

# A Survey of Locative Media

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## ABSTRACT

In this paper, studies on locative media are investigated. Through a survey of supporting technologies, structure of related projects, both within artistic, social and practical contexts are covered. Also, the social implications of these studies, such as the new urban communities, virtual spaces versus physical ones, and the theory of location awareness in general are discussed. Furthermore, concepts that are tightly coupled with locative media such as context-awareness, ubiquitous systems, pervasive computing and ambient intelligence are explained as new vistas for locative media projects.

## Keywords

Locative Media, GPS, Mobile Technologies, Location-Awareness, Context-Awareness, Ubiquitous and Pervasive Computing, Ambient Intelligence.

## 1. INTRODUCTION

With substantial leaps in technology during the last two decades, mobile applications today are on the forefront of media research. Starting with cell-phones in 90s, mobile technologies now provide us with hand-held devices that far exceed personal computer technologies of few years back. As in the case of all massively celebrated emerging technologies, these advancements impact social lives in many ways.

The dependency on mobile devices increases with each new technology and a new social self for the man in public is being defined. The concepts of locative and context-aware media can be explained on a purely technical basis with a survey of supporting technologies such as sensors, transmitters and receivers. But this emergence also encapsulates many social implications as the locative technologies now work as a mediator between this new social self and the environment.

## 2. LOCATIVE MEDIA

Ben Russell, the author of Headmap, a manifesto of locative media referred to by many theorists, explains locative media as “the relationship of consciousness to place and other people” [1]. This conceptualization is addressed within many contexts including intellectual, financial, political studies in which the artist, the researcher or the government explores new models of communication amongst individuals, communities and spaces. While the social implementation of locative media can and will be further elaborated, the technical components that make up a locative system are fairly comprehensive. In more concrete terms, locative media is realized by a location aware system employing GPS technology coupled with a mobile computing device that has wireless network access. When these two technologies are

coupled, we obtain the basic locative media device through the attachment of location information to the data that is passed to a network via mobile devices.

## 3. SUPPORTING TECHNOLOGIES

### 3.1 GPS

The GPS technology is a central component to locative media projects and applications. While there are other technologies such as GIS (Geographical Information System), GSM (Global System for Mobile communications) etc. that can be incorporated into locative media studies, the ubiquity of GPS puts this technology to the focus of the locative media research both in terms of technology and concept development.

GPS is a satellite-based navigation system. The GPS network consists of 24 satellites that started being placed into orbit by the U.S. Department of Defense starting in 1978. In 1994, with the addition of the last satellite, the current system was achieved [2].



Figure 1: GPS Satellite Constellation [2]

The performance of the GPS is consistent over weather conditions and it provides continuous service. Being originally intended for military purposes in the 70s, the GPS now works on two low power radio signals one of which being for civilian use that does not require a subscription. Each satellite is replaced once every 10 years [2].

GPS technology is based on the triangulation of position. GPS satellites revolve around the world twice a day, transmitting radio signals to earth. The receiver on the user end compares the time-

stamps of the emission and the arrival of the signal and obtains the distance from that particular satellite. When this process is multiplied with other satellites, the comparison allows for the pinpointing of the location of the receiver. In order to obtain latitude and longitude triangulation, the receiver must acquire data from at least three satellites. With addition of more satellites altitude information too can be calculated.

## 3.2 Mobile Phones

The second central component of locative media technology is a mobile device. Today's mobile phones are currently the most convenient tools to fulfill this requirement, both in terms of ubiquity and efficiency.

### 3.2.1 Brief History

The idea of cellular phones was first proposed in 1947. Following the investment of the required spectrum for the connections in late 60s by the Federal Communications Commission, Motorola put extensive research into the matter and in 1984 they introduced the first cellular telephone, DynaTAC 8000X [3]. However it was not until the mid-90s the size of a cellular phone was diminished to commercially feasible dimensions made possible by the switch from analog to digital signals. The result of this transition is also known as the "Second Generation" (2G) of the mobile phone technology including GSM. Before the introduction of the third generation, an intermediate step, coined 2.5G, provided the GPRS technology that provided better rates in data transfer. Later on, in 2001, the first "Third Generation Network" (3G) was commercially launched in Japan [4], and this technology is currently in its midst of the process of being the norm of mobile communication.

