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Social Navigation and Local Folksonomies: Technical and Design Considerations for a Mobile Information System

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Abstract
Web services such as wikis, blogs, podcasting, file sharing and social networking are frequently referred to by the term Web 2.0. The innovation of these services lies in their ability to enable an increasing number of users to actively participate on the Internet by creating and sharing their own content and help develop a collective intelligence. In this paper we discuss how we use Web 2.0 techniques such as 'folksonomy' and 'geo-tagging' in a mobile information system to collect and harness the everyday connections and local knowledge of urban residents in order to support their social navigation practices.

1 Introduction

Our physical world holds certain characteristics that enable us to interpret what other people have done, how they behaved, and where they have travelled. Sometimes, we can see traces on physical objects that provide hints about people's actions in the past. Footprints on the ground left by previous walkers can show us the right way through a forest or, in a library, for example, dog-eared books with well thumbed pages might be worthwhile reading as they indicate the popularity of the text. The phenomenon of people making decisions about their actions based on what other people have done in the past or what other people have recommended doing, forms part of our everyday social navigation (Dourish & Chalmers, 1994). In contrast to physical objects, digital information has no such 'visible' interaction history *per se*. We do not see how many people have listened to an MP3 file or read a webpage. In a digital environment people do not leave interaction traces, leaving us, according to Erickson and Kellogg (2000), 'socially blind'. However, the high value placed on social navigation in the physical world has motivated people to start thinking about it as a general design approach for digital information systems as well (A. Dieberger, 1995; A. Dieberger, 1997; Forsberg, Höök, & Svensson, 1998; Svensson, Höök, & Cöster, 2005; Wexelblat & Maes, 1999).
This chapter explores some of the technical and design considerations that underpin the conception and development of a mobile information system called *CityFlocks*. It enables visitors and new residents of a city to tap into the knowledge and experiences of local residents and gather information about their new environment. Its design specifically aims to lower existing barriers of access and facilitate social navigation in urban places. The technical development phase and the empirical usability research of *CityFlocks* has been reported elsewhere (Bilandzic, Foth, & De Luca, 2008). The purpose and focus of this chapter is to discuss the underlying design concepts that informed this social software. These concepts are positioned at the intersection of three broad areas of research and development that inform human-centred and participatory methods for designing interactive social networking systems on mobile platforms: social navigation, Web 2.0, and mobile spatial interaction (Figure 1).

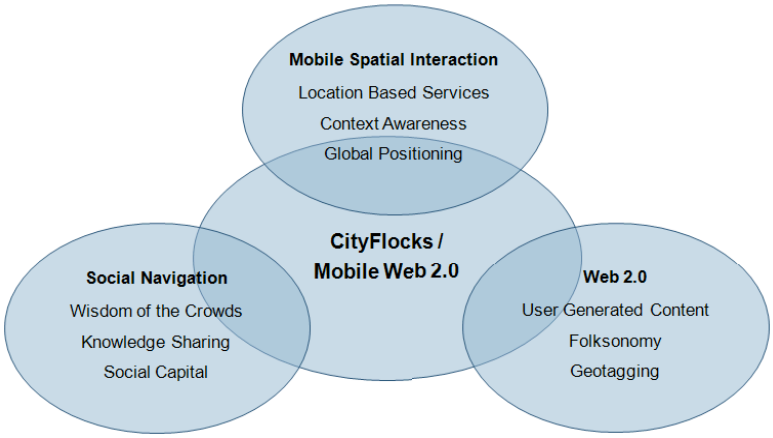

Figure 1: CityFlocks is placed in an interdisciplinary field, embracing topics in social navigation, mobile spatial interaction and Web 2.0 technology

First, the concept of social navigation and how people make use of it in the physical world are examined. Relevant previous studies and examples are discussed that apply social navigation as a design approach, e.g., for virtual information spaces on the web. Based on the success and popularity of what has now been coined 'Web 2.0' services, the second part of this chapter analyses a number of web development trends that foster participatory culture and the creation and exchange of user generated content. Some of these developments that introduced more and more social interaction and navigation methods to the web, such as user participation, folksonomy and geo-tagging, were reappropriated to inform the design of *CityFlocks*. Given new generation mobile phones that allow global positioning, Web 2.0 technologies that were initially aimed to facilitate social navigation on the web, can now be used to facilitate social navigation in physical places. The third part of the chapter discusses related projects in the field of mobile spatial interaction, a research area covering mobile applications that deal with information related to the user's surroundings. The review of the aims, strengths and weaknesses of previous research projects in this field refines the research trajectory which guides the development of the *CityFlocks* prototype and potentially similar mobile information systems. The chapter thus reveals further opportunities and issues regarding social navigation in the context of new generation mobile phone services, the 'Mobile Web 2.0' (Jaokar & Fish, 2006).

