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Hohl, Michael

Beyond the screen: visualizing visits to a website as an experience in physical space

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Michael Hohl, Ph.D., Dipl.-Des.

CCI / Art and Design Research

University of Hertfordshire

College Lane Campus

Hatfield, Hertfordshire

United-Kingdom

m.hohl@herts.ac.uk

+44.1707.285328

[http://sitem.herts.ac.uk/artdes\\_research/ind.html](http://sitem.herts.ac.uk/artdes_research/ind.html)

### **Biographical data**

Michael Hohl began with a very traditional three-year apprenticeship as a graphic-designer in the town of Ulm, Germany and graduated in 2000 with a Diploma (MA) in Digital Media Design from the University of the Arts, Berlin. He worked as a media conceptionist beside his studies and holds an interdisciplinary Ph.D. between fine art and computer sciences from Sheffield Hallam University. He is a research fellow at the Art and Design research department (CCI) of the University of Hertfordshire in Hatfield, UK, exploring telematic visualisation technologies in physical space.

**Keywords:** information visualisation, non-visual multi-modal visualisation, emotional design, user experience, ambient displays, awareness displays, presence indication, calm technology,

### **Beyond The Screen: Visualising Visits To A Website As An Experience In Physical Space**

Research position paper: circa 5000 words.

# Beyond The Screen: Visualising Visits To A Website As An Experience In Physical Space

*“Form follows emotion”*

Lev Manovich, 2007

## Abstract

This text describes an applied investigation into a concept of information visualisation where data<sup>1</sup> is not rendered as graphs, charts or diagrams on the screen but as a sensual experience beyond the screen in physical space. It introduces predecessors such as *calm technologies* and *ambient displays* among a number of poetic and applied examples from related backgrounds to establish the context and relevance for communication design and graphic design, and proceeds with presenting a current research undertaking in which the social activity of visiting a website is visualised in multiple sensorial modalities in real-time in form of a kinetic and sensual display.

## Introduction

In 1991 Marc Weiser wrote *“The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.”* (Weiser, 1991) With this idea of Weiser the concept of ubiquitous computing emerged; a world of “intelligent” objects exchanging data with one another and in which this network of objects is superseding a centralised computer.

Another idea that Weiser introduced was that of information being displayed at the periphery of perception, and thus distinguishing between a centre and a background for digital information. He used Natalie Jeremijenko’s work *“Dangling String”* (Weiser, 1995) as an example of what he described as calm technology. The artist had attached an eight foot long plastic string to a small electric motor fixed to the

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1 There is a problem involved in using the term “data.” We cannot speak in such an abstract way of data as such although digitisation makes it appear this way. Data is information on different layers. Data, or the information into which the designer transforms it, is not neutral, it is political, it has a

ceiling which was connected to an ethernet cable. By visibly and audibly whirling around at different speeds the string indicated light or heavy ethernet traffic. From this example Weiser concluded that digital information did not necessarily had to be confined to a computer screen but could include everyday objects, describing this application as "*fun and useful.*" These "*calm technologies,*" he wrote, possibly were the "*key challenge in technology design for the next decade.*" His argument was that there was a growing need for calm technologies as a result of information technology more often being the enemy of calm with mobile phones, email, pagers and the web inundating us with information. He observed that the difference lay in the way in which each engaged our attention. Especially his association of information technologies becoming "*fun and useful*" where a prediction for future developments.

Both of Weisers concepts, that of ubiquitous computing and peripheral perception were later explored by Hiroshi Ishi and The Tangible Media Group at the MIT Media Lab. Here the terms "*tangible bits,*" tangible computing and ambient media were coined. Ambient media (Ishi et. al, 1998a, 1998b) were seamless interfaces integrating people and digital information through interactive objects. In the process this led to research into ambient displays that could convey more complex information. These ambient displays were displays that resided in the background, unobtrusive, not interrupting the attention of humans but were available when needed such as a clock upon the wall at the periphery of human perception.

