

Calm Technologies 2.0: Visualising Social Data as an Experience in Physical Space

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KEYWORDS *Ambient displays, awareness displays, calm technology, emotional design, multi-modal displays, presence indication, ubiquitous computing, user experience*

ABSTRACT In this paper we present our research into the next generation of calm technologies utilizing information visualization where data is not rendered as graphs, charts, or diagrams on the screen, but as a sensual experience in physical space. It introduces a number of examples to establish the context and relevance for communication design and proceeds with presenting our current research framework in which the social activity of visiting a website is visualized in real-time, in the form of a natural and sensual display. The paper argues that a mediator between us and an overly intrusive Social Media such as Twitter, Friendfeed, and the approaching “realtime web” is needed. This mediator should have minimal and reduced cues of expression while not sacrificing the warm and personal voice of a web-blog.

“*Attractive things work better.*”¹ — Donald Norman

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.”² With this idea, the concept of ubiquitous computing emerged—a world of “intelligent” objects exchanging data with one another and in which this network of objects superseded a centralized computer.

Another idea that Weiser introduced was that of information being displayed at the periphery of perception, and thus distinguishing between a foreground and a background for digital information. He used Natalie Jeremijenko’s Dangling String³ as an example of what he described as “calm technology.” The artist attached an 8-foot-long plastic string to a small electric motor fixed to the ceiling, which was in turn connected to the Ethernet. By visibly and audibly spinning around at different speeds in the hallway the string indicated the volume of ethernet traffic. From this example, Weiser concluded that digital information did not necessarily have to be confined to a computer screen but could include everyday objects, and

he described this application as “fun and useful.” These “calm technologies,” he wrote, were possibly the “key challenge in technology design for the next decade.” He argues for a growing need for calm technologies as a result of information technology 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 engages our attention. In particular, his association of information technologies becoming “fun and useful” was a prediction for future developments.

Weiser’s concepts of ubiquitous computing and peripheral perception were later explored by Hiroshi Ishii and the Tangible Media Group at the MIT Media Lab. Here the terms *tangible bits*, *tangible computing* and *ambient media* were coined. Ambient media⁴ 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 than something like the dangling string. These ambient displays reside in the background, similar to a clock on the wall at the periphery of human perception, not interrupting the attention of humans, but available when needed.

Since then, the design of information technologies has moved on. Media theorist Lev Manovich observes, in retrospect, that instead of the computer becoming invisible, as Weiser had predicted, the opposite has taken place. Today, according to Manovich, we are surrounded by interactive devices such as laptops, MP3 players, mobile phones, and handhelds yet our interaction with them has changed. It is “treated as an event... a carefully orchestrated experience,” resulting in a “theatrization” of information technology design.⁵

Usability expert Donald Norman, advocating “simplicity” in the past, also modified his attitude towards the affordances of information design by dedicating an entire book to Emotional Design in which he reasons why “attractive things work better.”⁶

It appears that within the last decade the principles underlying the interaction design of information technology have become much less about calmness and invisibility, than about visibly celebrating the interaction with the device itself. While being marketed via the rational argument of usefulness, most consumers will associate their mobiles with being social, aesthetic, and fun, especially since mobile devices have become closely interwoven with social media, the Internet, and Web 2.0 services.

SOCIAL MEDIA MIXING INFORMATION AND COMMUNICATION IN PUBLIC AND PERSONAL SPHERES

With Web 2.0 technologies the web has become an interoperable platform, which users of mobile devices, as well as users of desktop computers use to communicate, share information, and collaborate with one another. Besides the novel character of these services something exciting and new has been taking place with their rising popularity; the boundaries between private and public and between information and communication have become increasingly blurred.

Where does this blurring occur? While mobiles and desktop computers are perceived as personal devices, that are employed to edit personal websites and blogs, this personal information is often publicly available. Many also share their geographical location with their friends and followers on social messaging sites such as Twitter or travel sharing plans like Dopplr via short text messages. Additionally they can upload geotagged images⁷ to image-sharing sites such as Flickr. Geotagged images include the geographical latitude and longitude where the image was taken and this position can automatically be displayed on a map. The same is taking place with personal video clips that are shared on Youtube and other video-sharing sites, while Internet links are shared on social bookmarking sites such as Delicious or Reddit. All of these diverse sources can be aggregated in realtime by services such as Friendfeed and consolidated as “RSS feeds.” These feeds can automatically be fed into social network services (SNS) such as web-based Friendster or Facebook. These services allow a compact overview of all these data to be generated and then shared again amongst friends. It is in this emerging area where data are conflating the physical world with the Internet, which may also change our sense of identity. When this sharing and creating of personal data is something we “do,” and so much of our personal data is located all over the web, the web becomes an extension of ourselves.