2 Social Navigation

The phenomenon of people asking other people for advice is part of a broader concept called social navigation, at first introduced by Dourish and Chalmers (1994). They describe it as 'moving towards a cluster of other people, or selecting objects because others have been examining them' (Dourish & Chalmers, 1994). It can be seen as a form of navigation, where people make decisions about their actions based on what other people have done or what other people have recommended doing. Tourists in a new town for example, often choose to go to restaurants that are crowded with people rather than picking empty places. The fact that a fair crowd of people has decided to walk down a certain path within a space, enables us to be more comfortable to do so as well (Norman, 1988; Rheingold, 2002; Wexelblat & Maes, 1999). We might also take such interaction histories between objects and people as a warning. For example, if we observe skid marks while driving on a road, we implicitly slow down because the marks show us that an earlier driver obviously had to brake rapidly.

2.1 Mediated and Unmediated Social Navigation

Compared to physical spaces, in the digital world there are no such visible hints that naturally describe an object's interaction history. In contrast to a physical paperback book or a CD, digital documents or music files do not have dog-eared pages or scratches that give us an idea about their amount or time of

usage. Similarly, footprints of earlier walkers in the wood might show us the right way, as opposed to virtual information spaces, such as the web, that do not provide any natural traces and visible paths that could help following navigators. People have recognised that such traces on physical objects provide important information for their navigational behavior in physical spaces and have constantly been trying to transfer the same sort of navigational aid to virtual information spaces, especially to the web (A. Dieberger, 1997, 2003; Höök, Benyon, & Munro, 2003).

In the recent years people have developed mediated techniques and technologies that provide much more sophisticated social navigation possibilities. In the physical world we are restricted to visual traces on objects (e.g. dog-eared pages on a book) that only give us a vague hint about its quality. Using the second possibility in a non-digital world to find out about a book's quality, asking people directly about their personal opinion, we are restricted to a number of friends or librarians who might have read it before. In contrast to that, the web has some clear benefits for making use of social navigation. It connects hundreds of millions of people from all over the world in one medium. People have developed services and technologies that leverage this physical connectivity of web users to connect them on a social level as well. To continue with the book example, Amazon (http://amazon.com) for instance has created a platform that brings together people from all over the world to comment, review and exchange personal opinions before they purchase a book. The platform keeps track of the books each user has purchased in order to identify and suggest titles that other users with the same shopping history have read as well. As all purchases, reviews and ratings are tracked and saved in a database, collaborative filtering methods can be applied to analyze the taste of many people to automatically predict the book taste of individual users. Providing such a mediated social environment, Amazon has created far more sophisticated social navigation affordances than traditional book stores ever had.

In the last couple of years the social navigation approach for designing web services has become ubiquitous in the web due to the appearance of a set of Web 2.0 technologies which facilitate rich user interfaces (e.g. AJAX, CSS), the use of interchangeable data formats (e.g. XML, RSS) and a user based taxonomy (e.g. folksonomy, geo-tagging). The high potential of Web 2.0 technologies combined with the fast development of mobile phone capabilities, such as global positioning technology and high-speed Internet access opens up great capabilities to develop mediated social navigation aids for mobile phone users in physical spaces. Similar to how Amazon leverages the physical connectivity of web users to provide social aid and recommendations for book shopping, the connectivity of mobile phone users and recent mobile phone technology can be leveraged to enhance social navigational help when searching for places in the physical world.