### 3.2.2 Mobile Phones and Locative Media

While cellular networks can also provide locative information, though less accurately when compared to GPS, the mobile phone is a critical component to locative media without taking this capability into account. A GPS network, as the core of the locative design, gives us purely the position information. This raw data as it is, do not represent much and what the locative media theorists dreamt of is achieved only when this data is coupled with a secondary network that attaches a social context to this information. This is where the 3G networks come into play as it enables the generation of the new city structure through user input. Now the perceived physical space has a whole new dimension as the components of the city you observe with your senses, the coffee shop you always go to, the street you often pass by are redefined virtually with whole new social proportions provided to the network through 3G enabled mobile phones by the people who experience these venues.

## 4. SOCIAL AND ARTISTIC IMPLICATIONS

### 4.1 The Social and The Urban

#### 4.1.1 The Impact of Mobile Devices

Although the original telephone invented in the 19<sup>th</sup> century gave birth to a novel type of presence without physicality, the cell-phone created a whole new breed in which the mental absence merged with a physical presence in the urban space. This idea is one of the key concepts to how a new urban self emerges along

with mobile and pervasive technologies. "Talking on a mobile phone while walking down the sidewalk, text-messaging with a friend while on the bus, or listening to an iPod on the subway are everyday practices for organizing space, time and the boundaries around the body in public" [5]. From this point of view, locative technologies can be seen as a liaison between this new self and the physical world.

Along with advancements in mobile technologies, important transformations occurred regarding the methods of communication as well as the urban spaces; as these media devices gain pervasive qualities, they start transforming the fundamental methods of social interaction within city spaces, blurring the distinctions between the public and the private; technology redefines these terms.

#### 4.1.2 Space as a Canvas

Locative media enables the communities to handle the geographical space as a "canvas" [15] and lets them mark locations with their desires, stories, memories and suggestions. It becomes an instrument for people to rewrite a whole new subjective context that overlays the physical world.

Many theorists prefer to use the term "digital city" in order to define this virtual urbanism; a new understanding of the city life, achieved via locative media. When the positioning data is coupled with information regarding the trends and the social input from the users, the city is redesigned in a new dimension through this network, bringing upon a "digital architecture" [6].

#### 4.1.3 Augmented Realities

Within the social context, one of the strengths of locative media lies in augmented reality studies. According to the noted technologist Scott Fisher, with the rapid advancements in microcomputer technology, mobile virtual environment systems will evolve to allow for many prospects the augmented reality studies propose; a disappearing interface that opens up new worlds. This augmentation however is not limited to individual experience and expands the definition of socialization within the physical space of the city.

These technological "utopias" are also shared by the industry. Cell phone companies have paid multiple billions to acquire the spectrum the cellular networks today function over and they anticipated, with hopes of an impact to the industry, that these studies in augmented reality technologies will allow for reduced, mobile augmented reality systems for cell phones [6]. At this stage, locative media is one of the key mediators between the cell phone and the physical reality that expands the virtual dimensions of the device.

#### 4.1.4 Analogy to Ant Colonies

According to Russell, locative media creates a portable, temporary and self-governing zone on top of the subject region. His idea of a new urban form that emerges from the "collective action of essentially selfish actors, coordinated through an intelligent system" can be resembled to the order amongst ant colonies that designate an autonomous territory and will eventually generate "a new social contract of selectively accessible self-centered utopias" [1]. Actors of the urban space, contained within their personal virtual worlds built up of mobile devices and communication networks start generating collaborative paths for each other. Out

of the combinatory contribution of each actor, virtual circulations emerge and offer a new experience of the city for others.

## 4.2 Locative Media in Arts

Concepts such as “space”, “city” and “urbanism” have gained prominence within art projects the last two decades. Out of the urge of commenting about the city, came studies that centralized the site and actually carried the execution of the artwork to the space itself. Whether striving for pure esthetics, criticism, practicality or discovery within social studies, these works brought upon interesting elaborations on the idea of “the city” and philosophical discussions on the distinctions between “the space” and “the place”.

Locative technologies at this point enabled the artist to explore a whole new dimension attached to the city. Beyond the physical content of an urban space, now the artist could tap into the virtual city that could be superimposed on top of the physical one. What made up this virtual city is completely dependent on the social context the artist is trying to address and the user profile defines the results of the data mining. Further examples of locative media in art projects will be discussed later on.

### 4.2.1 Psychogeography

A term coined by the “Situationists International” is an interesting example to the fruits of the locative media think tank: Psychogeography. “(...) Artists are once again interested, via technology, in the connection between the so-called internal (“psychic”) and external (“geography”) worlds. Psychogeography brings the art installation and its audience from the contained space of the gallery into the body of the city” [6] and studies the effect of the city on the individuals. Within this concept, many theorists discuss the strategies that emerge towards the exploration of the urban space and how a new consciousness of the city and new paths are created amongst individuals through collaborative wanderings experienced with locative devices. This idea also brings us back to the analogy to ant colonies.