It is here that the boundaries between information and communication are becoming blurred, and in this context become meta-data, information about information, such as the knowledge where a friend is, as well as that she is (for example) taking photographs, while not necessarily being aware of the actual content.

What most of these different streams of information have in common is that they are displayed upon screens of varying sizes, whether on the small screens of mobile devices or that of desktop computers. Moreover, some of this information may also require active participation. Despite their usefulness, it appears that Web 2.0 services are

far from being calm technologies in Marc Weiser’s sense. They demand action and the involvement of their users, therefore large volumes of activity may overwhelm them.

Once we look at true meta-data, such as the statistical-tools of websites and blogs, we become aware of another, more analytical side.

These pages provide statistical information about the audience of a blog and are used to make its content and appearance accessible for different platforms. Other information these analytical web-based tools show are: the countries visits originate from, browsers visitors are using (mobile or desktop), and links from other sites visitors followed or which search phrases they have been using to find a particular blog entry or page.

Worth noting in this context is that while the “voice” of a blog and the communication among author and visitor may be personal, these statistics are not. Usually, the information is anonymous and provides no reference to individual visitors, except their IP address. Additionally, these statistics are static and generated once every day. While comments to blog entries, tweets, and status updates have a personal voice, their statistical analysis is quantitative, impersonal, or “cold,” and lacks the “buzz” of realtime connectivity.

Some websites, however, provide a small indicator of realtime activity by displaying the “number of guests online.” This information consists of text and numerals and cognitive information that has to be processed, although it can induce a tingling sense of connectedness on the web.

Our research explores this area of experience—beyond abstract figures and text—where the immediacy of realtime connectivity, the emotional, and the aesthetic intersect.

OUR SCOPE, AIMS AND OBJECTIVES

Our research focuses on the aesthetic, the qualitative aspects such as the “calmness” of applications, the perceived appropriateness of mappings (or “metaphors of interaction”), and the effects of exposure over time. The perception of those qualities is influenced by context and individual dispositions. The intention for our exploration is a perceived increase of disruptive information technologies and a conspicuous lack of calm technologies, especially in the form of natural displays that make use of wind, smoke, physical motion, non-musical sounds, or water.

Monitoring or analyzing the full complexity of Web 2.0 technology is not part of our initial research. Instead, we are looking at very basic online activities such as the arrival of visitors to a website. These are visualized in real time in an office space that the website represents. In

earlier research we have found evidence that an important experiential factor influencing an individual's perception is the awareness that interactive information is presented in realtime. The immediacy of this telematic connection creates an enhanced state of awareness and experience of connectedness for susceptible individuals.⁸

We have developed a prototype which will be modified in a number of different iterations of natural displays, beginning with basic functions and extending these, step-by-step, upon evaluation. This bottom-up development is technically based on an Arduino microcontroller and PHP scripts on the server side.

To establish context, we are now looking at a selection of case studies of displays from different backgrounds that indicate website activity beyond the screen, preferably in a non-textual and tangible manner. Among our questions are: Why do individuals create these displays? What are the aesthetic principles underlying their designs? Which mappings are used to visualize the essentially virtual activity of "visiting" a website?

THREE CASE STUDIES THAT VISUALIZE VISITS TO A WEBSITE BEYOND THE SCREEN

To our knowledge, it has only been in recent years that there have been attempts to visualize website visits beyond the screen with physical displays and experiential design in mind. Excluded from this selection are led message boards that display written text or Visit Counters that display numbers. These have been around in different versions since the 1990s. The following examples are from artists and programmers that created physical web-visit indicators beyond the computer screen.

Dimitrios Vlastaras, a programmer, has created such an indicator with an Arduino⁹ microcontroller. His WebVisitors Blinker (FIGURE 1) is designed in a very straightforward manner.¹⁰ The led is inserted directly into the microcontroller while the webserver is running on the local computer to which the controller is connected.