2.2 The Evolution of Social Navigation on the World Wide Web

The problem in the early stages of the web and its hyperlink based navigation was a lack of navigational and visual structure of space. As Dieberger claims, this very lack of visual structure was the reason that motivated people to start sharing their link references on their personal home pages (A. Dieberger, 1997). Users were ironing out the lack of structure in the web by providing navigational help to each other. This social sharing of information or hyperlinks with others on the web is the major enabler of what we call *surfing* or *browsing* the Internet, which turned out to be a popular search strategy for finding websites on the Internet (Erickson, 1996). People have actually adopted the same strategy they usually apply to find information in the real world: They ask people in their social networks and if they can not help, they would know someone who knows and eventually they would get the information they were looking for. Similarly, people started to search for information on the web by browsing through personal websites and following their links to other personal websites until they found the site with the specific information. Erickson describes this early phenomenon in the World Wide Web as a *"slow transformation from an abstract, chaotic, information web into what I call a social hypertext"* (Erickson, 1996). With this social hypertext, the web has become a medium that people can easily browse through the immense pool of social capital and knowledge available in their networks.

Social navigation has become a key principle of how we search for information and navigate the web today. One example that illustrates its breakthrough on the web can be seen in the history of search engines. While early search engines until 2001, such as Lycos, Yahoo or Altavista were still based on big web directories, Google has outpaced all other players with *relevance ranking*, a search concept based on social navigation. Google implemented this concept in its *PageRank* algorithm. For any URL

on the web, it analyses the amount and content of web pages that refer to it when calculating its position in the search results (Google, 2007). The more people set links to a particular website, the more important Google considers it to be and the further up it appears on the result page. What Google has achieved with *PageRank* is basically an automation of searching for a website that most other people hyperlink to from their own webpage. Thus, for any topic or search request it provides a ranking of pages that are obviously considered to be the most popular among other people on the web.
The CityFlocks prototype is a similar system designed for local places and services in a city. For any type of local service in a city, e.g. 'fish restaurant' or 'tennis court', the system comes up with a ranking of the most popular, relevant places in the city, based on the opinion and ratings of the local community of residents. Harnessing the intelligence of local residents and their participation on a shared knowledge platform can democratise urban information, such as opinions about a local service or place. The next section explains how participatory culture has transformed the web from something we considered as a pure information space to what it has become today, a thoroughly social medium (O'Reilly, 2005).

3 Web 2.0

The term Web 2.0 has been coined to identify – arguably – a second-generation of web services that aim to facilitate collaboration and sharing between users, such as social networking systems, file sharing sites and wikis. These services provide means for users to engage in participatory culture that are no longer limited to the technically versed or the civically inclined. Scholars such as Jenkins (2006) and Burgess et al. (2006) have identified socio-technical trends towards a wider ('vernacular') ability of people to participate in digital culture through personal expressions of creativity. Many examples of how participatory culture is enabled by recent technological innovation rely on Web 2.0 applications and services such as blogs, Wikipedia, YouTube, Flickr, and social networking sites such as Facebook, which are arguably more open, collaborative, personalisable, and therefore participatory than the previous internet experience. According to Kolbitsch & Maurer (2006), the participatory qualities of Web 2.0 encourage ordinary users to make their knowledge explicit and help a collective intelligence to develop. In an urban context, Foth et al. (2007) argue that such capabilities present diverse possibilities for a profound urban epistemology to evolve. New tools and practices, inspired by user-led innovation, are springing up faster than our ability to analyse them individually. It has been claimed that such a social navigation approach can foster a new generation of user experience for mobile applications as well (Höök, 2003; Jaokar & Fish, 2006). Bypassing the terminology debate, whether the term 'Web 2.0' is adequate, this section focuses in particular on three characteristics of Web 2.0 developments, that is, user participation, folksonomy and geo-tagging. It prepares the discussion in section 4 about the ways these characteristics can be applied to a mobile spatial interaction service that facilitates social navigation in the physical world.

3.1 User Participation: Let the Users Generate Content

Looking back at the history of the Internet, we can see that its real breakthrough as a social mass-medium first came with the introduction of the World Wide Web, the number of users skyrocketing from 600.000 to over 40 million within only five years (Friedman, 2006, p.61). One major reason for this magnificent success of the Internet was that for the first time people were given a medium which allowed them to participate in the content creation process. In contrast to other media such as television or radio which only enables professional information providers to broadcast information, the web enabled individual users to contribute. Hypertext Markup Language (HTML) offered users means to codify, upload and share their own content with other users on the network. With hyperlinks they were able to refer and set shortcuts to other relevant or interesting pages. This is in fact how the Internet became a social medium. The combination of user participation and the hyperlink system enabled the web to be used as a tremendous repository of social knowledge (Erickson & Kellogg, 2000).

