

Locative Media

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Contents

[Introduction](#)

[Projects](#)

[Technology](#)

[Future](#)

[References](#)

Introduction

This document is a result of the research I have done on Mobile Technology this past year. This document does not encompass the entire research field but focusses purely on Locative Media. The goal of this document is to provide some basis for discussion on Locative Media within (and possibly outside) Waag Society.

First of all let's look at some definitions. Wikipedia states the following:

"Locative Media are media of communication bound to a location. They are digital media applied to real places and thus triggering real social interactions. While mobile technologies such as the Global Positioning System (GPS), laptop computers and mobile phones enable locative media, they are not the goal for the development of projects in this field. Rather:

"Locative media is many things: A new site for old discussions about the relationship of consciousness to place and other people. A framework within which to actively engage with, critique, and shape a rapid set of technological developments. A context within which to explore new and old models of communication, community and exchange. A name for the ambiguous shape of a rapidly deploying surveillance and control infrastructure." (Russell, 2004)"

http://en.wikipedia.org/wiki/Locative_media

A report on locative media from the École Polytechnique Fédérale de Lausanne states the following:

"The term "locative media" refers to every information about the physical location as well as other contextual cues. The most commonly used context of mobile systems is the location of the user since it is easy to determine and it could be meaningful to use it in order to adapt the behavior of a mobile application. Academics (Schmidt et al., 1998) proposes a wider definition of location awareness. They structure the concept of context by defining a hierarchically organized model in which they distinguish two categories according to the level of abstraction : physical environment and human factors. At the lowest level, the physical environment refers to all the physical variables like location (absolute or relative) as well as conditions (e.g. light, temperature) or infrastructure (surrounding resources for communication, computation, task performance). At the higher level, human factor related context is structured into : information about the user (emotional state, knowledge of habits, ...), the user's social environment (co-location of others, social interaction, group dynamics,...) and the user's tasks (spontaneous activity, engaged tasks, general goals, ...)."

http://craftsrv1.epfl.ch/MT/research/archives/CRAFT_report2.pdf

Locative Media concentrates on personal social interaction with a place and with technology. Therefore a lot of locative media projects have a social, critical or personal (memory) background. Locative Media let's us interact differently with our surroundings. Overlaying everything is a whole new invisible layer of annotation. Textual, visual and audible information is available as you get close, as context dictates, or when you ask. Keywords are a.o. sharing, messaging, notes, leaving, marking, demarcating, tracking, logging, opinions, trading, collaboration, gaming and searching.

Waag Society has developed Amsterdam Realtime (together with Esther Polak), Frequency 1550 and N8spel based on the KeyWorx platform. Just van den Broecke's Geotracing, Geoskating and Geosailing is also based on KeyWorx technology. Finally Waag Society has advised in the initial stages of Esther Polak's MILK project.

Projects

The field in which locative media is applied is immense, so therefore I've tried to categorise the projects I read about this past year in order to be able to discuss them separately. The project listing including a short description can be found at the end of this document as references. This is very definitely not "the definitive list" so if you have come across other projects please let me know. Below I single out just a few projects per category.

Art

Art projects such as **.walk** that combined computer code and "psychogeographic" streetwalking, the **Milk project**, a personal narrative provided by the international trade in milk between Latvia and the Netherlands, **Urban Eyes** that wants to provide an alternative view on the city by using pigeons as the messengers of camera and other imagery overlooking the main streets and back alleys, use location each in their own specific way. A project called **TaggedSpace** even claims to be the first RFID art project working with active sensing. In **Tagged Space** the movement of the participants and their grounding time at one of the 15 art objects placed in three parks of the Trienal exhibition 'Vormen van Aarden' in Apeldoorn, is translated into an individualised work of art on their own generated website and a by all participants generated story about grounding told by one of the birds from the park.

```
// Classic.walk
Repeat
{
  1 st street left
  2 nd street right
  2 nd street left
}
```

"This .walk example shows the classic generative psychogeographical algorithm, that urban exploration haiku, written down like a pseudo-computer language ." (<http://socialfiction.org/dotwalk/dummies.html>)

Storytelling

Although storytelling can easily be a characteristic of a locative media project instead of a category, I've put it down as a category to bundle the more theatrical projects such as **Embedded Theatre** in which a person becomes a participant in a context-specific story that evolves based on their position, movement, and choices, **Hidden natures** which is halfway between a theatre play and a novel, with something of experimental audio, a narrative that you make. These projects lean heavily on psychogeography, a kind of meditative walking practice through the urban landscape. The walk encourages the drifter to "get lost" in order to break with ingrained patterns of routine and see the landscape as a source of endless possibility in which a multitude of paths open for remapping the city.

From the Embedded Theatre website: "In this scenario a man is experiencing Embedded Theater for the first time. He enters a shop, gets the garment, and upon exiting the shop begins to understand the interface as the experience begins. Because the story takes place in various fictional Cities, it best illustrates the concept of navigating from to different nodes of the story." (<http://www.interaction-ivrea.it/theses/2002-03/r.genz>)

Blogging

In the world of blogging the use of location has now also penetrated in several ways. Some blogs like **Blogmapper** and **SpaceNameSpace** allow for geo-locative semantic information to be incorporated related stories to locations while other blogs like **The Where project** consist solely of personal posts about locations.

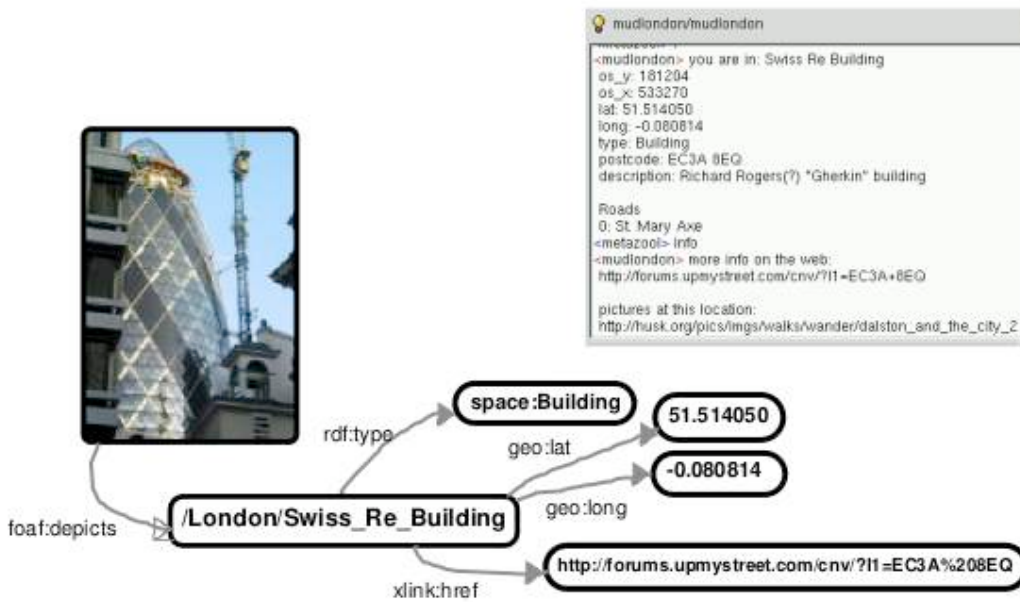


Image from the Mudlondon site explaining the semantic geographical model that is proposed. Read more at <http://space.frot.org/mudlondon.html>.

Gaming

Locative Gaming seems to be an unstoppable trend. It's an undoable task keeping up with the number of projects that are taking place all around the world. I've summarised a bunch of them in the references so take your time to go through them. To single out a few I'd like to mention **Demor** which is a location based 3D audio first person shooter for the blind and **La Fuga** held a former bank in northern Madrid in which up to 300 players at a time must try to escape solving RFID triggered quizzes. A minor trend can be seen in creating locative games out of those "old" games we used to know. (for instance **Pacmanhattan**, **Monopoly live** and **GPS:Tron**)



"RFID tracks La Fuga players as they make their way through the Mazzinia complex, trying to escape." (<http://www1.rfidjournal.com/article/view/1986/>)

MoSoSo's

Over the last few years we have seen a lot of social networking sites emerge such as Orkut, Friendster, MyPlace etc. A MoSoSo, or mobile social software, is software that associates geographical location and time with such a social network. Most projects help you find and communicate with "kindred spirits" based on your profile (hobby's, work and sexual preferences). **Dodgeball** got a lot of attention this year because it got acquired by Google. One I still really like is the **JabberWocky** which helps you engage with those "Familiar Strangers" you see every day. For more see the references.



Image from the jabberwocky website (<http://berkeley.intel-research.net/paulos/research/familiarstranger/index.htm>)

Spatial Annotation & Geodrawing

In this category I've put projects that have been inspired by possibilities of Google Maps, such as **Frappr**, **Plazes**, **Rabble**, **Geoskating** and **Semapedia** and projects that allow you to post personal media at locations. I'd still like to mention **Yellow Arrow**; you've probably heard about it before but I just love its simplicity (for more details see the ref). Another project I'd like to mention is **VoiceNote** with which blind people can receive or record audio notes and pinpoint them to GPS locations. Voice commands tell him/her what direction to go in, where and when to turn, and how far away (s)he is from his/her destination at any given time. In the recording mode the device tracks and records an exact route, which can be stored and shared with other users or uploaded to a database or website.