Vlastaras writes, "[...] every time somebody visits my website, an led light blinks once in my room, and I get a warm feeling of a visitor."¹¹

Vlastaras' blinking led is a relative abstract signal and can be considered ambient, as it is not overly intrusive. It is confined to a small area, tethered to the computer, and does not involve any sound. The led is even smaller than the microcontroller it is connected to. The mapping is an abstract visual signal—conceptually the approach is straightforward and functional. The project's priority emphasizes expedience and feasibility over a deeper aesthetic or conceptual framework. Nevertheless for Vlastaras, it



FIGURE 1: *Dimitrios Vlastaras' "WebVisitors Blinker." An LED is directly inserted into an Arduino micro-controller. It lights up every time a page of his blog is loaded from the server.*

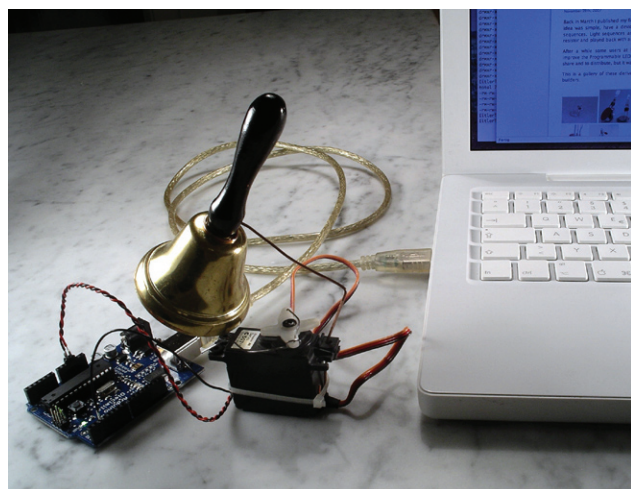


FIGURE 2: *Alexander Weber's "Xmas Hitcounter" actuates a servo motor which rings a physical bell.*

does provide the "warm feeling of a visitor" and "tingling" of telematic connectivity. It takes place at the periphery of perception and does not interfere with primary tasks. After an extended period of exposure it may even completely blend in with the background and be hardly noticed at all.

Another approach has been realized by Alexander Weber, a system architect and programmer. His "XmasHit-counter" (FIGURE 2) uses a servo motor to ring a physical bell with every webpage that loads. He writes, "Literally. It puts a smile on your face, every time someone hits your blog."¹² He also is aware of its intrusive properties and humorously mentions it being "[...] a great way to annoy your colleagues or your girlfriend."¹³

Weber's sounding bell attracts attention. A short video documentation shows the bell physically moving, creating an almost tangible experience of the presence of a visitor. With this physical motion and the slightly alerting character of the distinct bell sound the "Hitcounter" attracts attention and has intrusive characteristics. Its mapping is literal and reminiscent of entering a shop, or ringing a doorbell, both activities usually demanding attention if not action from the visited party. When he writes, "It puts a smile on your face..." we can see that his motivation is also a desire to feel connected with the visitors of his blog.

These examples illustrate that there not only is an intrinsic personal desire to become aware of a visitor instantaneously, but also to "visualize" such a presence beyond the screen as a more direct, tangible and immediate experience. The information is transformed from being an abstract representation on the screen into becoming an active part of the physical world. It is not perceived as communication, but as information. What are the conceptual approaches underlying these ideas? What is the relationship between the visit—and its visualization? And what can we tell of the conceptual mapping or metaphor?

A more public approach of visualizing visits to a website has been taken by the researcher and artist Jonah Brucker-Cohen in 2003.¹⁴ His project *Alerting Infrastructure!* (FIGURE 3) is located within a larger artistic and conceptual framework and consists of a jackhammer that is connected to the website of an exhibition space in a gallery. Every hit to the organization's website activates this jackhammer and results in actual, physical damage to the building. The website's visitors can view a

live video stream of the tool in action. With this "deconstruction" Brucker-Cohen's attempts to draw attention to the ambiguous relationship between a website and its representation—the physical building. Both "places," one virtual the other physical, has visitors that may be present at the same time, yet "there is little connection between the people simultaneously inhabiting these spaces."¹⁵ Although they—metaphorically—visit the same place at the same time, they usually are completely unaware of each other.

While the appearance of the website usually is not affected by visits, either virtual ones or those present at the physical exhibition space, here this relationship between the virtual and the real, so Brucker-Cohen, turns to an extreme opposite. Instead of going unnoticed, virtual visits not only become the center of attention but actually have a lasting effect upon the physical world. The project illustrates, states Brucker-Cohen, the fact that a fundamental change of roles had taken place: that physical space was losing its importance and relevance to its virtual representation. In that sense the project alerts its audience to the direct entanglement and mutual dependency between physical places and their virtual representations. The work's intention is to become aware of and critically reflect on this detached state and disconnected relationship. It provokes us to imagine alternative possibilities of linking the virtual and the physical unto one another. The piece is fundamentally different from the other examples in that it is not made for personal use but to be exhibited in public. We can consider it performative, as its main purpose lies in a public exhibition.