However, the majority of web users were still only information consumers. The lack of technical background knowledge, such as learning a markup language, uploading a site to a web server or take care of the site administration has prevented many people from creating their own webpage (Kolbitsch & Maurer, 2006). This is what the introduction of Web 2.0 technologies has dramatically changed. They flattened the technical obstacles and made it easy for anybody, not only geeks and professional information providers to engage in the content creation process. With wikis, weblogs or file sharing services for example, people do not need to learn HTML anymore in order to publish content on the web. Such services provide frameworks, templates and tools that abstract from the technical layers and enable ordinary users to easily become authors of web content. User generated content became a new paradigm for this revolutionary generation of Web 2.0 services (O'Reilly, 2005). Web 2.0 blurs the strict borderline between consumers and information providers which eventually leads to a trend of entirely community-driven web services (Lindahl & Blount, 2003).

People were given a tool to discuss ideas, exchange information and give advice to each other. With Flickr (http://flickr.com) and YouTube (http://youtube.com) people can easily share their pictures and videos; Blogger (http://blogger.com) and Typepad (http://typepad.com) allow individuals to publish personal stories, and Yahoo Answers (http://answers.yahoo.com) provides a platform for people to answer each other's questions on specific topics. The content of all those services is almost entirely created by the community of its users. This trend towards flattening technical barriers and giving individuals a voice in a mass medium, what Anderson refers to as 'the Long Tail' (Anderson, 2006), is one of the key success factors of Web 2.0. While conventional web services have mostly been providing content from a single entity (e.g. a professional content provider), they were outpaced by services leveraging the collaboration of many different entities which would all upload and share their content with others. Following this community driven approach, Wikipedia (http://wikipedia.org), an online encyclopedia, has outpaced Britannica, the most successful encyclopedia till then. The huge amount of web users, who add or edit Wikipedia articles, renders the content creation process much more flexibly than the relatively small number of Britannica authors. Consequently, the articles in Wikipedia are more current and have a much larger range of topics, covering 3.7 million articles in 200 languages from more than 45,000 registered users who upload about 1,500 new articles every day (Giles, 2006). The benefit of such collaborative information platforms is that their content is based on the collective intelligence of a crowd of people. As Surowiecki (Surowiecki, 2004) puts it, "the many are always smarter than the few", meaning that the information content from a massive user community can not easily be outpaced by a single entity. O'Reilly argues that this paradigm is one of the main drivers of this new generation of web applications, the Web 2.0 (O'Reilly, 2005).

The community driven design approach of those services transformed the web in a way that they now take advantage of the dynamic intelligence and content generating power of its community to provide full-blown and highly up-to-date information (Kolbitsch & Maurer, 2006; O'Reilly, 2005). This user participation and uploading of information facilitates social navigation on a much larger scale than we have in the physical world. In fact, the very process of designing proper affordances that allow people to socialise and help each other to navigate digital systems, has been a research topic in various domains (Höök et al., 2003), e.g. online food shopping (Svensson et al., 2005) or web browsing (Andreas Dieberger, 1995; A. Dieberger, 1997, 2003; Wexelblat & Maes, 1999), where e.g. Wexelblat and Maes have introduced Footprints, a system that tracks and visualises the navigational behavior of a website's visitors in order to provide future visitors with navigational aids such as maps and paths (Wexelblat & Maes, 1999).

These studies have shown that social navigation affordances do enhance users' experiences in digital information spaces. They have explored a number of design principles that are significant in different use cases and domains. Additionally, there are suggestions for some key principles, e.g. privacy, trust, personalisation and appropriateness that should be considered in general when designing for social navigation in digital systems (Forsberg et al., 1998).

