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Assessing the Multi-Sensory Qualities of Urban Space: A methodological approach and notational system for recording and designing the multi-sensory experience of urban space

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Abstract

Urban spaces are an experience for all the senses, but all too often, academics and designers are interested in only the visual or aural aspects of place. What are the implications of a more holistic approach to the role of the senses in our experience of urban space? This paper investigates ways of assessing the multi-sensory quality of urban spaces. One important task is to find ways of recording sensory experience, as individualistic and variable as it can be. The paper describes a notational system depicting the relative importance, corroboration, and qualities, of six perceptual systems in the tradition of James J. Gibson's (1966) groundbreaking work. The notational system is demonstrated with a series of notations of spaces in Rome. Such a notational system can be used as an individualistic exercise akin to sketching, but has a number of wider uses as well, such as the diagnosis of sensory deficits across a site or route. This research draws on a wide literature, from the phenomenology of Merleau-Ponty (1962) through Ingold's anthropology of the environment (2000, 2007a). The work of James J. Gibson on the contextual nature of perception (1966) is central to the research, enlarged by more literary approaches from Georges Perec (1974), Michel de Certeau, Gaston Bachelard and Henri Lefebvre's Rhythmanalysis. This research puts these more open, subjective theories of environmental perception into practice by embedding them in a set of inscriptive practices, allowing them to become part of the design process.

Keywords: Urban design, sensory perception, notation, representation of space, environmental cognition, environmental perception.

Evaluación de las cualidades multisensoriales del espacio urbano: un enfoque metodológico y sistema de notación para el registro y diseño de la experiencia multisensorial en el espacio urbano

Resumen

Los espacios urbanos son una experiencia para todos los sentidos, pero con demasiada frecuencia el interés de académicos y diseñadores se centra únicamente en los aspectos visuales o auditivos de los lugares. ¿Qué implica adoptar un enfoque más holístico del papel de los sentidos en nuestra experiencia del espacio urbano? Este artículo investiga distintas formas de evaluar la cualidad multisensorial de los espacios urbanos. Una tarea importante es encontrar maneras de registrar la experiencia sensorial, teniendo en cuenta su alta variabilidad e individualidad. Se describe aquí un sistema de notación de la importancia relativa, corroboración y cualidades de seis sistemas perceptuales, siguiendo la tradición del trabajo pionero de James J. Gibson (1966). Se ofrece como ejemplo de este sistema una serie de notaciones tomadas en varios espacios de Roma. Un sistema de estas características puede emplearse como ejercicio puntual, a la manera de un bosquejo, pero también tiene otras aplicaciones más amplias, como el diagnóstico de déficits sensoriales en un lugar o ruta. Esta investigación se basa en una extensa literatura, desde la fenomenología de Merleau-Ponty (1962) a la antropología ambiental de Ingold (2000, 2007a). El trabajo de James J. Gibson sobre la naturaleza contextual de la percepción (1966) es central para esta investigación, y se amplía con enfoques más literarios como los de Georges Perec (1974), Michel de Certeau, Gaston Bachelard y el ritmanálisis de Henri Lefebvre. En este estudio se ponen en práctica estas teorías más abiertas y subjetivas de la percepción ambiental, incorporándolas a un conjunto de prácticas de inscripción y permitiendo así que formen parte del proceso de diseño.

Palabras clave: Diseño urbano, percepción sensorial, notación, representación del espacio, cognición ambiental, percepción ambiental.

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Introduction

This paper is drawn from the research of the Multimodal Representation of Urban Space project, a Designing for the 21st Century project funded by the UK AHRC & EPSRC, the aim of which was to look into the visual bias of existing urban design practices, and to reconsider the entire sensory experience of such urban environments. This approach is then deployed to design a representational system for understanding and recording the sensory data of urban space with an eye towards the design process itself. Several considerations arise.

Firstly, whilst there are some recording devices available for visual and aural phenomena, these are mediated technologies, recording a range of phenomena passively in a manner unlike human perception. Recording devices for movement are more problematic still, requiring complex video and motion capture technology.

The chemical senses of taste and smell are also problematic, and whilst analysis of such sensations can be achieved, the technology is unsuitable for urban environments. Similarly, the tactile elements are difficult to record without recourse to translations into visual patterns representing texture.

There are a great many factors which contribute to our perception and experience of a space. Urban Design needs, as a discipline, to develop a fuller understanding of these aspects of space. With all this in mind, it was obvious that the implementation of such technical expertise was not the appropriate response to a more complete understanding of environmental experience and would not integrate well into the urban design process we were aiming at. An architect rarely sketches with a light meter in hand after all, but convincing and useful architecture emerges from a design process that effectively relies upon sketches, measured drawings, plans, sections and perspectives. This paper argues for the intrinsic, versatile potential of notation to include other than visual cues of use to the design process.