Image from the yellow arrow website (<http://yellowarrow.net/index2.php>)

Service

This category lists the typical location based services which let's users pull information such as **Google Local Mobile** and **JOCA** (wikipedia for your mobile).

Technology

Web development

Devices

Positioning

Locative MetaData

Web-development

The development of Web 2.0 (especially AJAX (<http://en.wikipedia.org/wiki/AJAX>)) and the release of Google Maps (<http://maps.google.com/>) have sparked a great number of locative media projects, because real-time events can now be drawn upon a map in a browser. AJAX stands for Asynchronous JavaScript and XML, and is a web development technique for creating interactive web applications using a combination of:

- * XHTML (or HTML) and CSS for marking up and styling information
- * The Document Object Model manipulated through JavaScript to dynamically display and interact with the information presented
- * The XMLHttpRequest object to exchange data asynchronously with the web server.

After the Google Maps release MSN and Yahoo followed with their own competing services, however it's worth keeping an eye on old standards like Multimap (<http://www.multimap.com/>).



Images from resp. Google Maps, Yahoo Maps and MSN Maps.

Mobile Devices

In the years to come mobile devices will become more location aware. This does not only mean that absolute positioning will become more accurate but also the person's (micro) movements can be tracked.

Phones with motion detection & control using built-in sensors

Samsung has released two Korea-only phones that come with a nifty feature: gesture recognition. By gesture, Samsung really means movement. The SPH-S4000 and SCH-S400 phones come with software to take advantage of this feature. A pedometer is included so you can count your steps to the local McDonalds, you can change tracks on the MP3 player by shaking the phone side-to-side, and some games can be played by moving the phone around.

<http://mobilementalism.com/2005/11/25/samsung-launch-new-gesture-recognition-mobile-phone/>

Phones with built-in GPS

It will probably take a few more years but they are coming. Motorola, Benetton and Garmin now offer GPS-enabled cellphones such as the ViaMoto (<http://www.viamoto.com/user/html/index.html>). Hopefully all with sirf III chipsets.

Phones that geotag photo's

http://akuaku.org/archives/2003/05/gps_tagged_jpeg.shtml

Positioning

The technological background of locative media is sometimes referred to as "location-aware computing". Location-aware computing is a field where the location of people and objects can be used by machines to derive contextual information with which to enhance and assist users.

There are two ways to acquire context using information technology : requiring the user to specify it or by monitoring users and computer-based activity. For instance, people can write their location in instant messengers (active user) or it can be detected by sensors (passive user). Sensor technology enables mobile devices to provide cues about context. There is a wide range of sensors that can extract information from motion, audio data, optical elements (light intensity, density, type of light, ...), biosensors (pulse, skin resistance, blood pressure). This technology can be used to obtain context meaningful in different applications (biosensors could be useful in sports and medical apps for instance).

Location awareness could refer to information about the present (synchronous awareness) or about the past (asynchronous awareness). We can decompose a locative media into three awareness components : presence (who was present and when), location and direction. Gaining location awareness require two positioning techniques : - absolute : awareness of the co-ordinates, the actual location or proximity, the place (city/country, building, room). - relative : awareness of what other objects or which places are in the proximity. IR, WiFi or Bluetooth supports this kind of positioning. In this case, the idea is to localize the devices with regard to a known beacon or antenna. Triangulation techniques allow to compute the position of the device. Another relevant dimension of location awareness is place. Sometimes, absolute or relative positioning is not the proper way to show location information. Knowing in which place or which kind of place is your teammate/friend is more meaningful. A place is defined as an area of space bound with a specific activity. By building up a history of experiences, space becomes a "place" and then its significance and utility is put forward.

For an overview of the different methodes used in positioning please check http://www.mobilein.com/mobile_positioning.htm.

(A-) GPS

"Global Positioning System, uses a set of satellites to locate a user's position. This system has been used in vehicle navigation systems as well as dedicated handheld devices for some time, and now it's making its way into the Mobile Internet. With GPS, the terminal gets positioning information from a number of satellites (usually 3-4). This raw information can then either be processed by the terminal or sent to the network for processing, in order to generate the actual position. Network Assisted GPS (A-GPS) uses fixed GPS receivers that are placed at regular intervals, every 200km to 400km to fetch data that can complement the readings of the terminal. The assistance data makes it possible for the receiver to make timing measurements from the satellites without having to decode the actual messages. This assistance greatly reduces the time needed for a GPS receiver to calculate the location. Without the assistance information the Time-to-First-Fix (TTFF) could be in the range of 20-45 seconds. With assistance data the TTFF could be in the range of 1-8 seconds. The assistance data is broadcast around once each 1 hour. So the providing of assistance data makes very little impact on the network."(<http://en.wikipedia.org/wiki/Gps>)

RFID

"Radio Frequency Identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. An RFID tag is a small object that can be attached to or incorporated into a product, animal, or person. RFID tags contain antennas to enable them to receive and respond to radio-frequency queries from an RFID transceiver. Passive tags require no internal power source, whereas active tags require a power source." (<http://en.wikipedia.org/wiki/Rfid>)



An RFID nameplate. Image from the Kennedy Group (<http://www.kennedygrp.com/>).

Wifi

"Skyhook Wireless provides a software-only positioning system that leverages a nationwide database of known Wi-Fi access points to calculate the precise location of any Wi-Fi enabled device." (<http://www.skyhookwireless.com/index.html>)

"Herecast provides location-based services on a WiFi device. At its simplest level, it can tell you where you are. More advanced services can use your location to enhance information lookups, publish presence information, and create unique games -- all while preserving privacy."

<http://www.herecast.com/>

TV

"Rosum's technology is based on the triangulation of TV signals, which it believes are well-suited for dense urban environments. The physics make sense: TV broadcast signals, which were designed for indoor use, are about ten thousand times more powerful than signals emanating from GPS satellites. TV signals are also in a lower frequency range than GPS signals, which means they do a better job of penetrating walls. (The next time your inconsiderate neighbor blasts his stereo, notice how you can hear the bass and drums better more than the lead guitar solos. Walls are good low-pass filters, which means they block high frequencies) TV also has a higher bandwidth than GPS, which means it can be used to get a more accurate position fix." (<http://www.rosun.com/>)

How Rosum TV-GPS Location Technology Works

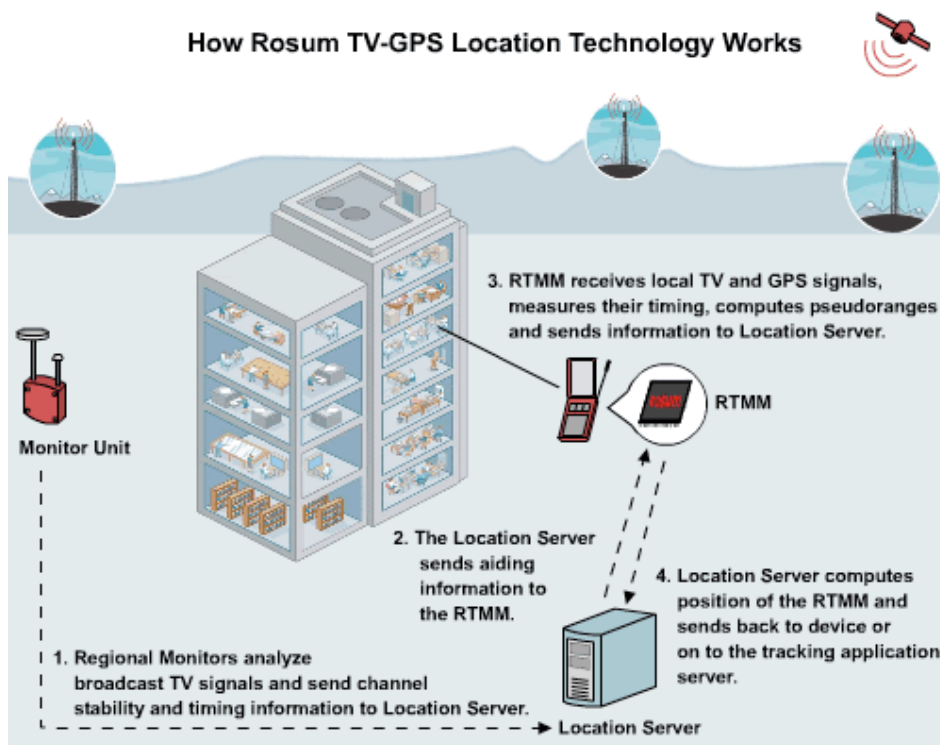


Image from the Rosum website (http://www.rosum.com/rosum_tv-gps_indoor_location_technology.html)

Wireless sensor network

"A wireless sensor network (WSN) is a network made of many small computers with onboard sensor boards. The sensor nodes, currently the size of a 35 mm film canister, are self-contained units consisting of a battery, RF adapter, microcontroller, and sensor board. The nodes self-organize their networks, rather than having a pre-programmed network topology. Because of the limitations due to battery life, nodes are built with power conservation in mind, and generally spend large amounts of time in a low-power "sleep" mode or processing the sensor data. The major academic centers for research in wireless sensor networks are CITRIS at Berkeley and CENS at UCLA, in the USA, as well as the NCCR MICS at EPFL, in Switzerland." (http://en.wikipedia.org/wiki/Wireless_sensor_network)

"Smartdust is a network of tiny wireless microelectromechanical sensors (MEMS), robots, or devices, installed with wireless communications, that can detect anything from light and temperature, to vibrations, etc." (<http://www.nanotech-now.com/smartdust.htm>)

Cellphone triangulation

"Cellphones can be tracked and their current position calculated by measuring the signal strength at a minimum of three cell base stations and using triangulation to calculate the approximate position of the cellphone user. These services are accurate to within around 50 meters, but are a simple alternative to GPS services which require the ability to receive satellite signals from the GPS satellite network to update the position." (http://en.wikipedia.org/wiki/Cellphone_tracking)

Bluetooth

With bluetooth devices at fixed positions it's possible to do wireless positioning. A proposal for Bluetooth positioning can be found at <http://media.csee.ltu.se/publications/2003/hallberg03positioning.pdf>.