Since then the design of information technologies has moved on further. Media theorist Lev Manovich observes in retrospect that instead of the computer becoming invisible, as had Weiser predicted, in fact the opposite had taken place. Today, so Manovich, we were surrounded by interactive devices such as Laptops, iPods, mobile phones and handhelds yet the interaction with them had changed. It was "*treated as an event [...] a carefully orchestrated experience.*" resulting in a "*theatrisation*" of information

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meaning, an agenda; sender and receiver bringing with them history and context.

technology design (Manovich, 2007). Usability expert Donald Norman, advocating “simplicity” in the past, also modified his attitude towards the affordances of information design when he wrote “*attractive things work better because it is more pleasurable to engage with them*” (Norman, 2004). It appears that within less than two decades the principles underlying the design of interactions have become much less about *calm* and *invisibility* than about celebrating the interaction with the device itself; emotion, experiential quality and bold visibility have become central to the consumer as well as to the design process. We can see an example of this in that some mobile devices may look most sexy when *not* in use and their appearance is as seductive as a Handschmeichler<sup>2</sup> inviting touch while simply lying on a table. The form of the mobile device having an aesthetic appeal and experiential quality that attracts us beyond its utilitarian functions.

### **From visualisation to transformation**

Another aspect related to our investigation is the relationship between digital technologies and visualisation. Software applications permit not only to visualise data but to transform it in entirely new and unprecedented ways.<sup>3</sup> They allow us, for example, to dynamically switch between different types of representations and sensory modalities, such as sound into visuals or visuals into sound, while achieving this in real-time. Software applications that organise and play music, such as iTunes, often offer visualiser plug-ins that perform these types of visualisations. Here certain properties of the sound such as pitch and beat are transformed in realtime into animated visuals upon the screen. Often such a visualiser incorporates multiple visualisation styles which then are successively synchronised with the playing music on the screen. Sound thus is transformed in an instance into animated colours of a particular graphical style upon the screen. The same process is also possible in the opposite direction with a stream of images being

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2 Handschmeichler, Noun, German for an object that flatters the hand and is a pleasure to touch similar to a stoneegg.

3 The websites Information Aesthetics <http://infosthetics.com/> and Visual Complexity <http://www.visualcomplexity.com/vc> have many examples of novel and

translated into sound. An application of this is helping visually-impaired people to orient themselves in space by learning to “see”<sup>4</sup> via their sense of hearing for which a period of adaptation is necessary. Potentially these transformations remind of synæsthesia, a neurological phenomenon where subjects can experience colours as taste, music as colours, amongst others. Other transformations from one sensorial modality to another extend from the screen into physical space. An example for these is a non-interactive installation called “Mori” (Wilson, 2002, 241, 531) created by Ken Goldberg, Randall Packer, Wojciech Matusik and Gregory Kuhn. Here a seismograph measures the constant movements of the earth’s crust in Berkeley, California. This seismographic data is used in an installation piece in two ways, as an animated curve on a screen and additionally it is transformed into a constantly changing low frequency sound reverberating within the space. This allows the visitors not only to see the imperceptible constant trembling of the earth’s crust around the San Andreas fault as an abstract graph on a screen, but actually *feel* it applied as a visceral physical experience with their whole body as the sound reverberates within the exhibition space.

For visualisation purposes these new technologies provide entirely new opportunities for designers. Large amounts of data can be transformed in an instance into multi-modal renditions that can make complex relationships clear. Although new and revolutionary this type of “non-visual multimodal visualisation” or *mapping of data* has received more attention from the arts than from information design – although it is of high relevance here. Traditionally graphic designers and communication designers visualise raw data into meaningful information – making the complex clearer and more comprehensible. Lev Manovich referred to this extended sense of data visualisation in his 2001 essay “The Anti-Sublime Ideal in New Media” (Manovich, 2001) where he describes the

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surprising applications of visualising data in creative ways.

<sup>4</sup> vOICe (Vision technology for the totally blind) is a software transforming live video images into sound: <http://www.seeingwithsound.com/> accessed 2008.09.23

possibilities of "mapping data" as "one of the most fruitful research directions in new media art."

The following text describes our investigations into sensual natural displays and why, especially through Web 2.0, XML, RSS and media-convergence, this intrinsic relationship between mapping, visualisation/transformation and interaction design may become more relevant for graphic design/communication design as well.