The advantage of such a process is a low cost technology, potentially ubiquitous. Communicative inscribed marks such as drawings and notations are, after all, a technology: one still capable of innovations as suggested by practitioners such as Rudolf von Laban, creator of a fascinating and pragmatic form of movement notation in the 1920s, or Kevin Lynch, who explored ways of describing the navigation of urban spaces in Boston and other North American cities in the 1960s. Systems of notation such as Lynch's have distinct advantages for dissemination of the research, and allows it to be taken up far more readily. More recent developments such as the range of Space Syntax notations have relevance, as explored by Akkelies van Nes (2008, p. 172, in Lucas & Mair, 2008) with specific reference to the perception of safety.

Also, notation integrates with a wide range of other drawing types. Plans and sections are the most immediately useful, but the notation can be applied to perspectives, axonometrics, across a wide range of scales and so on. This adaptability allows the notation to become part of already existing practices whilst imprinting some of its concerns for the sensory onto that process of design (Lucas and Romice, 2008).

The notation is narrative, using a tight range of commonly understood descriptor terms as well as allowing the notator to append his/her own thoughts. The notation can be used by one practitioner to record an impression, or a body of people such as a community to relate and arrive at common perceptions of a space, meaning that it holds both the extremes of a subjective individual sketch and objective surveys.

Phenomenology of architecture, phenomenology of cities

Phenomenological approaches to architecture are relatively common, particularly with reference to the loaded cultural space of home, which receives a great deal of attention from writers in philosophy, cultural theory, architecture and anthropology.

Classic writings such as Gaston Bachelard's (1994) *Poetics of Space* and Georges Perec's (1997) *Species of Space* concentrate upon the ways in which home environments are a part of our being, an extension of mind and body. The phenomenology of home describes home not as a space or fixed point, but as a series of practices and acts, so that the mundane and prosaic activities of dwelling are elevated to Being. This thesis is explored further by anthropologist Sarah Pink and backed up by substantial field research, producing an ethnography of several examples of home. The role of the home is, here, intertwined with identity, the temporality of routine, gender and the production of the self (see Pink 2004, p. 147).

Architecture engages with this theory in the works of writers such as Juhani Pallasmaa and Stephen Holl (Holl, Pallasmaa and Pérez-Gómez, 2006). Pallasmaa considers the senses in his essay *Eyes of the Skin* and other writings; the sensorium consists of modifications of the sense of touch, and each sensory receptor consists of a specially sensitive area of the body, the photoreceptor of the eyes, the taste buds on the tongue and so on. All these are, hence, modifications of touch, of tactility.

Whilst scientifically questionable, this shift in bias is instructive as an exercise in thinking about space. Yet despite this tactility in Pallasmaa's thinking about architecture, when he comes to consider the city, the eye still threatens dominance: "The visual city leaves us as outsiders, voyeuristic spectators, and momentary visitors, incapable of participation" (Pallasmaa, 2005, p. 142).

Pallasmaa asserts the potential of a tactile city and questions the success of a solely visual city:

The measure of the sense of the city is this: in the city of your memory, can you hear the laughter of children, the flutter of pigeon wings, and the shouting of the peddler? Can you recall the echo of your footsteps? In the city of your mind, can you imagine yourself falling in love? (Pallasmaa, 2005, p. 146).

That the phenomenological and sensory city inspires such romanticism is not without precedent, of course. The large body of texts on the flâneur and similar urban characters such as the dandy, Situationist drifter or more recent Tokyo Cos-Player take this very stance, engaging with the sensory pleasures of the city fully and celebrating the possibilities represented by urban life. That such accounts are inextricably related to sensory experience places them firmly within the phenomenological tradition.

In his essay *The Phenomenon of Place*, Christian Norberg-Schulz approaches the question of phenomenology in urban space rather than in the home. There is a difference more fundamental than simply the scale when considering urban space rather than architecture, which lies in the distinction between public and private, subject of a number of urban representations as we shall discuss later. Norberg-Schulz marks the distinction between space and character as being of greatest interest. "Similar spatial organizations may possess very different characters according to the concrete treatment of the space-defining elements (the boundary). The history of basic spatial forms have been given ever new characterizing interpretations" (Christian Norberg-Schulz, 1976, p. 129).

The Multimodal Representations of Urban Space project is looking to explore these qualities of space with an eye to designing for them in a more informed way. The method for encouraging such multi-sensory multi-modal design is through the inscriptive practice of urban design, to create a notational system for describing the sensory experience of places.