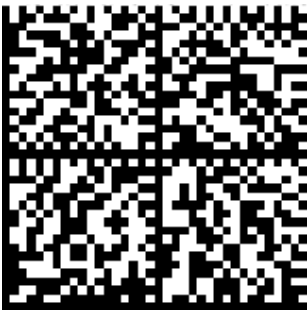
SMS/MMS/Voice

Just tell 'the system' where you are by sending a message.

Semacode

"Semacode is a trade name for machine-readable two-dimensional black and white symbols that act as "barcode URLs." It is primarily aimed at being used with cellular phones with cameras to quickly obtain a Web site address. The Semacode specification is open, and based on the ISO/IEC 16022 Datamatrix standard."

(<http://en.wikipedia.org/wiki/Semacode>)



Semacode image taken from <http://semacode.org/>.

Near Field Communication

"Near Field Communication Technology holds the promise of bringing true mobility to consumer electronics in an intuitive and psychologically comfortable way since the devices can hand-shake only when brought literally into touching distance."

http://en.wikipedia.org/wiki/Near_Field_Communication

<http://www.wired.com/news/technology/0,1282,64778,00.html>

Locative MetaData

This sections discusses ways of annotating space with metadata; how to build semantic models of places and exchanging geospatial data in RDF.

GeoUrl (<http://geourl.org/>)

"GeoURL is a location-to-URL reverse directory. This will allow you to find URLs by their proximity to a given location. Find your neighbor's blog, perhaps, or the web page of the restaurants near you. GeoURL is listing 212,800 sites. Projects like Geourl are allowing bloggers to add tags to there web pages, that locate the blog in a particular place. This locates the conversations of bloggers. Paris bloggers, NYC bloggers, London bloggers. Tagging projects allow for adding location as a property to all kinds of web accessible information. UpMyStreet (<http://www.upmystreet.com/>) specialises in spatially locating conversations."

Geocoding

"Geocode your gear ! linking information to an object Attaching information to real world's stuff and gear is a trend. Projects like Aula or HP Cooltown ("everything has a web page!") are a step toward this direction. Geocoding is about embedding the location of an object in... the artifact itself. At the moment, geocoding an object in the physical world is possible but difficult. Indeed, one could use RFID tag and a tag reader but there is no universal protocol to sort out the artifacts or to search them. On the contrary, web pages (kind of artifacts) could be easily geocoded thanks to tag or RDF structure format (META tags, meta stands for metadata). For instance, tags are used on geourl. This website maps documents in cyberspace to real-world locations. You add this code in the <head> part of your html document : <meta name="geo.position" content="41.8833; 12.500" / > <meta name="DC.title" content="Jackson's blog" / > The first line contains the Latitude and Longitude, and the second line contains the site's name. Once the site is added to GeoURL's database, you can immediately see who else has registered Web pages in (or about) your neighborhood. These coordinates are called an "ICBM Address." (Like, Inter-Continental Ballistic Missile). geourl is a search engine that can help you to search website and locations with map and visualisations. The problem is that using latitudes and longitudes is not that trivial. GPS coordinates or those indication are not human readable as well as location names."

Locative packets (http://locative.rixc.lv/workshop/index.cgi?Locative_Packets)

"Locative Packets is just an example of interface with a simple RDF/XML format for geoannotation. It has been created by Jo Walsh 7. Omitting the header which declares XML namespaces, this is a complete locative packet, in outline. 1: <locative:Packet> 2: 3: <geo:long>-0.0104</geo:long> 4: <geo:lat>51.2377</geo:lat> 5: 6: <dc:title>Greenwich Observatory</dc:title> 7: <dc:description>It gets windy up there sometimes.</dc:description> 8: 9: <foaf:maker> 10: <foaf:Person foaf:mbox="mailto:jo@frot.org"/> 11: </foaf:maker> 12: 13: </locative:Packet>"

PML: Psychogeographical Markup Language

<http://socialfiction.org/psychogeography/PML.html>

"PML is a set of keywords lifted from various sources that can be used to capture meaningful psychogeographical [meta]data about urban space. PML is a unified system of psychogeonomic classification that lurks behind the psychogeogram: the diagrammatic representation of psychogeographically experienced space.

PML is the base layer for a psychogeographical content management system that can:

- 1) be used to transform a mass of subjective data into an objective representation
- 2) be used as an engine that, after being fed certain parameters, generates new psychogeographical drifts
- 3) be used to develop further a cartography that negates the territory
- 4) be datamined to show never before suspected patterns in the urban fabric
- 5) be fired up into a new mythology for urban space
- 6) be used to take the fingerprint of a city

PML incorporates work done in fields like annotated space, geo-tagging, mental mapping, GIS & collaborative mapping but is different in that it aims at the invisible & the absurd."

spacenamespace /MudLondon (<http://space.frot.org/>)

"Mudlondon is a kind of collaborative mapping project. it consists of geographical models which are represented as RDF graphs. you can wander round them, like a MUD or MOO, with a bot interface which you can use to create and connect new places."

W3C (<http://www.w3.org/2003/01/geo/>)

"This vocabulary begins an exploration of the possibilities of representing mapping/location data in RDF, and does not attempt to address many of the issues covered in the professional GIS world, notably by the Open Geospatial Consortium (OGC). Instead, we provide just a few basic terms that can be used in RDF (eg. RSS 1.0 or FOAF documents) when there is a need to describe latitudes and longitudes. The motivation for using RDF as a carrier for lat/long info is RDF's capability for cross-domain data mixing. We can describe not only maps, but the entities that are positioned on the map. And we can use any relevant RDF vocabularies to do so, without the need for expensive pre-coordination, or for changes to a centrally maintained schema."

Future

Headmap

What's next ?

Creative Commons

Identity 2.0

Discussion

Possible Waag focus

Headmap

Ben Russell's Headmap Manifesto (<http://www.headmap.org/headmap.pdf>) has been an enormous inspiration. The manifesto proposes a set of tactics for applying semantic web ontologies, to the mobile location-aware technology thereby transforming the latter from a means to push location-based content, into the basis for new kind of mobile networked presence. Russel argues that FOAF (friend of a friend) networks, applied to locative, mobile telephony, would allow for the emergence of an economy of exchange based on trust. Comparing urban infrastructure with that of the open-source software development community online, he suggests that there exists an unused abundance in the city, the key to which is trust. Russell envisions a future in which networks of friends could exchange personalized, location-encoded maps to access a network of friend of friends.

a quote from the manifesto:

"With the "geo enabled foaf adhoc mesh internet" in your pocket you should be able to turn a big piece of cheese into a hat no problem broadcast your cheese, your location, and your need for a hat ..maybe money will come into the equation maybe not ..maybe you'll get a free hat and give away your cheese ..maybe you'll meet some friends of friends."

"Will we live in a place where there are notes in boxes that are empty , every room has an accessible history , every place has emotional attachments you can open and save, you can search for sadness in new york , people within a mile of each other who have never met stop what they are doing and organise spontaneously to help with some task or other, paths compete to offer themselves to you , life flows into inanimate objects , the trees hum advertising jingles , everything in the world, animate and inanimate, abstract and concrete, has thoughts attached?"

What's next?

Below are some segments on possible ways in which we will have locative media in our lives. Ofcourse there are many more and I hope to get feedback on this.

Bluecasting = Wireless data vending = Bluespamming?

As most mobile phones that are currently sold are equipped with bluetooth, advertising might become be more interactive and localised. Maybe department-stores will provide mobile software that will tell you about the latest discounts when you're in the neighbourhood.

"A company called **Hypertag** (<http://www.hypertag.com/>) already sells bluecasting products. Their product allows people to download content directly to their phone handsets and PDAs. By enabling the Infra-Red (IR) port or Bluetooth, the user receives a phone number, reminder prompt, game, logo, picture or ring-tone. The system only comprises an electronic device - the Hypertag - which is installed in a poster panel or dedicated unit. With the Hypertag service there is no access to internet web sites and content is strictly controlled by the Tag owner. No software is required on the mobile device."



Image from the Hypertag website.

This type of advertising has also been dubbed "Bluespamming" because it basically connects to every device that has Bluetooth switch on. And worse by using a large directional Bluetooth transmitter behind a billboard a region of up to 100 metres in front of the advert can be searched for mobile phones.