3.2 Folksonomy: Let the Users Organise Content

With the amount of user generated content constantly increasing in web services, there is a need to structure and organise all the uploaded material. This would ensure that the submitted content could be identified and retrieved at a later point in time. One straightforward way is to set up an indexing system, where all the information would be put in pre-fixed categories. This process usually requires highly trained information professionals and is very inflexible, e.g. for storing information that does

not fit in any of the existing categories (Macgregor & McCulloch, 2006; Vander Wal, 2007). In order to provide a more flexible storing and retrieval system, recent web services that deal with huge amounts of user generated content like Flickr or Del.icio.us, have employed a technique that has come to be known as 'folksonomy' (Golder & Huberman, 2005; Macgregor & McCulloch, 2006; Vander Wal, 2007). Folksonomy is a user created taxonomy for people to generate short keywords about their uploaded content rather that putting them in fixed categories. By assigning these keywords or so-called tags, the semantics of various information resources can be easily described (Amitay, Har'El, Sivan, & Soffer, 2004; Casey & Savastinuk, 2007; Coleman, 1988; Macgregor & McCulloch, 2006; Torniai, Battle, & Cayzer, 2005). A user submitting a picture of her new car on Flickr could for instance use the tags 'car', 'automobile', 'porsche' and 'cabriolet'. In contrast to an index, the picture will not be saved in any pre-fixed category in the system, but can be retrieved under any of those keywords. As users can assign such decentralised keywords to their content, there are no restrictions to what information one can submit as opposed to the constraints of fixed categories. The organisation of the information resources are completely controlled by the users themselves, which makes the system cheaper and much more flexible. Most recently, the advantages of this user based contextualisation of items have been used to facilitate information retrieval in libraries as well (Casey & Savastinuk, 2007; Courtney, 2007).

This collaborative tagging method, initially developed to organise information on the web, can be transferred to a mobile information system that people use to describe places in the physical world. Like Delicious (http://del.icio.us) uses collaborative tagging to let web users identify, describe, recommend and organise Internet-addresses (URLs), CityFlocks was designed in a way that allows the community of local residents to do the same with physical places in a city. Comments on the ice-cream parlor next door could for example be tagged with 'ice-cream', 'dessert' and 'coffee'.

3.3 Geo-tagging: Spatially Contextualised Content

Encouraging ordinary people as content providers for local information can be an effective way to provide a democratic, current and comprehensive pool of local information and news (We Media, 2003). In contrast to citizen journalism platforms – e.g. MyHeimat (http://myheimat.de) or EdgeX (http://edgex.org.au) – which enable local citizens to upload extensive stories relevant to their wider city area, there are use scenarios which indicate that spatial contextualisation sometimes requires finer granularity. A story or piece of information might for example only be relevant to a neighbourhood in the city or a specific place, like a shop.

In this cases geo-tagging, a method to attach latitude and longitude identifiers, enables people to put their information resources such as text, pictures or videos into a specific geographic context (Torniai et al., 2005). Such spatially and semantically contextualised information can be applied to overlay the real world with a virtual information space to be used for mobile services (Burrell & Gay, 2002; Jaokar & Fish, 2006), and more specifically, create a mediated social environment that helps people navigate physical spaces by using location aware mobile devices. Qype (http://qype.de) for example provides such a service which uses user-generated, geo-referenced comments in a mobile information service.

Similarly, recent photo cameras can automatically attach the latitude and longitude coordinates of the current geographical position when taking pictures. Later, the pictures can be displayed with special programs or web services on a map where they were taken. Locr (http://locr.com) for example provides such an online service to organise your picture collection on a geographical map and share them with others. As all pictures are geo-tagged people can compare their own pictures with the photos that other people or friends have taken at the same place or city. Or they can use it to see pictures of a place they plan to visit soon in order to learn about it in advance. Collaborative Tagging has enabled web users to describe the content and theme of their pictures and make them retrievable for other people. Geo-tagging allows them to additionally share the geographic location of where they have taken each of their pictures. Enriching the metadata of one's pictures with both, folksonomy tags and geographic identifiers enables a very specific and flexible organisation and retrieval of pictures in a shared database. Figure 2 shows a search request on a Flickr-map (http://flickr.com/map) for pictures that were taken in Bangalore, India and Melbourne, Australia and annotated with the tag 'car'.