### **Ambient displays and sensual displays**

Historically ambient displays are employed to visualise non-critical mostly abstract information at the periphery of the users attention, interfering as little as possible with primary tasks. Nevertheless, since the "Dangling String" described above, there can be made a distinction between those that either are primarily an aesthetic experience or those that provide an informative solution. Ambient Orbs<sup>5</sup> for example, highly decorative frosted glass spheres that can change their colour through remote signals to display realtime trends. The owner can choose among various data such as a specific real time stock market trend, traffic report or weather forecast changes of which are indicated in different colours such as red, green or yellow. With a quick glance at the orb its owner can check the current trend for the specific data that is displayed. A more sophisticated customised display is "Firefly/Butterfly" (Nesbitt, 2007) which resembles a colourful naïve painting hanging on a wall. Here minute details such as the number and position of dragonflies and butterflies visualise one particular stock market trend over time for several intervals. While the Ambient Orb is a tangible, playful object with a highly aesthetic appeal it has a low resolution of data. Only no change or general trends are indicated without a finer graduation of data. "Firefly/Butterfly" on the other hand provides much more information and is primarily an informative solution, however in a playful disguise. Both require an introduction into their "code" without which they content of the

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<sup>5</sup> Ambient Orbs <http://www.ambientdevices.com/cat/products.html> accessed at May 5th 2008.

information remains unclear.

### **Bits and People**

A balance between aesthetic experience and informative density is introduced with our display indicating network activity ("bits") together with presence and activity of individuals within a room ("people"). This project "bits'n people," conceived in collaboration with Björn Barnekow, visualises activities inside a class room of the University of the Arts Berlin in the form of a light and sound installation in the hallway outside of the room. While approaching the room this visual and acoustic "window" allowed to determine how active the network was, the number of computers in use, if there were people moving within the room, if it was noisy inside and if it was very dark inside (likely indicating that a presentation was taking place and late arrivals would have to enter quietly).

A range of visual and audible signals were developed functioning as indicators for different activities. The assumption was that members would over time *intuitively* begin to associate the overall state of the sound installation with the atmosphere inside. It should not require a manual to understand the meaning of each individual signal although this was possible. If there was motion or noise inside the room, the installation would indicate this by agitated expansion and contraction of the visual indicator bars (Figure 1) In that manner physical motion inside the room was indicated by visible activity of the installation outside. Any "digital" activity was indicated by the update frequency of the visual bars. Other digital activities such as visits to the class-website, computers in use and other TCP/IP traffic would be represented by sounds resembling question and answer motifs that updated itself every 15 seconds, the time it took to approach the room through the hallway. A Shockwave file embedded on the class' homepage would be mirroring the same activities visually and audibly with the head-banner of the class homepage (Figure 2).



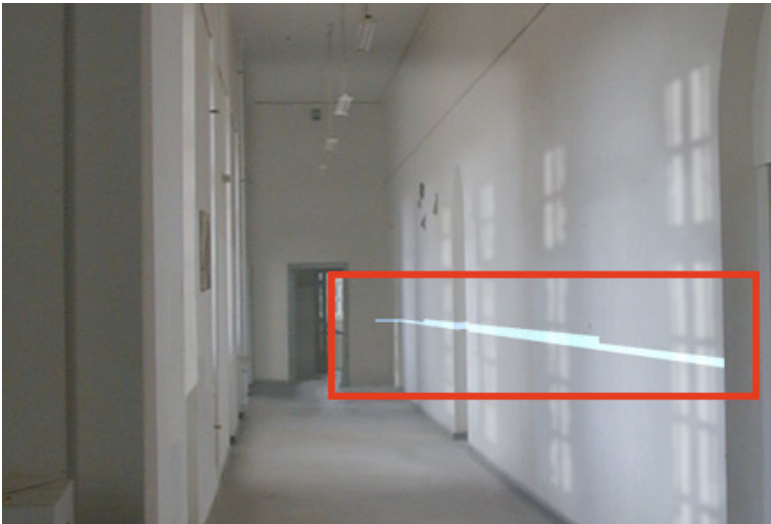


Figure 1: Barnekow, Hohl 1999, "bits'n people:" Activities inside the classroom such as motion, noise, and light as well as network activity and running software applications would be visualised in realtime in a light and sound installation.