Read more about the Coldplay "incident":

<http://techdirt.com/news/wireless/article/5802>

<http://www.newscientist.com/article.ns?id=dn7883>

Ofcourse when more mobile phones will have more accurate positioning Google will probably put more and more emphasis "Local Adsense" using Google Mobile.

MobSharing - the convergence of file sharing and flash-mobs

"Thinking about the functionalities that mobile devices will have in the very near future, peopple will have the ability to come together and form their own ad hoc Personal P2P file-sharing network. It's the Perfect Storm of two converging phenomena - File sharing and Flash-Mobs (crowds of people spontaneously coming together to perform some arbitrary task arranged by some media-hungry controller) - that together lead to the new concept of MobSharing: crowds of people lurking round WLAN hotspots, becoming part of an extremely local, transient P2P file-sharing network.

From a societal perspective, this has the potential to open up a completely new dimension to the high street shopping experience. Think of the main reasons people engage in file-sharing: it's not just the almost-unlimited access to the music and other files, it's the way that access is provided. You have an always-on broadband connection. You type in a search term, and hundreds of files are revealed, but crucially, you can't access them all immediately. So you select a large set of the files you want, and go to work, or to school, leaving your computer on to download what it can. What you get when you come back from work is a random collection of surprises, all of which are what you'd like. It's like the music postman, but without the bills: you never know whats going to be delivered, but all of it's good! The element of surprise, and the constant novelty of the shifting collection of files is what makes file-sharing so appealing. Don't like what you see today? Then try again tomorrow, hook up to a different set of servers, and see what else can be found with the same search term."

<http://mobilementalism.com/2005/09/02/mobsharing-coming-to-a-starbucks-near-you/>

What the Mobsharing story underlines is that in the near future we will have an all-covering high bandwidth wireless networking infrastructure. (Maybe when we mobshare it will be at places that are invisibly sign posted)

Reality Mining

With your always-on mobile device being more and more aware of your location and connected to all kinds of (personal) (ubiquitous) services, your life can be tracked with probably more accuracy than you might think (and probably want!).

"MIT has done a project on Reality Mining (<http://reality.media.mit.edu/>) which defines the collection of machine-sensed environmental data pertaining to human social behavior. This new paradigm of data mining makes possible the modeling of conversation context, proximity sensing, and temporospatial location throughout large communities of individuals. Mobile phones (and similarly innocuous devices) are used for data collection, opening social network analysis to new methods of empirical stochastic modeling.

MIT has captured communication, proximity, location, and activity information from 100 subjects at MIT over the course of the 2004-2005 academic year. This data represents over 350,000 hours (~40 years) of continuous data on human behavior. Such rich data on complex social systems have implications for a variety of fields. The research questions we are addressing include:

- * How do social networks evolve over time?
- * How entropic (predictable) are most people's lives?
- * How does information flow?
- * Can the topology of a social network be inferred from only proximity data?
- * How can we change a group's interactions to promote better functioning? "

It might be a good time to actually start reading the disclaimer when installing that new piece of software on your mobile!

Common use of RFID

"Human memory is imperfect, so an RFID-enabled smartwatch that keeps track of the easily lost items in your world could be the answer. The intended purpose of the smartwatch is to let a user know when he or she forgets something. If you constantly forget to return important documents to work when you are finished with them, slap an RFID tag on the folder with the docs and never leave home without them again. If you often forget where you left your keys, the control component of the interface can track down the item using its last known location as a starting point. The device could serve as a simple reminder service that can become a useful application for the forgetful -- provided you remember to tag the items." http://www.wired.com/news/technology/0,1282,65721,00.html?tw=wn_tophead_6

"Tmsuk and NTT Communications announced that they will introduce a service robot that follows shoppers and help them navigate in a shopping mall and carry heavy bags, etc. in a large shopping mall in Fukuoka, Japan. RFID technology is used to make this robot inexpensive." (<http://ubiks.net/local/blog/jmt/archives3/004358.html>)

"Edy to Edy is a new service from BitWallet, which will allow users of RFID-enabled Wallet Phones to exchange digital money easily." (<http://ubiks.net/local/blog/jmt/archives3/004045.html>)

Mobile Cloak

"Just think of Santa. He knows when you are sleeping. He knows when you're awake. He knows if you've been bad or good, for goodness' sake. And he knows these things all the time, even though you can't see him." With computing becoming more ubiquitous and pervasive you might want to appear to be invisible more often, like the "appear offline" toggle in your instant messenger. To provide you this temporary luxury <http://www.mobilecloak.com/> has come up with the off switch for always on mobile wireless devices and technologies. "A simple method of making your wireless stuff invisible to any other wireless stuff or signal that would want to communicate with it."

Air tagging

"Virtual graffiti will have a much wider following than the "real thing". There's no vandalism involved, which makes it a possibility for most of us. Moreover, digital tags are just that - digital. They can be created digitally using an array of tools. This also allows wider access. Most of us don't have sufficient dexterity with spray cans. Air tagging is a more private affair than physical tagging. With actual tags, the public gets to see them whether they want to or not. However, this is often an almost irrelevant side effect, as the public aren't supposed to be a part of the conversation. They're outside the culture. It helps to think of tagging as just another means of communication. Imagine an instant messaging interface that doesn't detect friends offline and online, but taggers "in zone" and "out of

zone". If the tagger's "in zone", that means his or her tag is nearby and can be seen using the app. Taggers might leave a variant tag at each spot they've tagged. These could be collected into a tag gallery (or a standard photo gallery, or mob-blog).

The really interesting part of air tagging is that taggers can communicate with each other, always via their pseudonyms and therefore almost always "anonymously". Different modes and rules of communication could be envisaged, such as instant messaging being possible only whilst "in zone". Also, comments can be left, which can be tags themselves, or text, or even photos. It is interesting to think of "photo verification" as a testimony to being present "in zone" i.e. at the place where the tag was originally left. This can be combined with mapping, which is another interesting extension to the theme."

<http://wirelesswonders.blogspot.com/2005/03/air-tagging.html>

"John Geraci's Grafedia (<http://www.grafedia.net/>), a fascinating mobile experiment that turns graffiti tags into mobile links. "Click" on the piece of graffiti and you get more info on your mobile phone. Grafedia: words written anywhere, then linked to images, video or sound files online. Grafedia is hyperlinked text, written by hand onto physical surfaces and linking to rich media content - images, video, sound files, and so forth. It can be written anywhere - on walls, in the streets, or on sidewalks. Grafedia can also be written in letters or postcards, on the body as tattoos, or anywhere you feel like putting it. Viewers "click" on these grafedia hyperlinks with their cell phones by sending a message addressed to the word + "@grafedia.net" to get the content behind the link."



Image from grafedia.net.

PodCaching

Although I don't believe PodCaching will take off, I mention it here because I think PodCaching is just one of the many combinations of existing technologies with positioning we'll come across in the near future.

Andrew Wooldridge wrote in his blog:

"What if you could combine Podcasting with Geocaching. Meaning instead of subscribing to a "show" you subscribe to a "location" - a GPS location. These locations could coincide with Geocaches so you could do things like listen for hints as to where to find the cache, list to others talking about the history of that location, or some funny thing that happened there.

Imagine further with me here :) Say you were going to go to a local restaurant. You could query the location and load into your iPod all the comments or interesting things about that restaurant. Heck! You might even get to listen to the owner of the store read to you the menu! Or imagine you want to go to a local museum. The night before you go, you request the feed for that location and in the morning you can take with you a series of stories, guides, comments and other great things around the museum. You might listen to someone who knows how to find the best art pieces quickly, or where to park nearby and save some money. "

<http://www.andrewwooldridge.com/blog/2004/10/idea-podcaching.html>

"At <http://www.podcacher.com/> a PodCache is described as the following:

1. A PodCache is a geeky / techy fun "game" of treasure hiding and finding.
2. Small containers are hidden for you to find.
3. Audio clues are recorded on an MP3 file that you can listen to with an MP3 player.
4. Listen to the clues, follow the directions and find the "treasure chest".

5. When you find it, sign the enclosed log book to document your success!!!"

NeighbourNode

"Local communities can be brought closer together if common interest is allowed to intersect with location in a more efficient way. Why should people in a town not be able to establish more accurately where the people are who share their interests. On the street where you live, the block where you live, the neighbourhood you live in, how many people do you know? And if you wanted to meet the subset of those people you might have something in common with, is there any reasonable way to do it without waiting for ten years worth of arbitrary random interactions."

With wireless nodes popping up at the current rate the scenario posed at <http://www.neighbornode.net/> seems to be a plausible one. "Neighbornodes are group message boards on wireless nodes, placed in residential areas and open to the public. These nodes transmit signal for around 300 feet, so everyone within that range has access to the board and can read and post to it. This means that with a Neighbornode you can broadcast a message to roughly everyone whose apartment window is within 300 feet of yours (and has line of sight), and they can broadcast messages back to you. Boards are only accessible from computers that go through the local node. Additionally, Neighbornodes are linked together, making up a node network to enable the passing of news and information on a street-by-street basis throughout the wider community. With access to your local Neighbornode, you can post messages to your local group board, as well as forward messages to other nodes in your vicinity. These other nodes can in turn forward messages to your node, resulting in a network of neighborhood message boards."

