Dialogues of Locations: BlueSpot

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Abstract. We designed and implemented an experimental communication system called BlueSpot, which was functioning for 3 months in Budapest, Hungary. It was a free communication system that connected nearly 50 geographical locations in the city into a network. In BlueSpot users could send messages to localities instead of people using the Bluetooth service of their mobile phones. Messages were received by all users present at the target location. We are describing the system architecture and our experiences with the interaction design of the BlueSpot application. We also provide an analysis of the content of the messages, revealing user experiences in a synchronous location based communication system.

Keywords: Location Based Services, Messaging system, Bluetooth, Interaction design.

1 Introduction

In most European countries the penetration of mobile phones almost reached, in some cases has already exceeded a 100 percent. Most of these devices are only used for talking and for sending short messages. Other potentials are still waiting to be unleashed by both the providers and the users. In the recent decade there was a lot of research carried out to utilize one of the most important information of these mobile ICT users: their location. Although Location Based Services (LBS) has become a very popular research area in recent years, only after the release of the iPhone it got significant public attention. According to the GFK Technology Research, in the 4th quarter of 2008 in the US one third of iPhone owners used LBS, as opposed to the overall of 10% of all mobile users of the 25-34 age group [1]. On one hand this fact shows the unused potentials of these services, on the other hand it also draws attention of the importance of the high entry threshold of being able to access LBS.

In this article we would like to discuss a Hungarian experimental Location Based Service called BlueSpot [2]. The system ran for 3 months in 2007 in Budapest, and was specially designed to be accessible on all mobile phones, not just for GPS or even G3 capable smartphone owners. In the following paragraphs we would like to give a short overview of some classifications of LBS, and try to define our system according

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to these concepts. We describe the functionality and the purpose of BlueSpot and finally share the results and our experiences we gathered in the test period.

2 Overview of Location Based Systems

According to the definition of Virrantaus LBSs are information services accessible with mobile devices through the mobile network and utilizing the ability to make use of the location of the mobile device [3]. As we previously mentioned the spread of mobile communication technologies necessarily resulted in the need for such services and thus lots of pilot systems were developed. As a consequence of the experimental nature of the field there is no unified classification of LBS exists. In his paragraph we do not try to create such a standard taxonomy, we just collected some considerations which are useful for us to describe our system and we also provide our own classification revealing the importance of our developments.

2.1 Classifications of LBSs

One of the most important factors that characterizes LBS is the source and the granularity of the location information. According to Dix [4] it is useful to differentiate between three different kinds of location detection.

Some of the systems have access to the *coordinates* of the users, like GSP enabled mobile devices or other systems that determine the location on the basis of nearby Wi-Fi routers or GSM antennas. In these systems the location is in some sort of explicit dimensional representation.

In a *zonal* system the devices are located within some area of a sensor. The granularity of these zones can vary from a few millimeters (enter a door with an RFID card and a reader) to a few meters (automatic road toll paying service) or even more (e.g. in the case of BlueSpot it was up to 10 meters). In the zonal system the exact location of the user is not know, thus the service provided must be relevant within the whole zone. Near Location Based Systems (NLBS), which allow users to access information based on their surroundings, typically belong to this category.

The third group of systems uses *relational* location detection, where objects report some form of relative location information. Usually these users are within a few meters distance of each other (e.g. Bluetooth devices which are close to each other).

Due to technical reasons these services also differ whether the device is used indoors or outdoors. Several modalities of location detection like GPS cannot be used indoors, or less accurate within a building like GSM based positioning, while others like infrared is more problematic to use in an open space.

From the HCI perspective the focus of the applications have a more significant importance. Steiniger [5] defined 8 categories of LBS systems based on the type of information they provide: Navigation (e.g. routing), Information (e.g. travel guide), Tracking (e.g. product tracking), Games (e.g. geocaching), Emergency, Advertising, Billing (e.g. road toll), Management (e.g. customer relationship) and Leisure (e.g. instant messaging). He also expresses that it is hard to define long lasting categories, because of the accelerated evolution of devices and application in this field.

2.2 Location in the Communicational Process

According to our understanding of LBS, it is also important to treat the location as a form of information, which is being used up in a communicational process. To characterize this process we can differentiate between the number of users participating and the synchronicity of the communication.

Along these dimensions we found two major clusters of applications, which do not cover all location based systems, and to some extent overlap with each other. Nevertheless we think it is important to describe them as they characterize a lot of recent LBS developments.

We think that one of the major categories of these applications has a focus on the social network of the users. These *Social Network Based LBS*s function as a locative extension of the well known social network services. The most typical application in this group is the so called buddy search. In these systems the users know the people who they are interacting with (most commonly by instant messaging with each other), and location serves as an important supplementary information in the dialogue. Another important attribute of these social networked based LBS is that they are synchronous communicational tools. The location information gains its importance if the user gets to know where the people are in his social network right now. In some cases the history of the location information of his/her friends is also presented. Typically it is a one to one communication tool, sometimes a one to many, where the receivers are the whole social network of the user. It is a very popular form of LBS: Google Latitude [6] or the Nok-Nok [7] system of Nokia are commonly known representatives of this category.