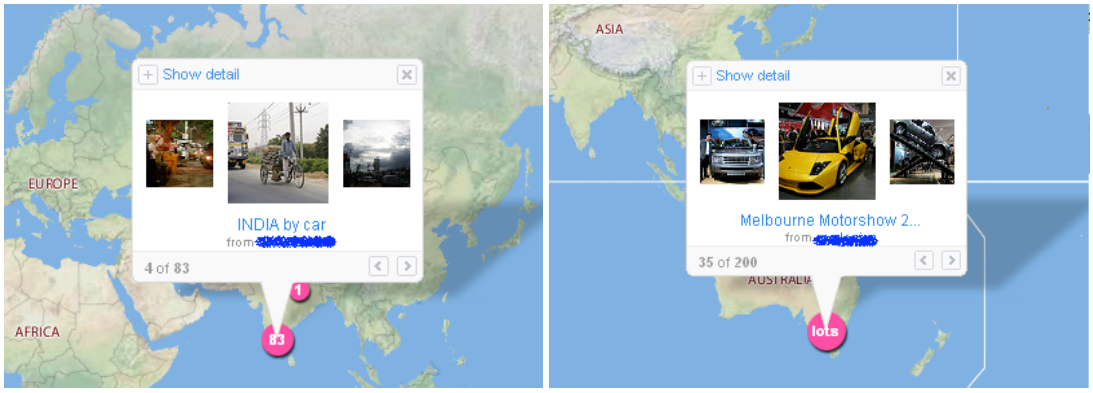

Figure 2: Folksonomy and geo-tagging enable a flexible organisation and retrieval of pictures.

Dealing with respectively large masses of stored data, Web 2.0 services have developed two very powerful information organisation methods – folksonomy and geo-tagging. With the design of the *CityFlocks* prototype we sought to transfer Web 2.0's participatory culture as well as the folksonomy and geo-tagging methods to foster a location and context sensitive mobile information system. Applying collaborative tagging and geo-tagging to a community driven, mobile information system enables people to annotate urban places in their neighbourhood with comments and recommendations and describe their entries with tags for later retrieval purposes. Such an urban information system helps collecting local knowledge and experiences in a shared knowledge platform about inner-city places and facilities. The collective intelligence and knowledge of local residents about particular places and local services in a city is much bigger than any single entity like a professional agency could provide. With the geographical identifiers in its metadata, the submitted content is used to support tourists and visitors in finding popular local services in new cities recommended by locals.

4 Mobile Spatial Interaction

The previous sections have covered related projects and literature on social navigation and relevant Web 2.0 technologies. This section is dedicated to related work and research studies undertaken on the mobile platform, specifically mobile spatial interaction, i.e. location and context-aware mobile applications that refer to information relevant to the current surroundings of the user. Such applications can be classified in four different categories: Systems that facilitate navigation and wayfinding in geographic places, mobile augmented reality applications, and applications that create or provide access to information attached to physical places or objects (Fröhlich et al., 2007). In the context of *CityFlocks*, the latter two categories are of special interest.

Lancaster University's GUIDE project for example is an electronic tourist guide that provides users with context-aware information, depending on their profile, interests and location. Its focus is on providing an automated personalised guided city tour with dynamic, interactive services. However it can only read information, but does not provide any content-generating functions to its users (Cheverst, Davies, Mitchell, Friday, & Efstratiou, 2000; Lancaster University). Another example for accessing virtual context-information on mobile devices, are applications that are based on visual codes (Ballagas, Rohs, & Sheridan, 2005; Rohs, 2005; Rohs & Gfeller, 2004; Toye et al., 2004). Using mobile phones with embedded photo cameras, one can select those visual codes and request information related to the object or place where the respective code tag is attached to. A drawback of this method is that the user can request information only in-situ, but not from remote places.