MoSoSo's

I think Mobile Social Software (see the project section for more info) will be a very common thing soon. There's already all kinds of software out there and this will only increase. I can also see all kinds of groups forming and sharing location-based information and media like for instance music fans, people going out to theatres, clubs, restaurants, people looking for a date and all based on the friend-of-a-friend (trust) mechanism. Geography is an essential added filter; it provides a context for your needs.



Image from <http://www.tabernadelturco.com/>.

PlaceFeeds

Locations will have RSS feeds. Walking around through the city the feeds you subscribed to get downloaded automatically to your mobile device, so you're always up-to-date when you arrive.

Creative Commons

My notion is that Creative Commons will become increasingly more important in the field of locative media because the principle of *sharing* is such an intrinsic part of it. Not only in the Mobsharing segment mentioned before but also when it comes to people producing media. The media functionalities on our mobile devices improve each year but do not incorporate any tools just yet that take care of the copyrights of those media. Some initiatives do exist such as mobile applications that allow you to upload your image to the Flickr creative commons pool but there's still a long way to go.

When you think of locative media projects by which interpretations, annotations and mediated subjective experiences of a location create a new public domain of information-augmented space shouldn't this be Creative Commons by default?

Identity 2.0

Because Locative Media is not only about location but also the user's history and context, your digital identity will become increasingly more important. New proposals based on the principles of Web 2.0 are being proposed: Identity 2.0. Trust and reputation will be based on FOAF (friend of a friend) mechanisms.

"These new identity systems place identity in the hands of users instead of directories. Simple, secure and open, these systems will provide the scalable, user-centric mechanism for authenticating and managing real-world identities online, enabling truly distinct and portable Internet identities." is an excerpt from the presentation from Dick Hardt at OSCON 2005. Please take a moment to see it at <http://www.identity20.com/media/OSCON2005/>.

<http://www.sxip.com/>

<http://www.identity20.com/>

Discussion

Some questions that could possibly help discussion:

- Add a geographical layer to the internet and it changes what the internet is: a whole new internet?
- How do inclusion and exclusion relate to a flexible mesh of separate social networks?
- What collaborative and participatory tools do we need in a locative media world?
- What will the new interface of a local space be like?
- How do privacy and identity change?
- Do we need to redefine the public/private distinction?

Possible Waag focus

Interesting technologies and subjects for the Waag to research include:

- Being one of the leaders of Creative Commons Holland we should develop ideas and tools that incorporate Creative Commons into Locative Media.
- The time element: the focus in Locative Media should not only be about the direct realtime interaction but should also take into account the history built up in the "system" (location history). The notion of time has been discussed in the Waag before in relation to developing scenario software and should in my opinion be discussed again when developing our locative media software.
- RFID workshop. RFID is now readily available and should be subjected to tests and discussion in the Lab.
- User Modelling: Creating a richer user context which incorporates both macro (GPS) and micro positioning (small user context changes detected by sensor networks such as Smartdust). This user context can also be enriched with data based on for instance his/her biological state, path history, state of connectedness, outdoor atmospherical circumstances etc. Having such a broad user context will widen the possibilities for interaction and game(play) design.
- New Locative Media Interfaces: research on the development of wearables that are location and context aware wearables and support new types of user interaction such as gesture/motion control and tactile feedback.
- Study the different types of proposals for locative metadata and determine which one(s) should be supported in KeyWorx to possibly be compatible with geotagged-media harvesting software/search-engines.
- Create a Waag MoSoSo application and releasing it to Amsterdam's medianetwork as an experiment?
- The development of Identity 2.0 and it's relation to Locative Media.

Project references

Art

.walk (<http://socialfiction.org/dotwalk/index.html>)

".walk (dot-walk) combines computer code and "psychogeographic" streetwalking. During the walk, participants carry out an algorithmic series of instructions derived from computer code, that "calculates" the city as a giant "peripatetic computer". The concept behind it is the clever part, based, as it is, on a metaphor for how order emerges from chaos, borrowed from the ant colony, which generates maps through the brute force, random exploration of a territory."

TaggedSpace (<http://www.taggedspace.nl/>)

Tagged Space claims to be the first RFID artproject in the world that works with active sensing. "The movement of the participants and their groundingtime at one of the 15 artobjects placed in three parks of the Trienal exhibition 'Vormen van Aarden' in Apeldoorn, is translated into an individualised work of art on their own generated website and a by all participants generated story about grounding told by one of the birds from the park. After returning everyone has produced his own website."

"In the for every participants of 'Tagged Space' produced individual website the participants can after logging in with their own password see their own produced story, the for them generated RIGA (reflective interactive generated art) and their grounding time. The words that are contributed by the participant himself are colored in red all other words that are part of his story are from other participants that where walking through the parks at the same time. These words are blue."

Télétaxi (<http://www.year01.com/teletaxi/>)

"Year Zero One presents teletaxi, a site-specific media art exhibition in a taxicab. The taxi is outfitted with an interactive touch screen that displays video, animations, music, and information triggered by an onboard GPS (Global Positioning System) receiver which allows the displayed artwork to change depending on where the taxi is in the city. With the combination of the media/gps technology, the mobile environment and the passenger/audience inside the cab - the eleven artists in teletaxi are offered a unique set of possibilities for showing their work - both technically and thematically."

Urban Eyes (<http://www.v2.nl/portal2004/generic/channel/item.sxml?uri=urn:v2:portal2004:rss:lab-projects.rss:051109133030-Urban-Eyes>)

"Urban Eyes wants to provide an alternative view on the city by using pigeons as the messengers of camera and other imagery overlooking the main streets and back alleys. Urban Eyes proposes the cameras being augmented with RFID tag readers, and feeding pigeons with bird seeds with embedded RFID tags. (Birds need stones in their digestive system, so the digital seeds would be harmless.) Due to the urban pigeon's natural habitat with a radius of 1 mile, the CCTVs triggered by the pigeons become an extended neighbourhood of your own mobility pattern in the city. The bird seeds can be purchased in a camera shop, and come with a unique URL from where to access the data gathered by the birds the seeds are fed to. When the pigeon flies close by a CCTV camera, it's inbuilt RFID reader captures the bird's ID and send an image or short video clip at that moment to the urban eyes server to a unique URL. The image database of a given pigeon grows until the RFID tag is ejected from the system after roughly 12 hours. Urban Eyes borrows from the shamanistic journeys, providing an animal perspective in a distance. It gives a view on our surroundings that is not intended for the public. Because the imagery is intimately associated to the pigeon, the captured images form a micro story of the life of the bird throughout the day."

MILK (<http://milkproject.net/>)

"The linkup of individual biographies and the existential spheres inhabited by human beings whose lives are interconnected via international trade is the centerpiece of */MILKproject, the winning work in the Interactive Art category. In this installation by artists Esther Polak / the Netherlands, Ieva Auzina and RIXC-Riga Center for New Media Culture / Latvia, visitors experience the incredible diversity of cultures and realms of life in a Europe that is in the process of growing together. The plot structure in this narrative is provided by the international trade in milk-one of mankind's most basic and most important foodstuffs - between Latvia and the Netherlands."

Waag Society's Aske Hopman has provided advise in the initial stages of the project. Waag Society and Esther Polak collaborated on the Amsterdam Realtime project, which is filed here under the Spatial Annotation & Geodrawing section.

DroomBeek (<http://www.droombeek.nl/>)

Droombeek collects stories of the people that used to live in the Roombeek district in Eschede, Holland before it was destroyed in a big fireworks disaster. These personal stories consist of text, images and sound. Stories are shared and published to create a collective history en make plans for the future. These stories can be accessed at the location they originated, either on the website or by walking in the area with a PDA and GPS device.

and more...

<http://mapmyths.rixc.lv/>

<http://www.field-works.net/>

Storytelling

Urbantapestries (<http://urbantapestries.net/>)

"Urban Tapestries is a Proboscis project exploring social and cultural uses of the convergence of place and mobile technologies through

transdisciplinary research. To model emerging social and cultural behaviours an experimental platform was built that allows people to author and access place-based content (text, audio and pictures). It is a framework for exploring and sharing experience and knowledge, for leaving and annotating ephemeral traces of peoples' presence in the geography of the city."

"The Urban Tapestries software platform allows people to author their own virtual annotations of the city, enabling a community's collective memory to grow organically, allowing ordinary citizens to embed social knowledge in the new wireless landscape of the city. People can add new locations, location content and the 'threads' which link individual locations to local contexts, which are accessed via handheld devices such as PDAs and mobile phones."

"Urban Tapestries seeks to understand why people would use emerging pervasive technologies, what they could do with them and how we can make this possible. It seeks to enable people as their own authors and agents, not merely as consumers of content provided to them by telecoms and media corporations. The project centres on a fundamental human desire to 'map' and 'mark' territory as part of belonging and of feeling a sense of ownership of our environment."

Embedded Theatre (<http://www.interaction-ivrea.it/theses/2002-03/r.genz/>)

"Embedded Theater is a system for creating immersive narrative experiences where location is an actor. It is the result of an intensive research and design project addressing how interactive narrative can be successfully realized through mobile technology. Through the Embedded Theater system a person, wearing an unobtrusive garment that provides directional sound and video, becomes a participant in a context-specific story that evolves based on their position, movement, and choices."

"The Embedded Theater project investigates designs for how stories may be told with interactive technologies that are becoming invisible and location aware. Through the Embedded Theater system a person, wearing an unobtrusive garment that provides directional sound and video, becomes a participant in a context-specific story that evolves based on their position, movement, and choices."

