

Mobile Mappa Mundi: using cell phones as associative mapping tools

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ABSTRACT

This paper describes some current initiatives, tools and implications of the creation of personalized, associative maps using mobile devices. These maps, collectively known as mobile mappa mundi, allow for the creation of novel tools and applications which hold significant social, anthropological and cultural implications. Possible applications include melding social networks and geography to provide traces of experiences and memories for circles of friends situated at specific locations.

Keywords

Cell phones, GPS, social networks, Location based services, metadata,

1. Introduction

Mappa Mundi is a term describing a world map dating back to the Middle Ages, produced as part of the European map-making tradition. One of the most famous examples of a *mappa mundi* traces its origin back to the year 1300 and is on display at the Hereford Cathedral in the UK. These maps follow the Roman convention of representing all parts of the known world in relation to the center of their world (traditionally Rome, but in the case of the Hereford document, Jerusalem). The maps are not geographically accurate and feature a number of mythical and imagined beings. Regardless of these inaccuracies, they are important cultural artifacts for a number of reasons. [1]

Firstly, they represent the extent of the map-maker's knowledge of the world at that time. Secondly, they provide a unique insight into the way people perceived the world around them at that time. These maps also reveal the extent to which a map owes its existence to the world from which it emerges.

Rather than being objective representations of reality, we can see that the construction of these maps is heavily reliant

on cartography and sociology among other fields. The knowledge that they embody is constructed through the cartographer's experience and is closer to a socially constructed opinion, rather than an accurate geographical representation of reality.

Modern mapping technology and more rigorous application of scientific principles has resulted in cartographers creating charts which are far more geographically accurate, but which lack the rich cultural *mélange* and individual experience which allows us to infer a great deal of "metadata" from the medieval *mappa mundi*. Although this is not necessarily a negative thing, particular when attempting to use a map to accurately navigate unfamiliar surroundings, the richness of socially constructed knowledge is inconspicuously absent from most general reference maps. Other modern maps, such as the NYC MTA Subway map or the map of the London Underground, forgo geographical accuracy and intentionally distort and simplify space to highlight particular information about the organization of the lines which is more relevant for their users.

In an interesting subversion of this, Simon Patterson, a British artist who was a finalist for the Turner Prize, replaced all of the station names on the map of the London Underground with a variety of famous names in his piece *The Great Bear*. [2] Each line on the network became a different category of famous person, ranging from musicians to philosophers to footballers. This replacement of names is completely disorienting, at first glance the map looks familiar – until one attempts to find a particular tube stop, and then it becomes increasingly difficult, as all points of reference have been changed.

Navigation technologies such as the Global Positioning System (GPS) revolutionized cartography by enabling greater precision and certainty in the creation, use and enjoyment of maps. The falling price and increasing

accuracy of civilian GPS devices (“Selective Availability” which limited accuracy to ~100m was disabled in 200) has brought cartography into the realm of everyday life and spurred the development of a wave of location based services, applications and games.

GPS technologies are now low-cost enough that they are beginning to be integrated into a range of devices such as mobile phones and handheld gaming platforms. These relatively low-cost mobile devices are fully-featured Swiss-Army knives of the mobile world with the ability to create video, audio and still images as well as handle most communication applications. Using one of these devices, we will be able to map our surroundings in terms of our own individual knowledge and perception and create wholly digital, associative maps which can be thought of as *mobile mappa mundi*.

2. Background discussion

As human beings, we are constantly bombarded by an enormous quantity of information from our sensory mechanisms which we organize and arrange mentally according to a range of context-dependent criteria. This vast stream of raw data is continually sorted, interpreted, catalogued, cross-referenced, associated, stored, discarded or rearranged based on our own internal mental models as well as the amount of data we are able to process. According to Norretranders, this quantity is enormous –

“the eye sends at least ten million bits to the brain every second. The skin sends a million bits a second, the ear one hundred thousand, our smell sensors a further one hundred thousand bits a second, our taste buds perhaps a thousand bits a second. All in all, over eleven million bits a second from the world to our sensory mechanisms... A million times more bits enter our heads than consciousness perceives.” [3]

This vast stream of information rushing past our heads is filtered, mostly discarded and the remaining trickle finally ends up in our minds as interpreted impulses. Each of these interpreted impulses in turn then becomes a memory which is stamped with numerous tags and associations which trigger its retrieval based on contextual impulses - a conversation, a smell, a strange place or any other sensory inputs.