The other type of applications relevant to the context of this work enables users not only to read but also create spatially contextualised content. GeoNotes (Espinoza et al., 2001) and Urban Tapestries (Proboscis, 2003) for example allow mobile users to attach virtual sticky notes to particular latitude / longitude coordinates. Equipped with Wi-Fi enabled PDAs, GeoNotes users can see other users' notes that were left behind in their current immediate surroundings. Even though GeoNotes embraces users

as information producers rather than just passive consumers, it is not an entirely community driven service. Its major weakness is that the user generated post-it notes are managed in hierarchical, tree-like location structures that have to be set up in advance manually. Thus people can create location based content, but are limited in specifying how it can be retrieved by other users. Urban Tapestries on the other hand allows users to self-organise their comments and relationships to different places with category-like "threads" (e.g. "my favorite pubs and clubs"). E-Graffiti, a context-aware application evaluated on a collage campus, detects each participating student's location on the campus and displays notes that were left behind by other students (Burrell & Gay, 2002). Just-for-Us (Kjeldskov & Paay, 2005) and the George Square project (Brown et al., 2005) represent context-aware real-time applications that provide an enjoyable shared social interaction of remote users that follow a common goal. While Just-for-Us helps a group of friends in a city to identify a good place to meet depending on their individual current locations, the George Square project focuses on location, photography and voice sharing functions to let on-site and off-site users collaboratively explore a city sight.

Much of the previous work in mobile spatial interaction is on enabling users to access or add content to physical places or objects. They focus on techniques that allow people to retrieve locative information or share it with others by attaching stories, thoughts, experiences and knowledge to specific places. Besides the various use scenarios, the applications primarily differ in the interaction design of specific features (Tungare, Burbey, & Perez-Quinones, 2006), e.g. access virtual post-its from remote places (Espinoza et al., 2001; Proboscis, 2003) vs. in-situ access (Burrell & Gay, 2002; Lancaster University, ; Rohs, 2005), push (Espinoza et al., 2001; Kjeldskov & Paay, 2005) vs. pull services, expiration dates of the messages or private vs. public messaging (Burrell & Gay, 2002; Espinoza et al., 2001). While most of the previous projects discuss such different features around indirect and asynchronous interaction methods (i.e. people exchange information by attaching text or multimedia content to specific places), not much work has yet been carried out on studying direct interaction methods (e.g. phone call, text message) in the context of spatial interaction.

CityFlocks focuses on evaluating the performance of people using direct and indirect social navigation methods when gathering information about a specific place. In a similar context, solely the George Square study supported a voice connection and has shown to be the most valuable channel for people when collaboratively exploring a city sight. In contrast to George Square, our participants were not recruited as pairs of friends, but complete strangers. Furthermore, the context is information and knowledge sharing in urban environments rather than collaborative exploration. *CityFlocks* users can, in addition to leaving relevant text or multimedia content at specific places, also attach their contact information. Other mobile phone users who are interested in more details about the place can then contact the author of the virtual post-it directly via voice-link or a direct text message. In a field study we evaluated which method, direct or indirect communication, users prefer in which situation and context (Bilandzic et al., 2008). The outcomes inform future mobile spatial interaction systems that are targeted in providing information to its users about places and objects in their immediate surroundings.

5 Conclusions

Originally social navigation was restricted to visible interaction histories that were naturally left behind and thus clued on earlier physical interaction between people and the respective object. People interpret these hints as a message, recommendation, warning or just a note telling them something about the type of interaction the previous navigator had with the object. Above, we have seen how online social communities have improved the social navigation experience for special interest groups. With the rapid developments of mobile information and communication technology, the methods which have been developed for such communities on the web, can also be used to enhance social navigation in physical spaces (Höök, 2003).

There is an emerging trend that sees the network connectivity of mobile phone users leveraged to create a mediated social environment where people who are interested in particular geographic locations can exchange information, personal opinions and experiences with the respective place. This would for example enable visitors of a new city to access the knowledge and experiences from local

residents about inner-city facilities. Recent developments in the mobile technology sector indeed have made this scenario become realistic. Multimedia mobile phones with voice recording and photo camera capabilities as well as mobile high speed Internet networks enable users to create and upload location based content anywhere, anytime. Equipped with such a device, people can easily capture and digitise whatever they have experienced at the very point of inspiration, using text, video or audio recordings (Jaokar & Fish, 2006). A mobile web application would let them upload such location based recommendations and make them available for other mobile users who plan to navigate the same space later on. For example they could create a recommendation for an ice cream parlor, saying *'This place serves the best ice-cream in town. They have a wide range, cheap prices and a very friendly service!'* and attach a rating, e.g. 8 out of 10. Applying collaborative filtering techniques, the service provides a ranking of the most popular places based on all mobile users' entries. This mind-shift in designing mobile services towards a high engagement of individuals has great potential to enhance peoples' experience when navigating physical spaces (Höök, 2003; Jaokar & Fish, 2006). Turning mobile phone users into in-situ journalist who can upload location based ratings, comments and recommendations to a shared community platform will eventually form a huge social knowledge repository decentralising control over information about local services.