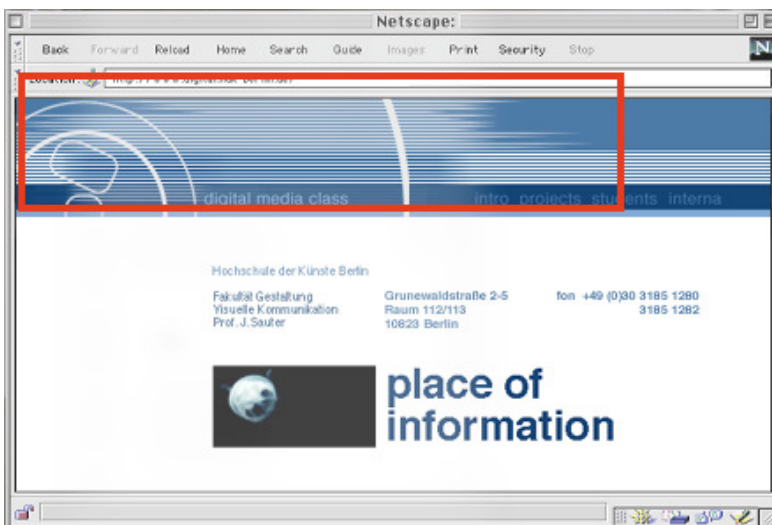


Figure 2: Barnekow, Hohl, 1999, "bits'n people:" Activities inside the classroom are additionally mirrored on the class homepage. Identical sounds and animated visuals are embedded within a shockwave movie to which the control data is streamed.

"Bits'n people" attempted to find a balance between an aesthetic experience while also providing a rich source of useful information for those initiated and able to "decode" its information. The scope of our following research program lies mainly in the transformation of social data into an experience and is less about accurately visualising complex

multi-layered abstract information in rich detail as in 'bits'n people."

## **The WebPresence project**

Since the rise of Web 2.0 the communication between the author of a blog and the audience has become almost ubiquitous and instantaneous. Anyone connected to the Internet via mobile or stationary computer can create a personal blog with only a few mouse-clicks and publish his or her thoughts in an instance; a reader can respond just as easily to a posting by using a "comment" function. Both, author and reader, can keep track of any responses to this particular text-entry, new posts or comments to comments, via RSS feeds or automated mail functions. The web-based service Feedburner<sup>6</sup> even allows to keep track of responses by other blogs. As media are converging this also extends beyond the web to mobile devices and vice versa. They allow authors to keep track of, manage and react to popular blog-entries with easy-to-use statistical tools. Additionally these tools can visualise numbers of visitors, how long these have stayed on overall and on which pages, which other sites linked to which entry and also the kind of internet clients visitors have been using. Where useful this data is visualised in the form of maps, graphs, charts or diagrams. What these statistics have in common is that they are abstract and anonymous. They show little awareness of the individuals visiting that website, or of the act of visiting as such. They are statistics of the recent past - not of the present. This appears somewhat paradoxical: While the voice of the blog and the communication amongst author and visitor often are warm and personal these statistics do not convey this kind of closeness. Additionally these graphs and charts are usually examined asynchronously at a later date. Indicators showing that a visit is taking place at this very moment are usually limited to displaying the number of "members online" on some websites.

Besides the usefulness of Web 2.0 technologies, it appears that they are far from being calm technologies in Marc Weiser's sense. They demand action, they involve and may also overwhelm some users by adding another

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<sup>6</sup> Feedburner.com is a service for "media distribution and audience engagement for blogs and RSS feeds."

layer of complexity. We suggest that there should be other possibilities, beyond statistical visualisations or textual communication (such as Twitter's "tweets" or Facebook's "Friends Feed") that create an awareness of the individual visit, of the presence of a visitor, in real-time. The aim is to create a sense of connectedness between author and visitor without being intrusive in the sense of an ambient display. We see this as a mostly aesthetic experience; ephemeral, sensual and emotional, taking place beyond the computer screen in physical space in form of a natural display. "Natural" in this sense refers to an ephemeral background activity such as, for example, a breeze or the sound of trickling water that can be perceived as natural occurrences and which easily embed themselves into a working background without being overly intrusive.

Why is this relevant? We live in a visual culture that emphasises visibility. To a degree it does so to the detriment of our other senses which are neglected, although we perceive the world around us with *all* our senses and not merely the visual one. The goal of WebPresence is not to provide yet another channel of intrusive communication but to leave the visibility of the screen behind and explore an alternative to "dry" and abstract statistical data in a more sensual, natural and perhaps also ambiguous manner.

This also involves the appropriate mapping or transforming of the remote activity. What does a visit to a website sound like? The "visit" is a metaphor and not taking place in our physical world. It consists of bits being exchanged between client and server. The "visitor" remains at her geographically distant location - while the visit to the website is only a virtual one. How can such a virtual event be represented? What does it look and feel like? The problem reminds of the Zen Koan investigating what one-hand-clapping sounded like. On a conceptual-artistic level we treat the website as a digital representation of the "real world" office space. This context provides the basis for various iterations of mappings or transformations. A visit to a physical place consists of numerous deeply engrained cultural rituals and habits. What we may

associated with it can be a temporary draft caused by the opening of the door that moves curtains or rustling papers on the table. Though not consciously aware we may associate these and other occurrences with a visitor arriving at an office space. The goal of the research is to create a number of different mappings in various iterations to understand how their distinct sensual properties and mapping metaphors are perceived over time, what their benefits are and how what we can learn through them.