FIGURE 3: In Jonah Brucker-Cohen's *Alerting Infrastructure!* visits to the website of a gallery space actuate a large pneumatic jackhammer that "deconstructs" the physical building that the website represents.

OUR TECHNICAL AND CONCEPTUAL APPROACH TO VISUALIZE VISITORS ARRIVING AT THE PROJECT WEBSITE

Our research is titled Webpresence, and in its current iteration visualizes the arrival of visitors to our project website (FIGURE 4). With every arriving visitor a silent fan is actuated and a curtain gently billows in this breeze for three seconds (FIGURE 5). This natural ambient display relates the virtual visit to a physical one. This mapping was chosen because the motion of the curtain evokes the idea of an actual visitor opening the door of a room, creating a temporary draft; thus it represents a visitor here to our office space. Conceptually, this truly merges the physical place and its virtual representation. It creates a window, albeit one-way, that merges both formerly disconnected spheres in a natural display.

The motion of the curtain is perceived as very calming and natural. And although it fills a substantial part of the visual periphery, the motion is not perceived as intrusive as it integrates itself seamlessly into the background.

But how can we distinguish between the curtain being moved by a virtual visitor or a regular draft? Why is there no redundancy of information in another sensorial modality, for example, as sound? This aspect of “ambiguity of information”¹⁶ is intentional. As a regular draft also causes the curtain to move, its information is not entirely trustworthy, “casting doubt on our source of information.”¹⁷ Gaver regards intentional ambiguities as crucial for understanding as though “they may be perceptually undemanding, [...] they require users to fill in the gaps in information that is purposefully imprecise. When successful, such interfaces are not only aesthetically attractive, but conceptually appealing as well.”¹⁸ From another perspective we can see that this ambiguity may help us to delay the effect of hardening to a new medium through increased exposure. Art historian Oliver Grau writes in this context: “When a new medium of illusion is introduced, it opens a gap between the power of the image’s effect and conscious/reflected distancing in the observer. This gap narrows again with increasing exposure and there is a revision to conscious appraisal. Habituation chips away at the illusion, and soon it no longer has the power to captivate. It becomes stale, and the audience are hardened to its attempts at illusion.”¹⁹

The ambiguity of information in our natural display may not prevent us from hardening to the experience, but may slow down the process. It keeps the recipients aware and conscious, as with a delicate tool bearing certain idiosyncrasies which require special attention. We believe that in this example complete reliability of information

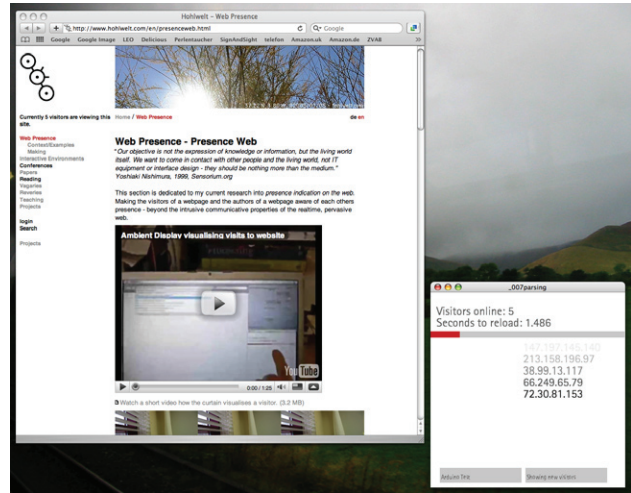


FIGURE 4: Visiting the page documenting this research at the website <http://hohlwelt.com/en/presenceweb.html>. The small window to the right is displaying our visit. It is the java applet that triggers the microcontroller over the serial port.

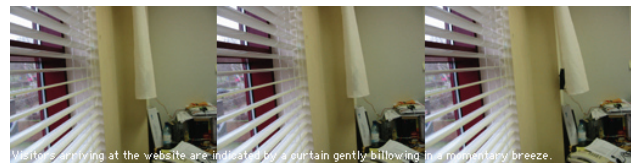


FIGURE 5: Every time a visitor arrives on the website (FIGURE 4) a silent fan billows a curtain, a natural display in the office space represented by the website.