## 5. EXAMPLE PROJECTS

A substantial amount of locative media applications up to date have been in the domain of art projects. As stated by Shepard, for locative media to prove its social potential, “its practices need to be evaluated in the larger framework of everyday life and urban public space” [5] so that its applications will be beyond the scope of novel art projects and address its social implications for the urban life. Needless to say many of these art projects aim for much more than pure esthetics and the following examples will project the scope of these studies as they blur the distinction between the artistic and the practical.

While the devices with locative capabilities have been gaining a considerable market share the last couple of years, examples of ubiquitous implementations that fulfill the breadth of the proposed ideas since the early elaborations within the concept of locative media are few.

### 5.1 Locative Applications for the Consumer

#### 5.1.1 Google Maps

One prominent example is Google Maps, where the user can acquire location information via cellular network or GPS triangulations with varying accuracies in positioning. This

application clearly fits with the definition of a locative technology; however, its current state is rather crude compared to what the locative media theorists conceptualized. While Google Maps is highly efficient in providing vast amounts of data regarding the physical world, it currently lacks the social context and the user interface that will enable this locative technology to impact urban lives. It can hopefully be estimated that once the infrastructure development of the Google Maps technology is brought up to a stable level, social interfacing on mobile devices will be a next stage.

#### 5.1.2 Mobile Phone Applications (Operating Systems)

Currently many applications on the mobile devices with GPS capabilities are in the transition of inheriting the locative capabilities of these devices to remove the extra stages of location acquisition to provide various services. The Safari Browser on the Apple’s mobile phone/media device iPhone, is an important example, as it will assume location-awareness within the new iPhone 3.0 operating system [7]. This will enable its user to directly access the region-specific data many websites provide.

#### 5.1.3 GPS Shoes

A particularly interesting locative media application has recently been developed through a collaboration of Aetrex, a footwear company, and GTX Corp., that specializes in miniaturized GPS and location-transmitting systems. The product the two companies manufacture targets people with Alzheimer’s disease to prevent incidents known as critical wandering. GPS enabled shoes assume the role of the locative media device: A geo-fence is designated for the patient and once these virtual boundaries are crossed a cell phone alert is sent to relatives of the patient.

## 5.2 Art Projects

### 5.2.1 GPS Drawing

GPS Drawing is a project by Jeremy Wood and Hugh Pryor started in 2000. The project is based on conceptual artworks created through digital markings via GPS [8]. The project focuses on both data acquisition from multiple sources (such as animals and humans) and the various methods for the representation of the GPS data. Several examples of this project can be viewed on <http://www.gpsdrawing.com> in image and video formats.

### 5.2.2 Urban Colonization and Orientation Gear (UCOG)

Another important locative media project is the UCOG-144 project of ATOL group led by Marko Peljhan in Ljubljana, Slovenia, a study that spans from 1996 to 2001. UCOG-144 proposes a device that lets an individual to gain his/her orientation within the “new electronic planes of communication” that came to being with the new mobile devices of the technological revolution. An instrument equipped with a GPS receiver serves the users to observe their occupation of newly discovered spaces, “the performer’s path of colonization” [9].

### 5.2.3 Karosta Project

The Karosta Project is a semantic location model proposed by Jo Walsh in collaboration with Andrew Paterson [10]. The developed model provides the users with a mapping architecture. Furthermore, Karosta provides a framework and an open model

for other GPS-based locative media projects enabling the annotation of physical environments that encapsulate fields for spatio-temporal as well as subjective elements. While primarily this project is aimed for and gained attraction from art project it provides a structure that can be implemented for consumer related applications of locative media.



Figure 2: Karosta Trace Route

#### 5.2.4 Moodlog

Also starting out as a multimedia art study in National Taiwan University, China, the Moodlog project proposes an idea of potential commercial use. The concept behind Moodlog is attaching human like feelings to a place and regarding it as a human, so that later on, the visitors of the place will be able to experience the “mood” of a place. The system to enable this idea consists of a PDA device with audiovisual recording and playing back capabilities and a network. The visitors of the place tag the location with digital media that they feel to be convenient for the venue and a providing “a meaningful atmosphere for the (following) users to easily get immersed in mood of place” [17]. This way the subject venue assumes a virtual memory and communicates a collaboratively decided mood to its new visitors to experience.