"Who killed Jack Down?" (<http://knifeandfork.org/case/>)

"The work utilizes PDAs and Bluetooth wireless technology to create a location-embedded, non-linear narrative in which participants are given an active role as the private eye in a film noir drama. In this role, every decision made affects the structure of the narrative experienced. When exploring the physical space of the building, participants question witnesses and find objects through an animated film on their PDA. It is the subjective experience of the narrative that allows them to unravel the mystery behind the violent murder of Jack Down."

"At the heart of the artwork are questions about the human ego, prejudice, and subjective vs. objective truth. The various witnesses all tell radically different versions of the exact same event, and the truth that the participant finds, or rather interprets, is one that is colored by his/her own prejudices and experiences. At the end of the investigation, participants gave their own responses to the question "Who killed Jack Down?" and according to one person, the killer must have been the Bartender because "he has a goatee" and you can't trust anyone with a goatee."

Hidden natures (<http://www.heretico.net/pretext.html>)

"You walk through an outdoor space with headphones on. Texts read by actors are the voices of the characters you hear as you walk. An arrow on the screen of your pocket computer (PDA) indicates the narrative direction. That's all. There is the absolute minimum of abstraction from the environment - light headphones permit hearing environmental sounds. Your interaction is walking. The screen of the portable computer is used only as a narrative compass & to make certain choices in the narrative (see below). The result is halfway between a theatre play and a novel, with something of experimental audio, a narrative that you make. "

Blogging

Bloggers are starting to incorporate geo-locative semantic information, thereby setting into motion the actual, real-world contact between virtually separated databases.

Blogmapper (<http://blogmapper.com/>)

SpaceNameSpace (<http://space.frot.org/>)

Locative Blog (extending blog engines with location-related information) (<http://locblog.sourceforge.net/>)

The Where project (<http://www.whereproject.org>) is all about placeblogs, in which bloggers describe their personal locations.

Gaming

"What if you had to run around and climb things to play computer games rather than sitting in a room listening to headphones. Imagine

games which involved spatial challenges, and involved whole communities of kids, both building the levels and playing the games. 'go to the end of the road and climb on the roof of the deserted cinema' or rather (introducing a time element, and in order to get the next instruction) 'RUN to the end of the road and climb on the roof of the deserted cinema.' Such games might result in a few fatalities, but at least it would get kids out of the house. " (from the headmap manifesto)

BlastTheory

I like Frank (http://www.blasttheory.co.uk/bt/work_ilikefrank.html)

"Players in the real city chatted with players in the virtual city as they searched for the elusive Frank. Whether playing on the streets or logging from around the world, players built relationships, swapped information and tested the possibilities of a new hybrid space. The game invited players to search for Frank through the streets of Adelaide. Online Players moved through a virtual model of the city, opening location specific photos of the city. One photo revealed the location of a hidden object. Online Players then had to enlist a Street Player to go to that location and retrieve it. In the Exeter Hotel, in a pool hall and in saddle bags on bicycles were four different postcards each with a question for the Street Player to answer such as, 'Who do you think of when you feel alone?' Once an Online Player had achieved this they entered a new virtual Adelaide saturated in red where Frank was waiting in a photographic 'Future Land'."

Uncle Roy all around you (http://www.blasttheory.co.uk/bt/work_uncleroy.html)

"Uncle Roy All Around You is a game played online in a virtual city and on the streets of an actual city. Online Players and Street Players collaborate to find Uncle Roy's office before being invited to make a year long commitment to a total stranger. The city is an arena where the unfamiliar flourishes, where the disjointed and the disrupted are constantly threatening to overwhelm us. It is also a zone of possibility; new encounters. Building on Can You See Me Now? the game investigates some of the social changes brought about by ubiquitous mobile devices, persistent access to a network and location aware technologies."

Can you see me now? (http://www.blasttheory.co.uk/bt/work_cysmn.html)

"Can You See Me Now? is a game that happens simultaneously online and on the streets. Players from anywhere in the world can play online in a virtual city against members of Blast Theory. Tracked by satellites, Blast Theory's runners appear online next to your player on a map of the city. On the streets, handheld computers showing the positions of online players guide the runners in tracking you down. With up to 20 people playing online at a time, players can exchange tactics and send messages to Blast Theory. An audio stream from Blast Theory's walkie talkies allowed you to eavesdrop on your pursuers: getting lost, cold and out of breath on the streets of the city."

BotFighters (<http://www.botfighters.com/>)

"Join forces against a corrupt regime in this futuristic pervasive combat game. The battle is on the streets. The year is 2105. The world-spanning Global Nation controls 99% of our planet's resources. It is a sprawling bureaucracy, bloated and corrupt. The bureaucrats wield total power over 17 billion people, and only a few dare to oppose. But still a war is being waged, a war where rebels fight for the freedom to control their own lives and where corporate loyalists strive to uphold the system that once saved our planet from extinction. You start as a newly graduated bot pilot, and then the action begins as you join the ferocious battles of the botfighters. The real world is the game arena. This is a truly pervasive game that blends with your everyday life. Using location technology, the player's movement is mirrored in the game. Your own neighborhood could turn out to be hostile territory, and weapons and power-ups can be found on the streets. BotFighters spans across the mobile and the Web."

ConQwest (<http://www.conqwest2005.com/>)

"ConQwest is what is known as a "Big Game". 2005 marks the second annual tour of the game and this year, Kamida is helping to bring ConQwest to 5 US cities - Tucson, Albuquerque, Boise, Omaha and Portland. In each city, 125 students from 5 area high schools will compete to win \$5,000 for their school by running around their city/game-board carrying around giant inflatable animal totems and using mobile camera phones to collect treasure in the form of 2-dimensional barcodes called semacodes. Sound crazy...? It is."

Pacman in Singapore (<http://news.bbc.co.uk/1/hi/technology/4607449.stm>)

A human version of the classic arcade game Pacman, superimposing the virtual 3D game world on to city streets and buildings, is being developed by researchers at Singapore.

Raygun (<http://www.glofun.com/>)

"A cell phone loaded with RayGun software emits "spectral" energy that lets you attract and track ghosts. Unfortunately, the energy also annoys the ghosts, so you, better "ionize" them before they get to you. Here's the twist: RayGun is a GPS game, and to play it you have to move through the real world, that is, running around using your real feet."

Swordfish (<http://www.blisterent.com/swordfish.html>)

"An exciting new location based fishing game that uses the latest GPS technology. Using your phone's GPS capability and Blister's unique Swordfish finder, you can locate schools of fish that are close to you, move to them and land the BIG ONE!"

[GameSpy] (<http://wireless.gamespy.com/wireless/before-crisis-final-fantasy-vii/550235p1.html>)

"The most interesting twist in Before Crisis is how it utilizes the properties of a mobile phone. Materia is an integral part of the game and players will need to use the F900's camera and phone features to make the most out of it. To activate the various types of material, you must take a picture of an object of a similar color. However, each phone can only have a finite amount of material; the only way to get more is to interact with other users. (It's almost as devilishly clever as needing another player to catch all the Pokemon.) Players can also call each other for help when they're stuck or tag along in an adventure, though not in an MMORPG sense as the creators want the game to be more random."

Gunslingers (<http://guns.mikoishi.com/>)

"Gunslingers is a multi-player network game where players move around, track and engage enemies within their vicinity. All this, just using just an ordinary handphone. You walk around Singapore, you locate the nearest opponent around you and then you blow the crap out of each other. The game uses network positioning technology to help you find the nearest enemy. It is similar to GPS or Global Positioning System, except that you do not need a special phone with GPS capabilities. We use Cell-ID-Network-Positioning-Technology."

Cititag (<http://cnm.open.ac.uk/projects/cititag>)

"CitiTag is a wireless location-based multiplayer game, designed to enhance spontaneous social interaction and novel experiences in city environments by integrating virtual presence with physical. In the first version of CitiTag you roam the city with a GPS- and WiFi-enabled iPaq PocketPC in search for players of the opposite team that you can "tag". You can also get tagged yourself if one of them gets close to you. Then you need to find a friend to free you. Urban space becomes a playground and everyone is a suspect."

PacManhattan (<http://pacmanhattan.com>)

"Pac-Manhattan is a large-scale urban game that utilizes the New York City grid to recreate the 1980's video game sensation Pac-Man. This analog version of Pac-man is being developed in NYU's Interactive Telecommunications graduate program, in order to explore what happens when games are removed from their "little world" of tabletops, televisions and computers and placed in the larger "real world" of street corners, and cities. A player dressed as Pac-man will run around the Washington square park area of Manhattan while attempting to collect all of the virtual "dots" that run the length of the streets. Four players dressed as the ghosts Inky, Blinky, Pinky and Clyde will attempt to catch Pac-man before all of the dots are collected. Using cell-phone contact, Wi-Fi internet connections, and custom software designed by the Pac-Manhattan team, Pac-man and the ghosts will be tracked from a central location and their progress will be broadcast over the internet for viewers from around the world."