Among our initial research questions are: How much transparency is useful? How much opacity is necessary? Which indicated states are meaningful for recipients? How context relevant or activity related is subjective experience of ambient versus intrusive properties? How do these change over time? What are the most transparent mappings for conditions and actions? How direct do these mappings have to be to be perceived as meaningful? How will recipients' perception of the installation change over time through exposure? Will it be necessary to create variations in regular intervals to prevent users from numbing to the experience? What will its long term benefits be?

We are in the process of developing an installation piece that the activity it represents reminds of an actual visit to the main space from which the website is updated. In its current basic stage it consists of a curtain that is moving in the simulated breeze of a fan which is actuated every time a new visitor arrives at the website. The motion of the curtain simulates the motion that would be caused by an actual visitor opening the door of the room and creating a temporary draft; thus metaphorically representing a visitor in our physical space. A aesthetic notion that links the virtual visit to a physical one.

As mentioned earlier this type of visualisation is not intended as a substitute for the analysis of daily web-statistics but instead pertains to a completely different, a more emotional area. It aims at creating a fleeting, ephemeral experience, a sensual bond and connection between the space of the individuals maintaining the website and the anonymous

remote person that visits its virtual embodiment: its website. Our aim is to create something new, beyond the intrusiveness of synchronous communication or the asynchronous utility of graphs and charts. The latter are serving their own purpose of recording and displaying crucial information over time which which again is analysed leading to necessary actions. With Webpresence individuals have experiences of telematic connectedness, presence and awareness that draw their vivid experiential quality from the live-character of the fleeting ephemeral moment.

We aim at investigating the perception of various iterations of natural displays and how they are perceived by individuals. Some will involve cumulative data in the sense in that each visit will add to a quantity and, e.g. water, will accumulate over time. Our goal is to gain a better understanding of the relevance of, among others, how the *ambiguity* of the medium is perceived. A regular draft could also cause the curtain to move and the the information conveyed is not clear. The individual has to trust his or her senses differentiating between the natural motion and the artificial motion. *Redundancy* of ambient visuals and sound will also play a crucial role in our investigation. As we use a fan to animate the curtain an additional sound will accompany the motion, reinforcing the visual and sensual signal. The key affordance of our displays being that they are an application of calm technology aspiring for properties of ambient displays. These properties being that they are perceived as aesthetic, unobtrusive and not interfering with primary tasks taking place.

## Discussion

**Why is this relevant for graphic design / communication design?** The proposition is that while visualisations such as diagrams, maps, graphs and charts can achieve their purpose well in making complex information accessible and clear, there are an increasing number of events, where it may be useful to actually experience the information sensually and emotionally in physical space, as an alternative to an abstract and cognitive intake. Many of the utilitarian devices we use have increased emotional aspects of engagement. It provides a novel way of connecting with geographically remote people and create an experience of closeness and connectedness. This may not apply to most types of data but may become more relevant as a result of media-convergence, social software mash-ups such as Twitter, online data sharing and storage and other real-time information from online databases which mostly relate to individuals, relationships, activities and geographical locations. It is in this emerging area where data is conflating the physical world with the web or Internet and also changing our sense identity. When so much of my personal data is located all over the web - the web is becoming and extension of myself.

Graphic designers and communication designers have the experience of visualising data in that it becomes useful information. We believe that graphic designers have had to be "chronic generalists" and may easily expand their proficiency into this new arena. By that we imply that by working closely for and often with statistical or scientific data they not only have to understand the origin of that data, but also acquire competence and understanding of its relevance to properly structure the desired outcomes for various audiences. Charles Eames, for example, became so proficient in mathematics during the one year conceptual phase of the exhibition "IBM mathematica" opening in 1961, that the consulting mathematicians stated that he could easily have made a career in mathematics.<sup>7</sup> Occasionally complex topics may require adequate or

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<sup>7</sup> Eames, Charles, Eames, Ray (1961, 2000), "IBM Mathematics Peep Shows" (1961, 12 min. Film) on "The Films of Charles and Ray Eames" V.4 DVD,

diverse media such as film, others as a story, photography, an essay, a diagram or a website. This not only requires a deep and sophisticated insight into another discipline but also a broad knowledge and skill in various software applications from 3D modelling, programming scripts such as Flash, Macromedia Director, Maya, Adobe AfterEffects or processing for enlightening animations/visualisations that model data over time. E.g. true anatomical visualisations cannot be made without knowledge in anatomy.