Our memories in turn, allow us to store and accumulate experiences over time and construct elaborate, associative mental maps. In *The Power of Maps*, Wood [4] states that

“Onto the simple schemata with which we came into the world, our early suckling and crawling and grasping and peek-a-booing all mapped a web of simple topological relations. This provided a substrate for the etching – as we moved out into the school yard and the neighborhood, as we explored the words behind grandma’s house or the meadows down beyond the creek – of spatial relations invariant under changes in point of view. Once we coordinated these, we could begin the construction of systems of reference invariant under changes in location, we could begin making... maps...”

We begin making maps at an early age and continue constructing them incessantly, from holiday trips with our parents to trekking around the world by land, air and sea, from books we have read to paintings we have seen, from all the movies we have ever watched (and some that we’d like to still) to all the music we have ever heard, from advertising to news broadcasts to the seasons we experience to the emotions we feel. We carry these thematic maps of associations around with us throughout our lives, updating their rhumb lines, shifting their meridians, linking them to each other or splitting them apart based on things we learn or changes in our perception.

Navigating through these maps, finding a path between “landscape and time, geography and emotion, knowledge and behavior,” is a process that Hall [5] calls “orientating”. Orientating allows us to navigate our inner maps, crossing smoothly from one series of associations to another, remapping meanings as we go along, the line our path creates colored by the personal meanings of our search.

To the ancient Greeks, creating and navigating this memory was one of the five parts of rhetoric. The art of memory was a technique by which an orator could improve his memory to enable him to deliver long speeches with unflinching accuracy. The technique uses a mnemonic of *places* and *images* (*loci* and *imagines*) to construct a building in memory and subsequently “place” an image in each room which will then trigger the correct memory. According to Yates [6], Quintilian gives the clearest description of the process

“In order to form a series of places in memory, he says, a building is to be remembered, as spacious and varied as one as possible, the forecourt, the living room, bedrooms, and parlors, not omitting statues and other ornaments with which the rooms are decorated. The images by which the speech is to be remembered are then placed in imagination on the places which

have been memorized in the building. This done, as soon as the memory of the facts requires to be revived, all those places are visited in turn and the various deposits required of their custodians.”

The art of memory of the ancient Greeks as well as the continual process of constructing personal maps are interesting because they both use geography to mediate associations. Personal thematic maps are constructed by the arc of our lives, inspired by the journeys that we take and the experiences we have, the maps as richly detailed as we allow them to be. The “memory house” of the ancients enforces a strict form on the shape of the map we create and the ways in which we store the associations.

The concept of a mobile mappa mundi as a personal associative map created, updated and accessed via a mobile device would inherit characteristics from both our own personal mental maps as well as the techniques used to construct a house of memory by the ancient Greeks.

3. Mobilizing the devices

The near-ubiquity of mobile phones ensures that a significant percentage of the world’s population carry a mobile computing device with them on a daily basis. As these mobile devices have become more powerful and capable of handling, creating and processing different kinds of data, there has been a corresponding development in a cluster of core technologies surrounding them.

A few of the technologies are network technologies – such as GPRS, EDGE, CDMA2000 and 3G – which result in higher bandwidth, more reliable connectivity and basic location awareness. Other technologies are integrated into the devices such as the high quality Charge Coupled Devices (CCDs), Digital Signal Processors (DSPs) and color LCD screens which have resulted in a rash of camera and videophones and spawned countless new media creators eager to create moblogs, videoblogs or even post pictures directly to their regular blogs. Another key integrated technology is embedded GPS, which has been a feature in Japanese and South Korean handsets (on NTT Docomo, KDDI, SK Telecom and LG Telecom’s networks) for some time, but is now becoming available on handsets in Europe and the US. Embedded GPS or AGPS allows for much greater accuracy in device location awareness.

A direct result of bundling these technologies together is an increase in the ability of users to create different kinds of media – textual, aural, visual – on the go and then tag this media with location metadata, giving rise to spatialized, localized and personalized clusters of location based data.

These clusters of personal location-based information can form the skeleton of a mobile mappa mundi – which would provide a glimpse into the thoughts, experiences and memories of the author at particular locations. Following a “breadcrumb trail” or feed of these information nodes subscribed to using RSS/RDF or similar technologies, we could begin to analyze how another person’s customized multimedia map could change one’s own perception, associations and even experience of a particular place.

4. Locating myself

A lightweight form of mapping another person’s experiences using GPS can be found in geocaching. Geocaching is an adventure game which uses GPS units (which may or may not be handheld devices) to discover real world caches using specific coordinates which are then published on a web site and discovered by various players. [7] Although the only data that is linked to the site are the latitude and longitudes, we can relate the memories or associations to the objects found or left in the cache.