Mogi (<http://www.mogimogi.com/>)

"A game where players move outside, pick up virtual items through their mobile phone interface then trade with other players to complete collections. It's based on the player's location. From the web interface players see in real-time, on a 3d map, the positions of connected players as well as collection items. From both interfaces players trade the items picked-up with the mobile. Mogi is a community game, featuring a complete IM system. A web-player might help a mobile player by clicking on it's character on the map and sending "Lucky you! North, close to you, lies a rare item. Get it, get it! :)" which will pop up on the screen of the mobile player."

"A collecting game 'item hunt'. The game provides a data-layer over the city of Tokyo. As you move through the city, if you check a map on your mobile phone screen, you'll see nearby items you can pick up and nearby players you can meet or trade with. Mogi has a client for mobile phones, and a client for the desktop internet. Desktop internet players have access to a larger map. Newt Games's idea is to have the desktop players guiding the mobile internet players, a goal of collaborative play, team work. Casual players don't seem so useful for a guild in a regular MMOG. In [Mogi] the casual player is somewhere, the casual gamer has his location going for him. For a team, the location of the player is something useful. The desktop player can send a tool to the mobile players, and teach them how to use it."

Demor (<http://student-kmt.hku.nl/%7Eg7/site/index.html>)

"Demor is a location based 3D audio shooter. This highly innovative game was developed by a multi-disciplinary team of seven EMMA-students for the Bartimeus Institute for the Blind. Demor does not only focus on the entertainment aspect of computer gaming, but also attempts to contribute to the emancipation of the blind and visually impaired people in order to enhance their integration with the sighted world. It is a proof of concept developed on the basis of theoretical and practical research."

NodeRunner (<http://www.uncommonprojects.com/noderunner>)

"A competitive game, Node Runner fuses the streets with wireless networks to convert the city into a playing board. Two teams racing against time must log into as many nodes as they can and upload photographic proof to the server, documenting their progress."

NetAttack (http://www.fit.fraunhofer.de/projekte/netattack/index_en.xml)

"NetAttack" is a new type of indoor/outdoor Augmented Reality game that makes the actual physical environment an inherent part of the game itself." In this game, two teams are fighting to destroy the central database of a virtual big company. Both teams have indoor players, who control the game from their laptop computers, and outdoor players, equipped with GPS receivers, trackers, sensors and video cameras."

GPS::Tron (<http://datenmafia.org/gpstron/index-english.php>)

"GPS::Tron is an adaption of the classic arcade game Tron, for mobile phones. The players move in real space, they are tracked by GPS and their position influences their position in the game. The communication between the mobile devices is done over GPRS. The players do not have to be geographically close-by. The 2 players do not have to run, they can also play using a car, bike, ship, whatever."

Monopoly Live (<http://www.monopolylive.com/>)

"Monopolylive.com let you play Monopoly in the real London with 18 real cabs fitted with GPS systems as your movers. We pitted your cabbie against 5 others for 24 hours, and you could make millions by buying properties and placing apartments and hotels. There were some amazing prizes up for grabs, including your mortgage or rent paid for a year."

The Shroud (<http://shroudgame.com/>)

"The first location-based role playing game comes to mobile in Winter 2006 - The Shroud. Build a thriving community based on real world locations, defend it by any means necessary and venture out on heroic quests. For the first time, a truly immersive gameplay experience comes to wireless."

RealReplay (<http://realreplay.mopius.com/>)

"GPS racing on your mobile phone. It's one of our inherent necessities to compete with other people and to compare ourselves to them. It would be perfect if we could compete with everyone, without being dependent on their time. No matter if it's a car race, bike tour, sailing trip or a relaxed hiking tour. RealReplay offers the solution. You simply choose the track you want to race on, select your opponent and start right away! Your own race will be recorded by an accurate GPS system, which makes it possible to see your own current position and the route your opponent took when he recorded his race. In some games this is known as the "Ghost" mode - now you can race for real!"

Codex Kodanski (<http://www.codexkodanski.com/>)

Codex Kodanski was held in the center of Rotterdam, Holland and can be described as an four-dimensional interactive audio game. Walking through the city de player hears the voice of the main character in his head, the compulsive and paranoid Kodanski. Using a headphone and hightech navigation equipment the player gets access to a whole new city, hidden behind all we normally see. Facts, fiction, city history and statistics mix into a exciting story about and through the city. The project was developed by Hootchie Cootchie Mediacollectief.

MobZombie (<http://www.dailytrojan.com/media/paper679/news/2005/09/02/Lifestyle/Students.Resurrect.The.Dead-974725.shtml>)

"The concept of MobZombie is easy: The user must flee from undead characters shown on a hand-held screen by physically moving around in the real world; the longer the player evades the virtual zombies, the better the zombies become at stalking."

La Fuga (<http://www1.rfidjournal.com/article/view/1986/>)

"Named La Fuga (The Breakout), the game opened this month at a former bank not far from the Real Madrid Stadium in northern Madrid. The facility can host up to 300 players at a time, each of whom tries to solve quizzes and pass through different obstacles in order to escape. RFID interrogators (readers) placed in doorways and in other areas of the game rooms enable the application to detect a player's location, and to use that information to drive the gamer's experience."

Frequency 1550 (<http://freq1550.waag.org>)

"For one to two days, players roam through the city in small groups. GPS makes it possible to know the position of the team members (and of other players or objects). To prove they're the most worthy order of pilgrims, a team will need to demonstrate their knowledge of medieval Amsterdam by doing location-based media-assignments on the city's history. As they wander through the streets of medieval Amsterdam, they get in virtual phone contact with characters that provide information on locations and on the strange disappearing of the

holy relic. In the meantime, they're competing with the other teams. GPS technology and mobile phones turn the city into a medieval playingfield. Teams can boobytrap each other by placing bombs on the medieval streets: With a click on their gamephone the players can drop a virtual bomb at their current location that will go off in the face of a passing opponent, temporarily killing communication facilities with HQ. Running into other teams starts a confrontation between the Pilgrims - their Order determines who wins, taking away hard-earned experience points, co called Days of Poorterschap (medieval Days of Citizenship). "

GeoCaching (<http://www.geocaching.com/>)

"Geocaching is an outdoor activity that most often involves the use of a Global Positioning System ("GPS") receiver or traditional navigational techniques to find a "geocache" (or "cache") placed anywhere in the world. A typical cache is a small, waterproof container containing a logbook and "treasure", usually trinkets of little value. Participants are called geocachers."

N8spel (<http://www.n8spel.nl>)

Waag Society developed the N8spel for the annual museum night in Amsterdam in cooperation with KPN. The N8spel is a mobile game in which teams are dared to draw the most fascinating number 8 on the map of Amsterdam by walking it realtime carrying with them a mobile phone and GPS and annotating the route with photo's and movies. The results were shown live inside the Waag theater and outside on the Nieuwmarkt square. Teams could apply beforehand and were in the running for the grandprize consisting of 4 MSN prepaid phones supplied by KPN.

MoSoSo's

MoSoSo, or mobile social software, is software that associates geographical location and time with a social network. The basic idea of a MoSoSo is to overlay a location and time element to the idea of digital networking. So it enables you to find people in your vicinity and at that time for social, sexual/dating or business networking. It's worth noting that the time variable is often overlooked in analysis of MoSoSo dynamics.

Dodgeball (<http://dodgeball.com/>)

Basically Dodgeball tells your friends where you are by sending messages so you can meet up. Dodgeball also searches your friends if you tell where you are. Dodgeball was acquired by Google recently.

Nokia Sensor (<http://europe.nokia.com/nokia/0,1522,,00.html?orig=/sensor>)

"Social networking via cellphone is now a lot cheaper and easier, with the release of Nokia Sensor – at least for users of supported Nokia phones. Using Sensor – Nokia's MoSoSo app for Bluetooth phones – you can send free messages via Bluetooth to other Sensor users in a radius of about 30 feet. The software lets you create a "folio," or mobile home page, which can include a photo and personal info; once you hit the Scan button in the app, you'll get access to all folios within range, and can then decide who you want to chat with. Seems like it could be a useful way to track down friends (and make new ones) in a crowded, dark, noisy nightspot (which seems to be the way Nokia's marketing it), though like other MoSoSo apps, it could lead to a certain amount of cyberstalking, albeit at a very short range (the program allows block lists so you can hide from known creeps, though the default mode initially lets everyone in)."

Friendster Mobile (<http://fmobile.friendster.com/>)

"Friendster Mobile is a mobile community for Friendster members that operates over a SMS, MMS or WAP network."

JabberWocky / Familiar Strangers (<http://berkeley.intel-research.net/paulos/research/familiarstranger/index.htm>)

"Jabberwocky is a freely available mobile phone application designed to promote urban community connections and a sense of familiarity, anxiety, and play in public urban places. It takes advantage of current Bluetooth device proliferation. The application does not require seeding the population with initial users of the social network to function. Even today in most urban cities, the existence of even the current Bluetooth mobile phones is enough to gather meaningful and useful data for visualizations of place and urban strangers."

and many more...

<http://www.mobule.com/>

<http://www.playtxt.net/playtxt.do>

<http://jambonetworks.com>

<http://socialight.com/>

Spatial Annotation & GeoDrawing

Amsterdam Realtime (<http://realtime.waag.org>)

Although this can be categorised as an Art project I've put down as a geodrawing project (ofcourse it should have been in the geodrawing-art section).