Sensation in design

We have chosen, with our notational system, to take our cue from the phenomenology of Maurice Merleau-Ponty, a phenomenology of perception as opposed to the concern with being and experience explored by Heidegger. Merleau-

Ponty's phenomenology is "a matter of describing, not of explaining or analysing" (2002, p. ix).

Phenomenology is the study of essences; and according to it, all problems amount to finding definitions of essences: the essence of perception, of consciousness, for example. But phenomenology is also a philosophy which puts essences back into existence and does not expect to arrive at an understanding of man and the world from any other starting point other than that of their *facticity* (Merleau-Ponty, 2002, p. vii, authors' emphasis).

Merleau-Ponty, in his definitive work on the subject, *The Phenomenology of Perception*, defines the Sensation as being the basic unit of perception. This unit is described as being fundamentally different from a stimulus, that external cause for a sensation. We are, in our pursuit of the multi-sensory in urban design, dealing with sensations rather than stimuli.

The unit of perception is a useful abstraction (Merleau-Ponty, 2002, p. 9), and a knowingly convenient one. By considering the sensations experienced in a particular place and time, and under certain conditions, a more complete picture of the experience of that place is achieved. By surveying places such as a city square by notating the sensations at various salient points, or charting the fluctuating of perception along a given route, we aim to produce a pattern book in the fashion of Christopher Alexander. This toolkit is conceived of as akin to the sketching often carried out by architects when on site, in the field, or when travelling. By making a record of the experience of an urban space, it becomes available as a source, possible to replicate or modify. In this way, an architect or urban designer is given the opportunity to understand and record experiences for later reference, building their own Pattern Language along the way. "The visible is what is seized upon with the eyes, the sensible is what is seized on by the senses" (Merleau-Ponty, 2002, p. 7).

This active perception is particularly important, understanding perception as attentive rather than passive. Passivity is, according to James Gibson (1983, p. 33), one of the primary flaws in the understanding of perception in classic psychology, where controlled environments are used to test the senses as if they were reflexes, automatic reactions to stimuli. Gibson holds that the senses are much more than this, codifying his perceptual systems according to this more active seeking of sensation as opposed to a passive reception.

Gibson's work has been hugely influential in other fields with regards to his theory of affordances in design, but the perceptual systems are gaining favour with anthropological research into place and environment, such as Tim Ingold's *Perception of the Environment*. Ingold notes that there is no perception without context: that the act of perception is inextricable from where it happens, when it happens and under what conditions. A more poetic example can be found in the fiction of Italo Calvino, particularly *Mr. Palomar* and *Under a Jaguar Sun*:

In short, it would be all very well for you to sing: no one would hear you, they would not hear you, your song, your voice. They would be listening to the king, in the way a king must be listened to, receiving what comes from above and has no meaning beyond the unchanging relationship between him who is above and those who are below. Even she, the sole addressee of your song, could not hear you: yours would not be the voice she hears; she would listen to the king, her body frozen in a courtsey, with the smile prescribed by protocol masking a preconceived rejection (Calvino, 2001, p. 58).

The medium as alternative to space

A particularly important element to both Gibson and Ingold is the medium, be that air, water, or even earth. The concept of medium (Ingold, 2007b, p. 520) indicates that we are not placed upon some hard crust of the planet, but move through the air surrounding it, through the earth and mud or plunged wholly into water. This is more

than a semantic difference, as the consideration of medium is closely tied to that of context. We intermingle with our environment, our passage is marked by all manner of traces from footprints in sand or mud through to forensic traces of dust, fibres and shod skin.

To Gibson, the medium replaces space as a concept, given the implications of space as neutral, constant and unchanging. The medium is constantly in flux with changes in weather, pressure. This medium is accompanied by substances, those materials offering resistance and the surfaces which act as a threshold between them. Ingold further argues (2007b, p. 533) that the medium and surface are by necessity mingled and inseparable. For Gibson, the medium "permits the flux of light, it transmits vibration, and it mediates the diffusion of volatile substances" (Gibson, 1983, p. 14).

One of the most fundamental shifts in understanding offered by the research into sensory modality is this shift from space to medium. Space is the product of the geometric bias in urban design, often considered as a visual bias. The assumed visual bias takes account of few of the features of sight, concentrating upon form and Western perspective (itself a form of geometric projection), with assumptions of totality, fixity and permanence that an urbanism based on the medium would modify, temporalise and complicate. This feature of complication is essential: the geometric bias is a convenient abstraction, but it fails to take account of many of the things that happen in urban space. The movement of people is suggested, and many other effects from acoustics to wind and weather can be modelled based on a geometric basis, but these are not features of the traditional design process.