Another form of personal mapping can be found in GPS Drawing which is the art of using GPS receivers as “geodetic pencils” or “cartographic crayons” to create sketches by “joining the dots” of the path traveled. [8] These drawings subvert the positioning of the GPS units by creating images directly from the journey itself and place less emphasis on the actual position in favor of creating the resulting image.

Ultimately, these two systems are not attempting to be anything other than entertainment and represent creative uses of GPS technology. They are not ideal for use as early mobile mappa mundi as they lack certain significant features – such as persistent storage, the ability to link media to points in space as well as to an authenticated identity.

The creation of mobile mappa mundi would emerge from the creation of personalized media attached to or annotated within a particular location. This can be thought of as social locative media – media that is as aware of its location as it is of its creator.

5. Sticky space: public spatial annotations

Newt Games, the French developers behind Mogi, a scavenger hunt type game in Japan, have taken advantage of the possibilities offered by high speed networks and the embedded GPS capabilities of the phones to create a unique gaming and social experience which delivers its experience by mapping a unique set of associations over the existing streets of Tokyo. In addition, Mogi has some light social

network features allowing players to chat with each other, letting them see who is nearby and encouraging face-to-face meetings through in-game interactions. [9] These spatial annotations become the map and the game and assist in the creation of a new gaming experience.

While Mogi's application of spatial annotations is novel in execution and application, public spatial annotations are not particularly new. Chris Heathcote pointed out a number of examples of public spatial annotations ranging from pre-historic rock paintings or engravings to more modern forms such as graffiti, warchalking or stickers. [10] One of the key differences that mobile technology brings to these types of public spatial annotation is the ability to create dynamic annotations.

An early dynamic spatial annotation system which attempted to use the world as an interface was Jim Spohrer's Worldboard. Worldboard was a concept for a global augmented reality system which would "facilitate innovative ways of associating information with places". The Worldboard wanted to be a "planetary chalkboard" and create "virtual post-it" notes viewable only by authorized people. [11] Unfortunately, although their web site presciently acknowledged the convergence of mobile phones, mobile content creation devices and wireless technology, they focused too heavily on augmented reality technologies such as context-sensitive glasses and did not address issues of privacy, security and authorship.

Urban Tapestries is another spatial annotation project which aims to "explore the social and cultural uses of the convergence of place and mobile technologies through transdisciplinary research." Their software platform allows people to author and access location based content (text, audio, pictures). According to their site 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." [12]

Urban Tapestries have run two trials of their software, both of which have yielded intriguing results, but in both cases, the amount of participants was necessarily small, they were not filtering any of the content and their map of the resulting threads was extremely dense and difficult to

decipher. Their system does promise RSS feeds in the near future, allowing people to subscribe to content created by specific authors, within specific threads or within a set geographic radius.

Thingster is Yet Another Spatial Annotation System (YASAS) which lets you attach notes, images or events to specific locations. It describes itself as an open-source weblogging service for locative media. They perceive their reward as "enriching neighborhoods such that it becomes easy to discover local services at a lower cost and to create additional environmental awareness." [13] Their service is intriguing, but the posting interface was difficult to use and the viewing interface suffered from the same lack of filtering that Urban Tapestries had. Their map is more difficult to use, as it requires several levels of zooming in before one can view any useful information. If there were even a handful people posting a single "point" daily, the map would be rendered unusable within a very short space of time.

Using Thingster and Urban Tapestries' concepts of community maps as a stepping-off point, it becomes clear that with any kind of increase in scale, it is difficult to implement a public spatial annotation solution without creating filtering mechanisms to prevent the map from becoming overburdened with excessive information.

If you allow people to author various types of media and publicly situate them within a location, the media data will accrue over time and become significantly denser as it is used, updated and explored. Like the enormous amount of sensory information we receive and discard, we need to find some way to sift through this information. One way in which this data could be reduced or filtered could be by using collaborative filtering – such as that implemented by Google (PageRank), [14] Slashdot (Scores), or Amazon (User reviews and ratings). According to Shirky, collaborative filtering transforms decisions made by a few participants into "into aggregate recommendations of remarkably high quality". [15]

Collaborative filtering could definitely assist in reducing the sheer volume of posts or points on the map, but this would still leave a large quantity of public media items which although community aggregated into higher quality items, still may not be of interest to the person using it.

