (such as Autodesk 3D Max and Adobe Flash). The assumption is that real time mapping can allow for different analysis and evaluation of existing urban conditions and therefore support different interpretations and simulations of urban spaces to enhance sensorial experience. To test our assumption, we describe an exercise of dynamic mapping conducted by year 1 undergraduate students in an exercise of urban site analysis and explore how this methodology may provide opportunities for different design process approaches, as opposed to traditional, static and compartmentalized urban design site analysis.

Design Studio Experiment

The paper presents and analyses the results from a

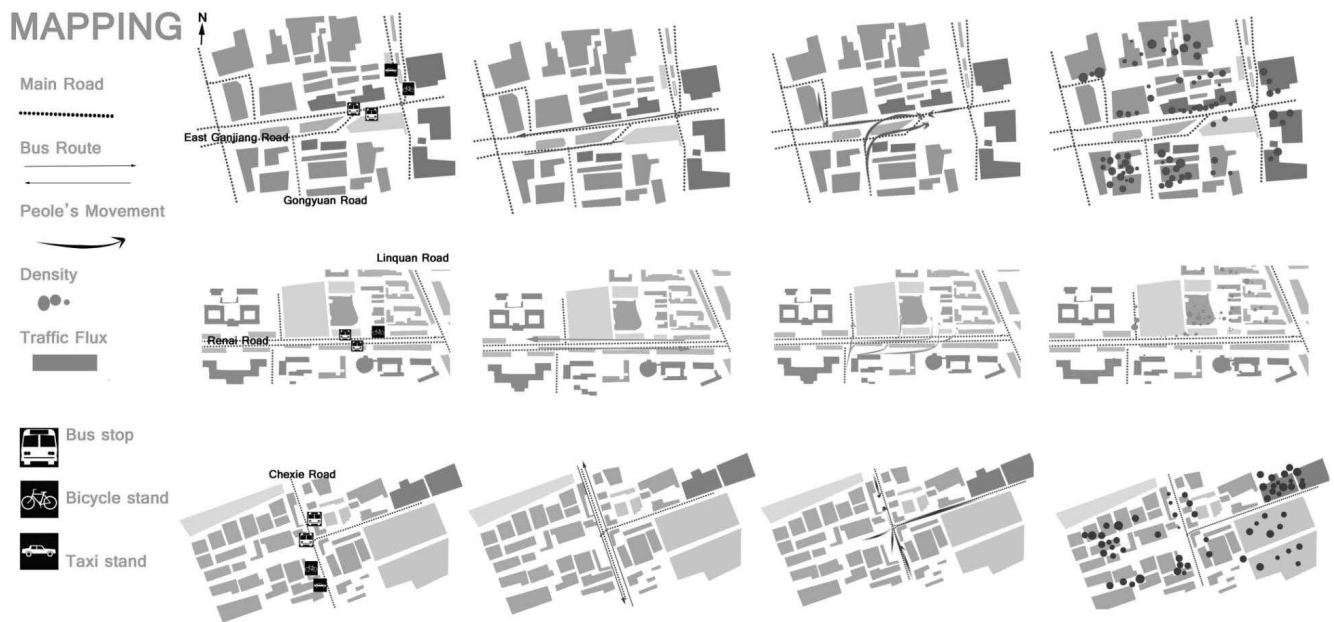


Fig. 1. An example of traditional site analysis visualization with emphasizes on flow (of people, buses, cars, bicycles) and concentration of elements. These visualizations rely heavily on the use of arrows, colour contrasts, and simple shapes as visual highlights.

design studio project undertaken during a semester. This paper only focuses on the site analysis task which took three weeks to conclude. Students were asked to redesign the main campus square of the university they had been enrolled. They were asked to provide news spaces for meeting points and additional spaces for leisure activities like a public performance and skating space. The methodology of the studio exercise was based on developing platforms to map dynamic information (time-based perception) as speculative tool sets for the visual integration of different data sources, key to the design process in architecture, including simulation, articulation and evaluation. They were tasked with identifying sensory aspects of the architecture to feed into a design concept for an outdoor social space in a university campus. Students were asked to carefully observe and reflect upon the place, thereby concretizing the experience conceived as a performance between the human body and the environment.

The studio mapping task proposes to methodologically experience architecture through additional parameters of site and analysis, building and urban design, space and body. Conventional representation methods of site analysis are generally context based to depict the functions of the place, traffic flow, and other environmental factors—for example, sun and wind intensity and directions (see Fig. 1 and Fig. 2). As such these methods of representing data are often static visualizations which are limited in their abilities to map continuity of body-space interaction. In this work, we aim to explore time-based data mapping approaches to support enhanced sensorial experiences through an overarching field of experiential parameters.