Score [experience] and plan [geometry]

This suggests a shift away from the totality of the plan towards scores, that is inscriptive practices which include elements of temporality. The root of the movement from space to medium is a move from the static view of space to a fluid and flowing understanding of experience. Plans and other orthographic projections are, of course, particularly useful diagrams, but operate at a level of abstraction from actual experience, which is a continuum, an unfurling of events in time.

The utility of the plan and section remains crucial to the pragmatic outcome of our investigations, being the forms of representation inherent and crucial to the contemporary practice of urban design. To throw orthographic projection out in favour of something entirely new would be to reject the thinking of the discipline entirely. A more useful approach, therefore, is to work with alternative notations, describing routes and locations within the conventional tools of urban design and architecture, building up a picture with reference to the fascinating work on image and navigation by urban theorist Kevin Lynch.

Lynch considers the imageable nature of several cities, and develops a survey methodology based on this idea of urban design and urban form in *The Image of the City*. A series of simple notations are devised in this work to describe fundamental elements of the urban fabric such as nodes, paths, edges, districts and landmarks. These can be used by the sole practitioner or as part of an extended community engagement.

This information is overlaid onto urban plans, and is used to study the perceived urban fabric, such as the relative strength of identity from one district to another or the presence of navigable landmarks.

Other examples of urban plan forms include the famous 1748 map of Rome by Giambattista Nolli, which depicts the differences between public space and private space through a number of simple codes. Private residences are shaded in, leaving open spaces in the blank white of the paper. Public buildings are rendered in a full floor plan,

showing the enclosure in more detail and marking its importance to the urban fabric. This clearly identifies these buildings as public space.

Similar ideas have been developed by a number of urban theorists and designers over the years, including Stanford Anderson's ecology of urban space (1986), where urban spaces are graded according to the level of public access from open streets and parks through general public shopping to more specialist shopping and institutions, to those exerting an "assertion of full social constraint" and the totally private. Accompanying notations describe the volume of pedestrian traffic on routes through line weight, and ecological diagrams.

These, and other recent systems such as that designed by Iain Simkins and Kevin Thwaites (2006) contribute to a notion that urban design operates with many levels of information from a variety of sources layered in transparencies. This layering is based off the plan or section, giving a grounding of geometric information, but augmented by descriptions of public and private space, use of spaces from commercial to residential and much more. It is, then, appropriate for our notation to become one additional layer to conventional drawings such as plan and section, working with all this other information rather than against it.

Sensory notation – An experiment

The notational system itself is only one part of the process, of course. Perception is, according to Gibson, an active process – one which relies upon attention.

The channels of sense are not subject to modification by learning. The data of sense are given, by definition. The perceptual systems, however, are clearly amenable to learning. It would be expected that an individual, after practice, could orient more exactly, listen more carefully, touch more acutely, smell and taste more precisely, and look more perceptively than he could before practice (Gibson, 1966, p. 51, and Malnar & Vodvarka, 2004).

Organising and giving form to this attention is crucial to the process, much like the attention given to the visual modality by an artist sketching, or the aural focus of a sound designer making field recordings. This process of perception is parallel to the practice of notation. The Sensory Notation system is being tested with the collaboration of groups of senior undergraduate and Masters students in a variety of disciplines from architecture, urban design, and anthropology. One team of students surveyed the High Street area of Glasgow, meeting to compare results at the end of the day. Two other teams conducted parallel surveys of the same area. The second team conducted a quality of life survey by means of interview and questionnaire. Team three conducted a broad literature review before going to the site, and compared their observations on the street to the theories they found.

This paper focuses on the sensory notation workshop, particularly the radar diagram method described below. The notations were conducted in two main ways. First of these was recording a route by taking a reading at either each traffic intersection or at specific timed intervals. The second notations were static recordings of a fixed place such as a square. Several sites around this place are recorded and plotted on a plan.

The notation progresses in the following order:

- Location: plot the site being recorded, whether a part of a route or a static position. Details such as time, date and weather may also be included.
- Descriptor: use a word from the list given to characterise each of the six perceptual systems: visual, aural, olfactory/gustatory, tactile, thermal, kinaesthetic.
- Priority: draw a line on the chart corresponding to the priority given to that perceptual system in this context.
- Corroboration: indicate how the senses overlap.
- Temporality: indicate the repetition, singularity, etc., of the observations.

By locating the site on a traditional drawing such as a plan or section, the notational scheme can be understood as a layer or transparency added to traditional modes of depicting urban spaces. This is an important step, as it identifies the process as part of the traditional toolkit, rather than completely alien to it. Additional information such as time, date and weather conditions are necessary for the future usefulness of the record, as the sensory data vary widely depending upon the time of day or the season.