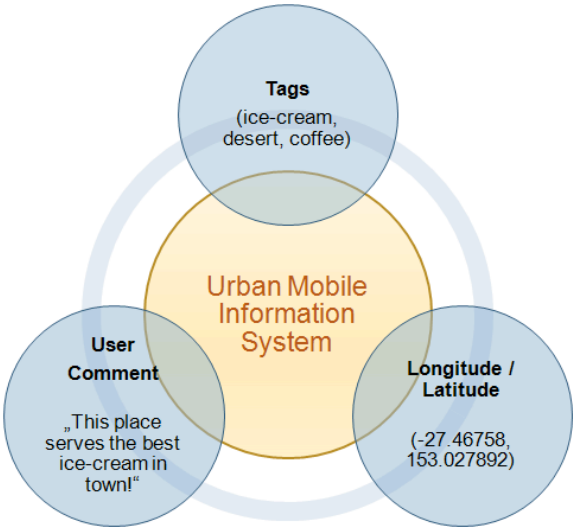

Figure 3: A resident-driven mobile information system: A mashup of folksonomy tags, location-based user recommendations, and geographic identifiers.

This idea targets a community-driven urban information service. The service is meant to provide an infrastructure to let residents become authors of information regarding their own neighbourhoods and make them available for interested people in the city, e.g. visitors and tourists. User participation, folksonomy and geo-tagging are three design methods that have become popular in Web 2.0 community-platforms and proven to be an effective information management tool for various domains (Casey & Savastinuk, 2007; Courtney, 2007; Macgregor & McCulloch, 2006). Applying such a design approach for a mobile information system (Figure 3) creates a new experience of collaboration between mobile users, a step towards what Jaokar refers to as the 'Mobile Web 2.0' (Jaokar & Fish, 2006), that is, a chance for mediated social navigation in physical spaces on the move.

Key Terms and Their Definitions

Social Navigation
The process of guiding activities aimed at determining our position and planning and following a specific route based on what other people have done or what other people have recommended doing.

First introduced by Dourish and Chalmers (1994), they describe it as 'moving towards a cluster of other people, or selecting objects because others have been examining them'.

Folksonomy
In the context of the Web 2.0 discussion, a folksonomy (sometimes also known as a 'tag cloud') is a user-generated taxonomy made up of key terms that describe online content. By assigning these freestyle keywords or so-called 'tags', the semantics of various information resources can be described in a more flexible, decentralised, collaborative and participatory way than fixed categories allow for. The term has been coined by Thomas Vander Wal.

Mobile Spatial Interaction
The increasing ubiquity of location and context-aware mobile devices and applications, geographic information systems (GIS) and sophisticated 3D representations of the physical world accessible by lay users is enabling more people to access information relevant to their current surroundings. The relationship between users and devices as well as the emerging oportunities and affordances are summarised by the term 'mobile spatial interaction'.

Geo-tagging
An approach which adds latitude and longitude identifiers as metadata to online content. It enables people to embed their information resources such as text, pictures or videos in a specific spatial and semantic context to augment the physical world with virtual information. Such a mediated social environment can help people navigate physical spaces by using location aware mobile devices.

Mobile Web 2.0
The suite of systems and mobile devices which either run existing Web 2.0 applications or re-appropriate Web 2.0 characteristics (tagging, user participation, mash-ups, personalisation, recommendations, social networking, collective intelligence, etc.) for the specific context of mobile use and mobile devices.

Local Knowledge
Knowledge, or even knowing, is the justified belief that something is true. Knowledge is thus different from opinion. Local knowledge refers to facts and information acquired by a person which are relevant to a specific locale or have been elicited from a place-based context. It can also include specific skills or experiences made in a particular location. In this regard, local knowledge can be tacitly held, that is, knowledge we draw upon to perform and act but we may not be able to easily and explicitly articulate it: "We can know things, and important things, that we cannot tell" (Polanyi, 1966).

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