The author is involved in the development of a mobile social software (MoSoSo) system with spatial annotation features called Socialight. [16] Socialight is a system which provides users with a social network accessed via either the web or a handheld GPS enabled phone. Like typical social networks, the user creates a basic profile and is then able to

add friends to their buddy list. They download an application onto their mobile phone and are then able to view their buddy list while mobile. The spatial annotation feature is called “Sticky Shadows” and is similar to the Urban Tapestries spatial annotation system, with one significant difference – messages are delivered to selected recipients. When a message is received, you are immediately able to see which friend or Friend of A Friend (FOAF) placed it within that space and are then immediately able to respond.

Although there have not been any public trials yet, the author believes that this type of social filtering could help alleviate the volume of shared locative media, by delivering messages that are particularly relevant to the person using the map.

6. Filtering socially

Apart from certain exceptions, in most cases, people find they have very little desire to converse with strangers. Sharing personal media with strangers is even less appealing. Social filtering can be thought of as collaborative filtering via your contact list. Media shared between friends has a great deal more relevance than media shared by strangers. These social principles influenced the development of photo sharing sites such as Webshots, Ofoto and Flickr [17] as well as numerous viruses (Love Bug, SoBig, MyDoom) which hunt through your address book to self-replicate and spoof their origins.

When you receive a message from friend, you immediately form specific assumptions (based on your relationship with that friend) about the message before opening it. These assumptions could be based on previous correspondences with that friend so that you would have an expectation of the type, quality and intended purpose of the media that would be sent by them. In addition, you have a personal interest in the media, as your memory of it will always be associated with that person and it may affect on your relationship.

If we apply social filters to a community based spatial annotation system such as Thingster or Urban Tapestries, we can try to create content which is more relevant and interesting to the users and communities within the system, rather than delivering content from everybody to everybody.

The ideal mobile mappa mundi will use these social filters to create a system which allows for the easy creation / updating and altering of your personal associative map using a mobile device. The system will use your social

network as first and second order filters to reduce the amount of irrelevant information presented to you. Using a pre-existing profile or one of the open-source human-metadata tools such as FOAF or LOAF [18] will allow for easy data transfer between networks and automatic importing and exporting of social network data between applications. This would push artificial social networks to more closely resemble real social networks by allowing for mobility between different platforms or interfaces.

7. Social implications

Once we are able to create mobile mappa mundi - what could happen when we share them? Sharing experiences that we have had at certain locations with our friends can strengthen personal bonds that we have with them, create new experiences and allow new links to emerge which were previously non-existent.

Mobile mappa mundi could also be used as entertainment – fulfilling the voyeuristic pleasure of following in a friend’s footsteps and being able to look “over their shoulder” at the media they created and placed throughout the course of their day. Browsing through the maps created by the friends in your social network, or receiving their locative media posts could change your entire experience of a place. Subscribing to a mappa mundi experience overlay could become as common as having a favorite blogger.

One social situation that could be awkward with a mappa mundi is what Dodgeball.com calls “the ex-girlfriend bug”. This is what happens when somebody that you would rather not have any contact with remains in your social network. The emotional stress of a traumatic breakup could be compounded by receiving unwanted location specific updates of your ex-significant other’s experiences. Dodgeball [19] – one of the first MoSoSo’s developed a workaround by creating a system to “manage friends”. What it does is prevent your “friend” from seeing any messages you send out regarding your current whereabouts. Using this option, you can avoid awkward situations such as when you have to explicitly bar or remove a person from your contact list (“I’m deleting you from my Friendster account”). This technological mediation of a socially awkward situation is an interesting social tool that mimics some of the unconscious mental calculations that we engage in constantly.

8. Conclusion

A number of tools and applications are beginning to explore the possibilities offered by creating locative media using handheld devices. The creation of a mobile mappa mundi-type service or application has still not emerged, but many

projects are under development which have toolsets approaching the capabilities of a holistic social locative media system. The promising amounts of development being undertaken and the realization of the mobile phone as ubiquitous computing tool bode well for the realization of a mobile mappa mundi system in the very near future.

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Michael Sharon is an artist, writer and technologist. He has worked as a wireless/web application developer, writer and consultant for clients in South Africa and the United States. Michael holds a Master's degree from the Interactive Telecommunications Program at New York University and a Bachelor's degree in English and Law from the University of the Witwatersrand. He is a co-founder of Socialight, a mobile social networking company which was recently featured at the Ubiquitous Computing Conference 2004. His research interests include gestural control of electronic instruments for live performance (*Pierrophone* interface featured at the New Interfaces for Musical Expression (NIME 2004) conference in Japan). He has exhibited and performed in Belgium, South Africa, UK, USA, Canada and Japan.

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