## 6. RELATED CONCEPTS

### 6.1 Context-Awareness

While locative media is mostly based on the location information coupled with the user input, context awareness proposes the idea of acquiring other variables related to the location beyond mere position information. In other words, context-awareness can be assumed to add new layers to the concept of locative media. However, since these emergent ideas on locative media and context-awareness are fairly recent, the distinction between locative and context-aware media is often blurred. Nova states that the term “locative media” refers to all the information on the physical location as well as contextual cues, and the physical environment encompasses variables of both relative or absolute location and conditions such as light, temperature etc. He also includes infrastructure variables like surrounding resources for communication, computation and task performance in his definition for the scope of locative media [11].

Schilit, on the other hand, takes a similar definition and coins the term “Context-Awareness” in a 1994 paper. As stated in another paper the same year by Schilit et al., the term “context” covers more than just the location, since the same environment includes many other mobile variables. Similar to Nova’s definition of locative media, he describes context with such environmental variables as lighting, noise level and infrastructural components like network connectivity, communication bandwidth etc. and classifies a context-aware system as “one that can adapt according to its location of use” [12].

From the concept of context-awareness we get to the idea of context-aware computing that involves mobile systems that adapt their behavior to the context of use and their physical environment. This is an intuitive expansion to what many theorists such as Russell proposed within the constraints of locative media. Each new dimension to the context sensing system adds another degree of freedom to the users experience of the “virtual” urban space.

### 6.2 Ubiquitous and Pervasive Systems

Mark Weiser, one of the chief scientists at Xerox PARC in the late 80s, who is considered to be the father of ubiquitous computing summarizes the vision of pervasive and ubiquitous systems in a 1993 paper as follows: “Machines that fit the human environment, instead of forcing humans to enter theirs, will make using a computer as refreshing as taking a walk in the woods” [16].

Ubiquitous computing refers to the idea of having computerized systems integrated everywhere in our everyday environments. Besides the ubiquity of the proposed design one important feature is invisibility, which brings upon the concept of Ambient Intelligence that will be further mentioned later on. Unlike virtual reality applications that overlay the current physical world with a virtual one, ubiquitous computing extends the physical world with integration of “information displays” [13] in urban spaces. In that sense, ubiquitous computing can be classified under augmented reality studies.

### 6.3 Ambient Intelligence

Ambient Intelligence studies the development of embedded interfaces in our environment. Parallel to the idea of ubiquitous computing, two key concepts for Ambient Intelligent are unobtrusiveness and invisibility. In order to provide the seamless and user-friendly intelligent interfaces of the future, these two characteristics will be central to the pervasive system studies. Ambient Intelligence will be within various objects in our daily environments and be aware of the actors of the space only to configure themselves accordingly. Locative and context-aware media are of the main components for this seamless interaction, providing an abstraction of the user interface that enables the objects to passively and invisibly acquire data and respond.

A current example to the context-awareness in Ambient Intelligence studies is e-SENSE [14]. e-SENSE proposes a context capturing framework that enables the convergence of many input modalities, mainly focusing on energy efficient wireless sensor networks that are multi-sensory in their composition, heterogeneous in their networking, either mobile or integrated in the environment e.g. from single sensors to thousands or millions of sensors collecting information about the environment, a person or an object. This framework will be able to supply ambient intelligent systems with information in a

transparent way hiding underlying technologies thus enabling simple integration.

The context capturing system proposed by e-SENSE supports multi-modal input, through employing multi-sensory, heterogeneous wireless networks embedded in the environment. The network can be made up of millions of sensors integrated into every possible place, capturing information about the spaces and the people within it hence providing a transparent data acquisition framework as a component of ambient intelligence systems.

## 7. CONCLUSIONS

The goal of this paper was to present the key concepts that are essential to the locative media research and provide the reader with an overall understanding of the subject matter. The breadth of the locative media studies was investigated to depict the possibilities and convey the vision this emerging technology proposes for the future of mobile technologies and more interestingly urban lives.

Locative media was analyzed on the level of technical requirements and infrastructure. The two main components that make up the basic locative device, GPS and the mobile device (e.g. a mobile phone, hand held computer with a network connection) were briefly explained to provide the understanding of the core technical requirements. Here, it was observed that, structurally, locative media relies on fairly simple implementation.

When the proposed ideas from the artists and the locative media theorists are considered, the impact of locative media appears to focus on the social life and urbanism. In that sense, the paper discussed examples of the expected modifications to the city life through elaboration of ideas and presentation of example projects both in the art and consumer-oriented domains.

Finally topics that are tightly coupled with locative media are presented to provide a bigger picture regarding the future of locative mobile technologies. Concepts, many of which coincide in large portions such as pervasive system, ubiquitous computing and ambient intelligence were briefly explained to provide a perspective on the future of locative media.

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