TABLE I
Descriptor Chart for Sensory Notation. The aim is to provide clear terminology for additional description of sensory experience of urban spaces

DESCRIPTORS					
VISUAL	AURAL	TACTILE	KINETIC	THERMAL	CHEMICAL
Dark	High Pitch	Static	Strong	Hot	Weak
Bright	Low Pitch	Mobile	Light	Cold	Intense
Saturated	Quiet	Rough	Free	Dry	Stagnant
Neutral	Loud	Smooth	Bound	Wet	Fresh
Perspectival	Clear	Light	Indirect	Natural	Musky
Flat	Reverberant	Heavy	Direct	Artificial	Putrid
Intimate	Vocal	Porous	Level	Ambient	Floral
Vast	Non-Vocal	Resistant	Graded	Source	Fruit
Solid	Natural	Hard	Sustained	Radiant	Spice
Void	Artificial	Soft	Quick	Convective	Resin
Detailed	Attack	Warm	Crowded	Constant	Meaty
Blank	Decay	Cold	Empty	Responsive	Oily

The next step is to place a descriptor word on each of the six perceptual systems employed by the notation. These are chosen from a restricted and carefully selected list of words for each sense. There are dangers as well as advantages to this approach. By constructing a common vocabulary of tightly defined terms, the aim is to allow designers and others including clients to communicate with one another. Written language is of course as loaded as any inscriptive practice with hidden, even unintended meanings, and opens the notation to the critique that the results are influenced by the research team. The terms are chosen for their relative clarity and absence of metaphorical content (although this is impossible to avoid entirely). This precision of language finds its roots in Laban notation's Effort and Shape matrices (see Laban & Lawrence, 1947), where a very tight use of language helps to describe quite complex movements. Similarly, a lesser known system of dance and movement notation, Saunders Notation (see Hutchinson Guest, 1998, p. 10) utilises a matrix of words which can be selected and connected in a variety of ways. Additionally, names of things causing particular sensations such as traffic or wind may be added if the notator feels it necessary. This adds an extra level of description and helps to avoid confusion. The danger of colouring the results of the notation by supplying words is an issue for the training of notators, as it is in Laban notation. A commonly

understood definition can be reached for the descriptor terms within the context of the notation and used as a helpful shorthand. Indeed, language and text consistently come up as an ideal medium for describing sensory experiences due at least in part to their deep entrenchment within our culture.

The third step in the notation is the main graphic step: priority. This stage in the Sensory Notation system is personal by its very nature, but it offers a strong picture of each environment as well as suggesting immediate ways in which the environment may be changed. Notating priority consists of deciding which senses are engaged more potently, and hence are most affective and prominent. The senses are then ranked in order of priority rather than introducing artificial constructs such as the percentage of the sensorium devoted to that sense. The Radar chart is drawn with numbers from 6 to 1, outside to inside. The highest priority is placed at one, the least at six. There is flexibility within this, of course, allowing some senses to be placed at the same rank as each other, or the gulf between two perceptual systems to be depicted as larger or lesser as appropriate.

FIGURE 1 & 2
Sensory priority and corroboration between senses

Figure 1 shows a simple radar diagram with a visual and kinetic bias to the experience. Figure 2 is a similar radar graph, but the notation shows a corroboration between the visual and thermal senses. An example may be an impressive fountain which cools the air in a square.

The next step is to depict the corroboration between the senses by using a dashed arc between the different senses. These lines can contain a variety of data about this relationship, but the main thrust is to efficiently describe where these overlaps occur without overloading the diagram.

The final step recognises the temporality of the senses, and adds indications to the main Radar diagram lines of the quality of time inherent to that sense. This can be persistent, repetitive, singular, rhythmic or intermittent. This notation is not necessarily timed using chronological time, but rather recognises the phenomenological basis of the notation. The conceptualisation of time in this regard is experienced time rather than the precise clock time of the physical sciences.

Figure 3 shows the various line modifiers which can be applied to the radar diagram in order to designate the temporality of an experience.

FIGURE 3
Temporality modifiers to Sensory Notation diagram

The diagrams have then been collected and analysed in a number of different ways. The notations across a path or route can be stacked and layered, showing the sensory progression along a path through transparency. This allows the route to be understood in terms of how the senses change from one position along the path to another. This can aid in identifying the prominent sensory stimuli on each route, where there are deficits, and what makes this trail unique in character. Similarly, the static locations can be reviewed and understood, particularly where a body of people have taken a record of the same place under similar conditions. Layering results in this way shows sensory experiences which remain constant, those which have abrupt shifts in character, deficits in sensation, and rhythmic arrangements of sensory stimulation.