"For the exhibition Maps of Amsterdam 1866-2000 at the Amsterdam City Archive, Waag Society and Esther Polak set up the Amsterdam RealTime project. Every inhabitant of Amsterdam has an invisible map of the city in his head. The way he moves about the city and the choices made in this process are determined by this mental map. Amsterdam RealTime attempted to visualize these mental maps through examining the mobile behaviour of the city's users. During two months (3 Oct to 1 Dec 2002) all of Amsterdam's residents were invited to be equipped with a GPS-unit. By visualizing the GPS data against a black background traces, lines, appear. From these lines a (partial) map of Amsterdam constructs itself. This map does not register streets or blocks of houses, but consists of the sheer movements of real people. When the different types of users draw their lines, it becomes clear to the viewer just how individual the map of Amsterdam can be. A cyclist will produce completely different favourite routes than someone driving a car. The means of transport, the location of home, work or other activities together with the mental map of the particular person determine the traces he leaves. This way an everchanging, very recent, and very subjective map of Amsterdam will come about. Participants received a print of their personal routes through the city, their diary in traces." <http://www.turbulence.org/blog/archives/000395.html>

frappr (<http://www.frappr.com/>)

"Create a map for your group. Share Group Photos. Get others to add themselves." People get together to post images on a subject dear to them to create a world-wide collective that share photo's. The location of the users is drawn upon a Google Map indicating the spatialisation of the group.

gpsdiary (<http://www.gpsdiary.org/>)

"GPSdiary.org is an online archive of an art project, in which artist Thorsten Knaub recorded his daily movements over the course of a year by carrying a Global Positioning System(GPS)receiver on him.

The GPS utilises special satellites in the earths' orbit to record any change of one's position on the surface of the earth. Therefore any kind of movement will be charted according to the latitude and longitude grid system, e.g. a walk to the local shop results in a small 'drawing', a day spent at home will be recorded as a dot only but a journey on the London Underground results in a straight line between the tube station where he is out of range of the GPS satellites.

GPSdiary.org makes it possible to view each days' trajectory individually and hence follow the artists' daily routine and movements."

Google Maps combined with Chat

<http://www.themidnightcoders.net/examples/messageserver/chat/mapchatajax.htm>

Geoskating (<http://www.geoskating.com/>)

"GeoSkating aims to automate the creation of interactive, multimedial skate-maps by using the Global Positioning System (GPS), Mobile Phones and the Internet." Geoskating is developed by Just van den Broecke who has been working on Waag projects for over seven years and is one of the key-developers of the KeyWorx platform (<http://www.keyworx.org>) which is the foundation for GeoSkating.

Geosailing (<http://www.geosailing.com/>)

GeoSailing is Geoskating's sister and was used to realtime track and annotate the "24 Uurs Zeilrace" which is the largest Dutch annual sailing event.

GeoNotes (<http://geonotes.sics.se/>)

"Based on positioning technology, allows people to attach virtual notes to real world locations. When other people pass the location, they will be notified about the note and will be able to read it. GeoNotes allows mass-annotations with no or little restrictions on accessing others' GeoNotes. It is also social in the way it incorporates social filtering techniques to sort out unwanted GeoNotes."

GeoStickies (<http://www.andrew.cmu.edu/user/noriyuki/artworks/geostickies/index.html>)

"An interactive public art project that enables us to make and access to collective of personal memory that could have been overlaid on to urban space. The project puts some "tags" of small events onto geographical fields so that the audience can feel correspondence

between "Information space" and "Urban space". The audience will find tiny electronic memorials for tiny events. But those are only visible or able to be experienced through mobile phones."

GeoTagr (<http://www.csthota.com/geotagr/>)

"Geotagr is the place where you can browse and tag photos from Flickr using MSN Virtual Earth Maps. You can browse anyone's (and yours) public geotagged pictures on the map and you can geotag your pictures to a location using simple drag-and-drop interface. "

Rabble (<http://www.rabble.com/>)

"Rabble enables a new kind of self-expression that informs, entertains and connects people through the media they create. Create your channel and post location-based media - your favorite places, photos or an up-to-the-minute newsworthy event. It's like putting virtual sticky notes on the world around you. Then connect with your world. Tell Rabble where you are and it will show you who is around you and the media they have created. Through bits of location-tagged media, find and interact with other people and get information you won't find in the yellow pages. Part blogging, part location-based personal networking, Rabble connects you with the world in a unique and intuitive way by turning "users" into "producers" and creating a marketplace for mobile user-generated content."

Plazes (<http://www.plazes.com/>)

"Plazes is a grassroot approach to location-aware interaction, using the local network you are connected to as location reference. Plazes allows you to share your location with the people you know and to discover people and plazes around you. It's the navigation system for your social life and it's absolutely free."

[murmur] (<http://murmurtoronto.ca/>)

"[murmur] is an archival audio project that collects and curates stories set in specific Toronto locations, told by Torontonians themselves. At each of these locations, a [murmur] sign with a telephone number and location code marks where stories are available. By using a mobile phone, users are able to listen to the story of that place while engaging in the physical experience of being there. Some stories suggest that the listener walk around, following a certain path through a place, while others allow a person to wander with both their feet and their gaze."

VoiceNote (http://geoffandwen.com/blind/newsarticle.asp?u_id=1797)

"Using the VoiceNote GPS device donated by sponsor Pulse Data HumanWare, Jim will make the first GPS recording of the Iditarod trail. He will also demonstrate this technology to schoolchildren in approximately 15 villages. The Pulse Data HumanWare VoiceNote GPS has two main functions: receiving and recording. In a receiving mode, the device receives signals that pinpoint a person's exact location via a network of 24 GPS (global positioning system) satellites that continually orbit the earth. Then it connects the user to a massive database that has over 700,000 preprogrammed points-of-interest, including restaurants, museums, hotels, and parks. The receiving mode is used primarily for route planning along city streets and previously mapped areas. For example, using the VoiceNote GPS, a blind person can easily find her way back to the hotel she is staying in without having to memorize a route or rely on mobility or orientation instructors. (NOTE: she still needs a cane or dog guide). Voice commands tell her what direction to go in, where and when to turn, and how far away she is from her destination at any given time. In the recording mode the device tracks and records an exact route, which can be stored and shared with other users or uploaded to a database or website. This is the mode that will be used primarily on the expedition. Using the GPS recording of The Iditarod Trail, other travelers (sighted or not) will literally be able to re-trace the expedition's journey."

semapedia (<http://www.semapedia.org/>)

"Our goal is to connect the virtual and physical world by bringing the best information from the internet to the relevant place in physical space. We do this by combining the physical annotation technology of Semacode with high quality information from Wikipedia."

Other semacode based projects are a.o. semanote (<http://www.merkwelt.com/people/stan/semanote/>) and shotcode (<http://www.shotcode.com>).

Geoloqus (<http://www.geoloq.us/blog/>)

"Geoloq.us is a service that lets users leave behind memories, comments and digital artefacts in a physical location, for others to discover and enjoy. A cameraphone with a web browser is all you need to use geoloq.us; browse pictures from the place you're at, comment a location or a picture and find out what's nearby. Tag your items and surf those tags for similar items from other people in other places."

Yellow arrow (<http://yellowarrow.net/>)

"You post a Yellow Arrow because you have something to say about where it points. Your thought is then forever tagged to that place."

When someone else finds your arrow and send the code, they get the message you left on their mobile phone."

Urban audio tours (<http://www.wirelesswalks.com/>)

"WirelessWalks.com lists the world's best cell phone audio guided walking tours. Just dial a number on your mobile phone to hear entertaining stories of history, architecture, culture and more! "

and more...

<http://www.yourhistoryhere.com/>

Down goes the System (<http://www.tokyo-picturesque.com/v1/>)

<http://www.gpsdrawing.com/>

http://www.hvedekorn.dk/2_02/202-jeremywoodgb.html

<http://www.aaronkoblin.com/work/faa/Documentationl.html>

Service

Google Local Mobile (<http://www.google.com/xhtml?site=local>)

"Google's Local for mobile service is a stripped-down version of the web-based Google Local that puts a heavy emphasis on maps and driving directions. The service allows you to search for specific addresses, businesses or business categories in the United States. Unlike the web-based Google Local service, results are minimal, featuring maps or satellite imagery. Information about individual businesses is limited to address and phone number, with an option to call the business by clicking a link. Locations you enter are stored, and up to 20 recent locations are accessible on your phone. "

JOCA: Wikipedia on your Mobile (<http://www.infosat.lu/Meldungen/index.php?msgID=16664>)

"JOCA is the first smart application enabling mobile users to enlarge their intellectual horizon at any place and any time. Up to now, Wikipedia could only be downloaded on PDAs, smartphones or communicators on a single-serving basis omitting the actual character of the free encyclopedia: Data could not be recalled, so the daily growing content of more than 400 contributions on Wikipedia was not considered. JOCA instead uses GPRS in order to screen the Internet encyclopedia for all existing and new findings and formats the founded content for mobile displays sizes. Recommended further readings are presented by links."

Listings

http://www.smartmobs.com/archive/2004/12/28/locationbased_.html

<http://www.netzwissenschaft.de/mob.htm>

<http://www.elasticspace.com/2004/06/spatial-annotation>

<http://www.elasticspace.com/2004/06/mobile-social-software>

<http://www.elasticspace.com/2004/04/urban-gps>