Recently software applications such as Processing<sup>8</sup> have become available that are used less as a readymade tool such as Photoshop with its constraints and limitations, but actually permit to create own software applications with real control over this application. This also permits control of all aspects in which raw data can be visualised. Other platforms provide an application programming interface (or API) which permits software applications to syndicate content provided by another software application. This allows programmers to easily create new extensions and adaptation of complex existing services. We see examples of this in Google Maps, Google Earth, Flickr and others where application have been created in relatively short amounts of time that enhance these. An example of what open API's allow we see in the web-based application Twittervision by Dave Troy. Troy is a programmer and webdesigner based in Baltimore. He created screen-based applications such as Twittervision (2007) and Flickrvision (2007) which both use other application services to augment live data in their geographical context upon a map of the world. Twittervision makes use of the service Twitter, a web-based message-board to which people send short text messages from mobile devices and to which their friends subscribe. This creates many individual streams of messages from remote friends letting people feel connected to their social network, the main purpose of this is to easily give notice of whereabouts, moods and plans to many friends

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8 Processing is a software development platform developed by Casey Reas and Ben Fry inspired by MIT Media Lab's John Maeda. "It targets an audience of computer-savvy individuals who are interested in creating interactive and visual work through writing software but have little or no prior experience."



at once. Troy's application combines the stream of personal messages from Twitter with the maps of Google Earth, thus setting them in a geographical context. Through this felicitous mapping he creates a vivid and exiting experience by merging two existing services in a novel way.

### **How can graphic designers/communication designers can contribute to visualising information in three dimensional representations?**

We believe that graphic designers/communication designers have a large benefit to get involved in this area: They know how to visualise complexity and understand intractable problems. My interest is about raising awareness for the concept of visualising data into a sensual experience as opposed to a manly cognitive one; and which this newly emerging area related to software development and rapid prototyping technologies rely on the experience and skill of graphic designers. Here the design process is about emotion, vivid, visceral feelings and excitement, experiences that verbose texts and numbers do not so easily achieve. The goal is to employ properties of realtime information to delight, excite and involve by making the information conveyed more memorable. We want to demonstrate that some types of information become more vivid, meaningful and accessible through a visualisation beyond the screen in form of a sensual/sensuous experience. Graphic/communication designers have the interdisciplinary skills and knowledge. This could be an avenue to expand the historical practice of information visualisation beyond paper, time and the screen into physical space and thus create a more comprehensive media experience and broader area of practice.

### **What does this mean for the field? Some conclusions for broader implications for this field of design.**

Emotional design plays an increasing role in our engagement with media. These pleasurable, sensual and emotional experiences have to be designed. Together with media convergence, mash-ups and the proliferation of social media we assume this type of information visualisation will become increasingly relevant to designers. Especially

for graphic designers and communication designers working with web-based data, social data and realtime data which could be presented upon ambient displays (indicating for example presence, activity, availability of members of a collaborating team of geographically remote individuals). This could also include sensual displays that display virtual activities such as sales statistics, website traffic, blog entries, keyword alerts and such. Familiarity with computers and software programming together with increased accessibility of rapid prototyping tools such as the Processing programming environment and the Arduino<sup>9</sup> hardware platform.

Above we have seen that through media conversion, the Internet, mobile media, locative media and social data are merging, leaving the screen behind and extending beyond the screen into physical space, into peoples lives. Additionally information technologies have not become invisible but have been transformed into carefully designed emotional experiences (which already begin by unwrapping a device from its packaging). The latter combined with an abundance of social and locative data can provide a rewarding area to be visualised and analysed for relevance. This requires felicitous mappings/transformations for people/friends, locations, relationships and messages - an area traditionally the domain of designers. Some of this data may be verbose and screen-based whereas other data may require ambient or sensual displays. Together with the yet under-explored field of non-visual multi-modal visualisation or mapping of data from one sensorial modality to another this creates a rich field for novel visualisation methods.

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<sup>9</sup> Arduino is a micro-controller board and a software environment to program this micro-controller. It allows to create rapid prototypes for sensors and actuators connected to a computer and is also accessible with Processing. Arduino is an open-source initiative and available at <http://www.arduino.cc>

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