A case or an example: Observing Streets in Rome

By way of example, we shall present some notations of Rome made in July 2008 during a trip to the city for the IAPS Congress. The task was simple: to record locations routes using Sensory Notation, and to supplement this with a 500-1000 word written account of a sensory experience. This is not an attempt to say that all architects and urban designers must also be novelists or poets, but this text exercise can give useful contextual information, particularly when written with a simple reportage in mind. The text was to be written as flatly and plainly as possible, following the example of Georges Perec:

Observe the street, from time to time, with some concern for system perhaps.

Apply Yourself. Take your time.

Note down the place: the terrace of a café near the junction of the Rue de Bac and the Boulevard Saint-Germain

the time: seven o'clock in the evening

the date: 15 May 1973

the weather: set fair

Note down what you can see. Anything worthy of note going on. Do you know how to see what's worthy of note? Is there anything that strikes you?

Nothing strikes you. You don't know how to see.

You must write about it more slowly, almost stupidly. Force yourself to write down what is of no interest, what is most obvious, most common, most colourless (Perec, 1997, p. 50).

Force yourself to see more flatly (Perec, 1997, p. 51).

The notation proved remarkably flexible when used by the students, and several practical considerations of the notation emerged, such as the difficulty of drawing notation over a plan or section and the preference for placing numbered markers on the base drawing, with notations placed to the side of this.

One of the key decisions early in the development of the notation was to use it as a supplement to conventional drawing techniques. This additive quality allowed the sensory data to interact with the understanding of spatial relations offered by plan drawings, as well as the volumetric understanding of a section. Moving between plan and section drawings was extremely important to the notation, and this was a decision which reflected the students' understanding of the space. Routes were often understood in section rather than plan, underlining the three-dimensional and volumetric nature

of the route. Static places on the other hand were commonly rendered in plan. This allowed a number of positions around the space to be plotted and recorded using the notation. The relative positions were recorded on the plan, where the section is presented as a progression through space.

Case study excerpts

A variety of scenes can be captured using the Sensory Notation system. All of the examples below are drawn from a study of Rome for the Sensory Notation Handbook (Lucas 2010), and detail such sites as a delicatessen, a quayside festival, a fresh food market, and a streetside drinking fountain. These are short excerpts from longer descriptions, each accompanied by a detailed plan and section giving a location to each notated experience.

Volpetti Deli. I negotiate my way back to the cheese end of the main counter. The curved glass front is topped by a metal platform which is piled high with packaged goods. Behind this, the staff wait patiently to serve up whatever goods you select, or are busy slicing and preparing for someone else. The smell of the cheese is potent, with twists and balls of light mozzarella and ricotta on one side and large rounds or segments of pungent hard cheeses such as parmesan and pecorino on the other. In between, a variety of blue cheeses and soft cheeses take the stage. The cheese smells mingle with one another, of course, all the notes of the sensation combining in a fairly cacophonous manner, but a pleasurable scent should one enjoy eating that kind of food.

The second half of the counter has cured and smoked meat, with an array of joints in the cabinet and an even greater selection arranged in stainless steel shelves on the wall behind. I decide to buy some pecorino and parmesan cheeses, parma ham, smoked sausage, savoiardi sponges, and a couple of jars of fruit preserve. I select the items I am interested in and the chef hands me a ticket. My choice is prepared for me whilst I cross the store to pay at the cash register. Paying, I return to the counter to receive my goods, packaged in brown paper, waxed paper and, in the case of the cheese, vacuum sealed for the journey home.

Figure 4 shows the notation of Volpetti Delicatessen's cheese counter. The dark, intimate visuals are corroborated by the chemical stimulation of the cheese smells. The chemical channel on the diagram is finessed further with meat, cheese, and bread scents marked out as the key elements in this site. The kinetic sense is low priority, but characterised by restricted movement in the busy store. Aurally, the space is clear, the vocalisations of staff being the important sounds, similarly, the dry coolness of the environment is desirable, contrasting with the July heat outside.