In contrast to the above visualizations, the illustrations below (Fig. 3) show different mapping methodologies to display information for urban site analysis. The data is based on observations and interviews of pedestrians over a period of 3 weeks. Although all three figures have been created using the same data, the visualizations in Fig. 3 emphasizes on the depiction of more transitional, time-dependent data and also on identifying patterns of movement based on different types of sensorial information. These visualizations are snapshots of animations of changes based on 12-hour cycles. We used animations because they represent one of the most intuitive ways for showing information that changes over time (Kadaba et al. 2007). In addition, animations can be easily rendered in off-the-shelf, easy to use to software (e.g., Adobe Flash). Students first created separate animations by theme (meeting points, pedestrian fluxes, human activities, smells, etc.) using Flash so that it is possible to visualize the animations in a number of ways—e.g., overlapping 2 or more maps together or putting in parallel similar to what Edward Tufte's small multiples (Tufte 1990).

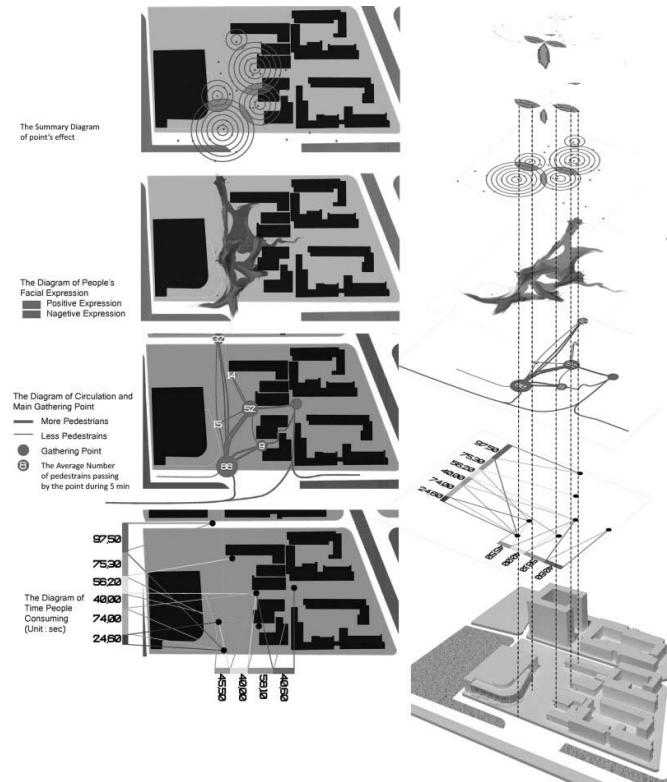
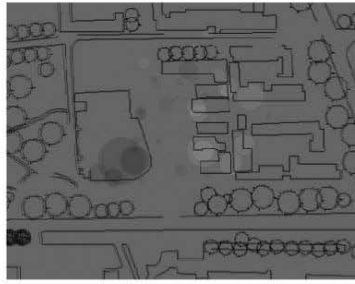


Fig. 2. Another example of traditional site analysis visualizations emphasizing the depiction of abstract information and the relationship between the different themes (right figure): flow and concentration of people/pedestrians, state of happiness (based on their facial expressions). The right figure makes use of layering of information to highlight relationships.

Discussion

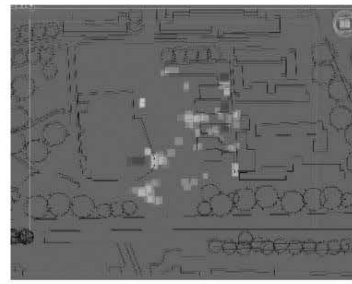
In line with previous research by Sanguinetti and Kraus (2011), the paper also supports the idea of mapping the experiences in real-time incorporating people's fluxes, activities, smells and densities in space. In this paper, we attempt to provide practical tools and techniques to communicate temporal sensorial information to assist in the analysis and design of urban sites. From our study, we used three simple techniques: animation, simple site analysis drawings, and parallel small multiples or layered visualizations. Animation has been suggested as an easy-to-implement and intuitive way to communication time-dependent data. With more traditional visualizations (e.g., Fig. 1 and 2), it is difficult to incorporate animation into them, especially as a post design feature. In contrast, Fig. 3 was conceptualized with animation being an integral part. Simple sketches have been used in the background to deemphasize the information (so as to highlight the other, foreground information). Finally, parallel small multiples differed from layered visualizations, with each one having varied benefits. Given access to both during the analytical process can bring forth their complementary benefits.

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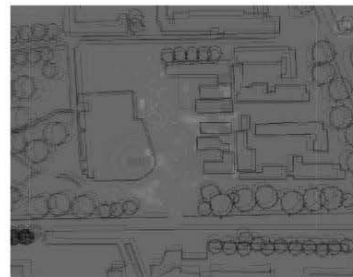
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Fig. 3. Snapshots of animated visualizations display time-dependent information with emphasis on sensorial and proxemic experiences.

We are in the early stages of understanding the potentials of dynamic mapping and the many aspects of their creation, and encourage others to conduct further research in this challenging application domain. A question for future development of this research will be: do we design differently by analysing real-time urban data other than with static one?

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