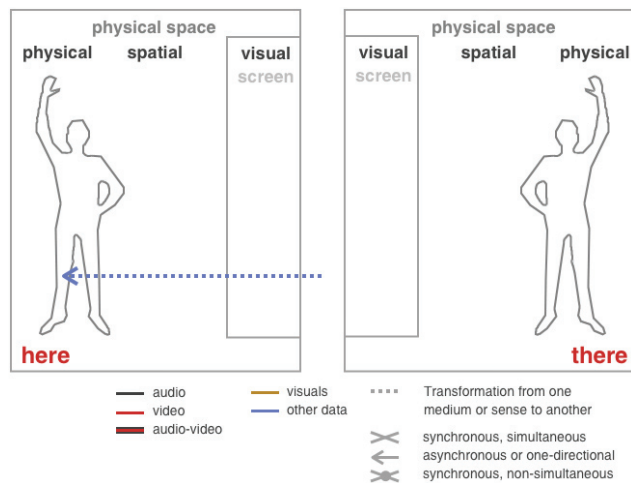


FIGURE 6: Dimensions of transportation and spatiality in WebPresence. A “visit” to the website is transformed into the motion of a physical curtain triggered by an air current. The visitor is anonymous and geography is irrelevant in this setup. As a result, the information originates from the web-server, in between “here” and “there.”

would provide a false sense of security—and this reliability would be detrimental to the poetic undertones and natural character of the display.

**CONCLUSIONS: SOCIAL DATA, INFORMATION
VISUALIZATION AND CALM TECHNOLOGIES**

By investigating how the act of “visiting” a blog or website can be visualized beyond the screen in physical space, we examine an avenue of research into novel mappings for virtual activities. From a designerly perspective the goal is to understand ambient displays and multi-modal visualization beyond the screen in physical space while developing calm and intuitive mappings. From a technical perspective the research involves robust, bottom-up prototypes that can be easily modified for new iterations. This includes both hardware and software. The artistic perspective finally completes this framework by integrating critical and reflective positions. While design is concerned about solving problems, art is positioned to challenge our assumptions with questions. Among those are: Why do we need calm technologies? What are the effects of being instantly connected over a distance? How does this change our perception? How is a physical, sensual display different to textual or numerical information? Does it affect our sense of place? Is it desirable to use natural displays to visualize our digital identity that is sending and receiving information via multiple channels such as Friendfeed, Twitter, Facebook, Flickr, etc? How would these disruptions affect our ability to concentrate and focus on tasks such as writing and reading (*sic!*) that require longer periods of uninterrupted immersion?

At the moment, our display is limited to indicating the arrival of a visitor. It does not display a visitor’s departure (technically the expiration of a “session”) nor the visitor’s continued presence. Both of these are possible avenues of research to be included in another iteration.

In the next iteration we will sonify visitors IP addresses in an application of calm technology. Identifying visitors with a sequence of sounds will create a different experience than the billowing curtain and possibly allow us to distinguish regular visitors from the web-crawlers used by search engines, which often visit a website from three to four computers simultaneously. These machines have almost identical IP addresses that often only differ by one digit. We expect that these sonic sequences will be easy to recognize and also lead to interesting new insights.

Also, the connection between the office space and its virtual representation is one-way only. The website does not reflect local conditions and a visitor is unable to experience a sense of place and connectedness. To ameliorate this

and add more transparency, we will extend the webpage to visualize local information in realtime. Linking back will close the circuit between the physical space and its virtual representation and integrate both spheres, resulting in a more vivid experience for both the visitor and the visited.

This text is based on the premise that through media conversion in which the Internet, mobile media, locative media, and social media are merging media extends beyond the screen into physical space—into our lives. Moreover, information technologies have not become invisible, but have been transformed into carefully designed emotional experiences—experiences that begin when devices are unwrapped from their packaging.

For communication designers this provides a rich source of data that can be visualized in the form of novel displays and even calm technologies. To make the complex clear is one of the main strengths of information design, and perhaps this is an opportunity to transform selected data into ambient or sensual displays. Together with the so far under-explored field of “non-visual multimodal visualization”, or mapping of data from one sensorial modality to another, there is a promising field for innovative visualization methods.

Our objective is not the expression of knowledge or information, but the living world itself. We want to come in contact with other people and the living world, not IT equipment or interface design—theory should be nothing more than the medium.”²⁰

—Yoshiaki Nishimura

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BIOGRAPHY

Michael Hohl is a designer and researcher working with digital media. He likes making things, thinking about things, how we make them, and what they mean to us. He studied Visual Communication at the University of the Arts Berlin and at the Cologne International School of Design before completing an interdisciplinary Ph.D. research program (Fine Art/Computer Sciences) at Sheffield Hallam University (UK) in 2007.

Presently, he is investigating “calm technologies” and telematics at the University of Hertfordshire. Michael lives and works in St. Albans. His work is documented at <http://www.hohlwelt.com/en>.

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