Trastevere Quayside. The next section has a flea market flavour to it, each booth having a speciality. Some stalls are wide and open, with boxes full of disparate items ripe for the rummage. Others have a similar attitude to the fairground stalls, a narrow opening and a small selection of themed wares that don't allow the browsing and handling of goods, but force a conversation with the stall holder, who can then use his abilities as a salesperson to convince you the lurid fluorescent novelties on offer are precisely what you want. The power of the voice is key here, and stall holders draw customers in with low voices, keeping them in proximity with continued engagement. The curiosity stalls tend to have a much more aloof strategy, observing from afar and not intervening in the serious activity of burrowing into these boxes of unrelated and constantly surprising articles. This kind of stall is much more tactile than aural, and the owner relies on the sense of adventure, or the absurd, in convincing people to buy. Handling and comparing objects is key to this activity, and perhaps the decision is more personal: who could fathom peoples' needs or desires for such old vinyl records, broken tin toys and well thumbed comics.

FIGURE 4
Notation of Volpetti cheese counter

FIGURE 5
Notation of Trastevere quayside

Figure 5 shows the one notation of the Trastevere quayside. The visual dominance is shown to be sharply shifting, with a jarring temporal quality lent by the carnival atmosphere of the flea market and food stalls. Movement is important, with a rhythm apparent to the flows of other patrons in the narrow band of walkway available. The aural character mirrors the shifting of the visual, but with a softened effect: sounds fade into one another more organically. There is no corroboration here, each sense seemingly excited in isolation.

Market, Via Cola di Rienzo. The goods are vibrant in colour, fresh and ripe, sitting in plain cardboard boxes, palettes and crates. Small signs are posted in each box with the name of the fruit and the price per kilo. The fruit stall to the left has a strong arrangement of smells, not overpowering, but subtle and varied. This level of olfactory interest attracts more of my attention and I am drawn to the display, buying some fruit to keep me going later in the day. I choose the fruits by picking them up and selecting the ones I want from those available. The fruit is cool to the touch, some smooth others dimpled, and yet more of them rough. The firmness of the fruit can be tested, the weight in the hand and other indications of quality and freshness all quickly assessed by balancing in the hand.

Across the centre aisle is a similar stall selling vegetables. Again, a subtle combination of smells fills the air, fresh, herby at times, pungent garlicks and watery salad leaves. It is the detail that fascinates rather than the power of the smells. The colour is more uniform here, white and green predominates, slowly giving way to purples and then red, green, yellow peppers. The skylights let in sufficient light without being too bright, and there is a gentle hubbub to the place, enough noise to indicate activity, with the occasional conversation between buyer and seller.

FIGURE 6 & 7
Notations of fresh food market, Via Cola di Rienzo

Figures 6 and 7 show a fruit stall and a vegetable stall at the market on Via Cola di Rienzo. The important corroboration between the tactile and chemical senses shows

how the fresh fruit (Figure 6) and vegetables (Figure 7) are chosen. This is a situated and repetitive activity.

Tridente. The standing fountain is set against a wall, badly weathered and constantly flowing with a quiet trickle into a drain. The fountain is distinctly tactile, the domed top seemingly polished by hand contact, the spout at a low level meaning I have to bend over to place my bottle there. The slow flow rate makes me rethink this and I crouch properly rather than bending from the waist, being able to hold this position for much longer. A salty deposit climbs up the fountain, with green algae around the damp base. Damp also rises up from the block paving into the plaster wall. This doesn't smell too bad, but there is a stale smell to the air.

The water itself is clean and clear, refreshing and revitalising. The pause is also welcome, given the rising heat of the day.

FIGURE 8
Notation of streetside drinking fountain, *Tridente*

Figure 8 shows a streetside drinking fountain in *Tridente*. The experience is strongly corroborated, with the senses overlapping and validating one another. The experience is also situated, a pause in the route. The thermal sense is excited by the relief from the city heat, whilst the thirst quenching taste of the water is noted by the importance of the chemical sense. This is a relatively unprepossessing fountain, a simple stand pipe with masonry basin set into the ground, yet an important feature in the city.

Conclusion

There is a great deal of power in representation. The form a representation actually takes is particularly telling on the thought processes involved, as these are far from neutral: representation is understanding something by reproducing it. In much the same way as a painter, no matter how much realism is attempted, cannot hope to entirely capture every detail in a scene, choices must be made. The choices of what to

leave in and what to omit are central to all acts of representation. This problematises our entire endeavour of producing a notational system for the non-visual sensory modalities. This problematic does not, of course, mean that we ought to abandon the project, but rather that we remain mindful that every decision on how to represent influences what we actually record and depict.

Our project asks if there is something inherent to design that marks it out as a visual discipline. The majority of tools we use to design are visual, drawings and models are all representations of the way something looks on one level. Of course there is more to the traditional representations than this, and drawings such as plans depict the relationships and thresholds between areas, section drawings tell us a great deal about volumes and massing, but the information is fundamentally visual. One reason for this is the false totality presumed by visual representation. The second most common sensory modality is distinctly temporal in its nature: sounds take time to play out, so a sound cannot ever be apprehended as a whole. Visual representation of sound, such as musical notation or waveforms are one aid to this and it is possible to compose a score working entirely with the notation, or to mix samples viewing the waveforms and matching them up (Lucas, 2009).

The totality available through visualisation is what makes it such a valuable tool for design. It is, of course, possible to design sound or other context-dependent sensory environments through experimentation and physical manipulation of stimuli in a space, but this is ultimately much more expensive and time consuming, requiring a great deal of equipment and technology to achieve the flexibility offered by a blank sheet of paper.

References

- ANDERSON, S. (1986). Ecological model of the urban environment. In S. Anderson (Ed.), *On streets* (pp. 1-11). Cambridge, MA: MIT Press.
- BACHELARD, G. (1994). *The poetics of space*. Boston, MA: Beacon Press. (Original work published 1958).
- BRODSKY LACOUR, C. (1996). *Lines of thought*. Durham, NC: Duke University Press.
- CALVINO, I. (1999). *Mr. Palomar*. London: Vintage. (Original work published 1985).
- CALVINO, I. (2001). *Under the jaguar sun*. London: Vintage. (Original work published 1988).
- GIBSON, J. J. (1983). *The senses considered as perceptual systems*. Westport, CT: Greenwood Press. (Original work published 1966).
- HOLL, S., PALLASMAA, J., & PÉREZ-GÓMEZ, A. (2006). *Questions of Perception: Phenomenology of Architecture*. San Francisco, CA: William Stout Publishers.
- HUTCHINSON GUEST, A. (1998). *Choren-Graphics*. Amsterdam: Gordon & Breach Publishers. (Original publication 1989).
- INGOLD, T. (2000). *Perception of the environment*. London: Routledge.
- INGOLD, T. (2007a). *Lines: A brief History*. London: Routledge.
- INGOLD, T. (2007b). Earth, sky, wind and weather. *Journal of the Royal Anthropological Institute N.S.* (special issue on 'Wind, life, health: anthropological and historical perspectives', C. Low & E. Hsu, Eds.), S19-S38.
- LABAN, R., & LAWRENCE, F. C. (1979). *Effort* (second edition). Slough: Macdonald & Evans. (Original work published 1947)
- LUCAS, R. (2009). The sensory experience of sacred space: Senso-Ji and Meiji-Jingu, Tokyo. In *MONU: Magazine on Urbanism, Vol. 10: Holy Urbanism* (pp. 46-55). Rotterdam: Board Publishers.
- LUCAS, R. (2010). *Sensory Notation Handbook: Multimodal Representations of Urban Space*. Outcome of the AHRC/EPSRC Designing for the 21st Century Research.
- LUCAS, R., & MAIR, G. (Eds.) (2008). *Sensory urbanism proceedings 2008*. Edinburgh: Flâneur Press.
- LUCAS, R., & ROMICE, O. (2008). Representing sensory experience in urban design. *Design Principles and Practices: An International Journal*, 2 (4), 83-94.
- LYNCH, K. (1990). *The image of the city*. Cambridge, MA: MIT Press. (Original work published 1960).
- MAINAR, J. M., & VODVARKA, F. (2004). *Sensory design*. Minneapolis, MN: University of Minnesota Press.
- MERLEAU-PONTY, M. (1968). *The visible and the invisible*. Evanston, IL: Northwestern University Press.
- MERLEAU-PONTY, M. (2002). *Phenomenology of perception*. London: Routledge. (Original work published 1962).
- NORBERG-SCHULZ, C. (2007). The Phenomenon of Place. In M. Larice & E. Macdonald, E. (Eds.), *The Urban Design Reader* (pp. 126-137). London: Routledge. (Original work published 1976).
- PALLASMAA, J. (1996). *The eyes of the skin*. London: Academy Editions.
- PALLASMAA, J. (2005). *Encounters: Architectural essays*. Helsinki: Rakennustieto Oy.
- PEREC, G. (1997). *Species of spaces and other pieces*. London: Penguin. (Original work published 1974).
- PINK, S. (2004). *Home truths: Gender, domestic objects and everyday life*. Oxford: Berg.
- SIMKINS, I. M., & THWAITES, K. (2006). *Experiential Landscape. An Approach to People, Place And Space*. UK: Taylor & Francis Ltd.
- VAN NES, A. (2008). Adjacency, Permeability & Inter-Visibility: micro scale spatial analyses tools for revealing the private-public space relationship and its impact on urban safety. In R. Lucas & G. Mair (Eds.), *Sensory Urbanism Proceedings 2008* (pp. 172-179). Edinburgh: The Flâneur Press.