We think that another emerging focus of LBS is *Location Based Tagging*. In these systems there is a database of places with different granularity of location information, and some specialized type of information is being attached to these localities. To some extent it can be treated as a form of augmented reality. Usually the information assigned to the location already exists at time of the interaction, and as a result the communication between the information provider and receiver is asynchronous. Like other knowledge sharing systems these LBSs typically serve as a many to many communicational tool. Most location based iPhone applications (e.g. iSushi, or travel tip services) fit into this category.

3 The BlueSpot Location Based Chat System

The purpose of the BlueSpot system was to provide a special location based chat application, in which the participants of the dialogues are not representing themselves, but their location. The system was only available in specific places like bars, cafes, and other scenes of social life. To create such a system we only needed a zonal granularity of the location information. This Near LBS only had to detect whether the user is present in that specific place or not. The system harnessed the Bluetooth capability of the mobile phones, and connected the users with each other through special Bluetooth routers, which were connected to the internet.

As we discussed previously most location based chat services rely on the social network of the user. These services could be better described as Location Based Instant Messaging systems, as the users are selecting their partners from a previously

defined contact list. On the web the killer feature of chat rooms and IRC channels is that unidentified (not necessarily anonymous) users participate in a virtual public space. In this way IRC and chat is very similar to hanging out in a bar, talking to friends and getting acquainted with strangers in a public space. These communicational tools are not just using and strengthening the already existing strong social links, but also provide a possibility to expand the network of the participant. In Instant Messaging, text messaging (SMS) and telephony partners mostly know each other, so these channels of communications are taking place in a virtual private space. These services are metaphors of inviting friends to our home, or our office and having a discussion with them in our private space.

In virtual spaces no matter if they are public or private; the users are staying in their real private space: mostly sitting in their room or at their office, instead of a real public space. There are just a few examples of technology being used in public spaces to enhance the communication of the people present. The most commonly used service is the SMS Wall, which provides a common platform for the people located at the same public space.

There has not been any technology developed yet, which enables public spaces to communicate with each other. Real life public spaces incubate an ad-hoc community of people being present at the same time at the same place. But these communities remain isolated. When youngsters decide to hang out in an evening, they have very limited information about what is happening at a specific place. The information they have about an event or a public space is mediated by an asynchronous communication channel (website, magazine etc.). If nobody is present there from their social network they cannot get information about the ongoing event at a location. In 2008, one year after the BlueSpot experiment, the rise of Twitter microblogging service showed the importance of this type of synchronous communication, since this is one of the most important themes of the tweets.

In BlueSpot, the user staying at a location could send a message to another location with his/her phone. The people present at the other location could reply, creating one dialogue between the two public spaces. All the other people present can follow and take part in the discussion. On the other hand dialogues within one location were not supported; from the same place the senders` messages could only be seen in the history of the dialogue thread after someone replying form the addressed location.

We also created a client, accessible from the web, grouping all the web users to one location, which could be regarded as "*home*". Although these users were at different places they were all behaving similarly, as they were all asking questions from their home, which determined the topics of the discussions.

3.1 System Architecture

The key idea in BlueSpot was to try to develop a free mobile messaging service not restricted to be used on smartphones only. Therefore the most important requirement of the system was to demand a low entry threshold. The service had to be free, so we had to provide the technical infrastructure, which was completely independent from the Hungarian mobile networks. Taking part in the project demanded minimal effort from the users. For this, we developed hotspots connected to each other through the internet and communicating with the mobile clients via Bluetooth. Therefore, the communication of the users relied only on their Bluetooth enabled mobile device and

the BlueSpot system. The whole project was based on Open Source solutions, and the infrastructure consisted of three levels of devices: a central webserver, hotpots (Bluebox) placed at special locations and mobile clients running on the users' phones.

Webserver. On the top level there was a webserver which was connected to the hotspots through the Internet. We used PostgreSQL as database system, and PHP as programming language above a standard Debian Linux system. The communication between the different levels was based on standard XML requests. The webserver was basically a transmitter between the hotspots. It distributed the messages to the different locations and collected data on the actual state of the whole system. It counted how many reachable users had been logged in and how many users had participated in the discussions. The server sent this information to every user via the hotspots.

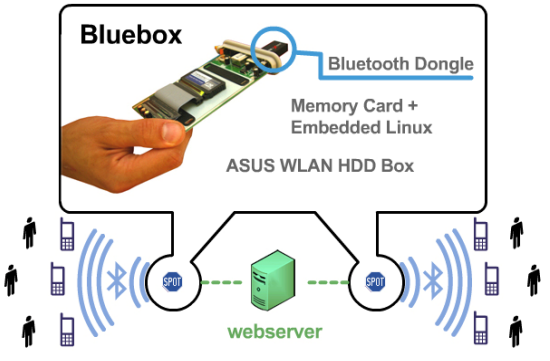

Fig. 1. System architecture of BlueSpot: mobile clients, Bluetooth hotspots and the webserver

Bluebox Hotspots. The Bluebox hotspots were specially designed for the BlueSpot infrastructure, making them the most interesting part of the system. These devices were hacked ASUS WLAN HDD. They wirelessly connected to a Wi-Fi router or to a modem via LAN cable. We dismantled the boxes and changed the hard drive to a 128MB memory card. We ran an OpenWRT embedded Linux application on these cards, which ensured the communication between the webserver and mobile phones as a mediator. These cards stored the downloadable mobile client applications as well. We plugged in a Bluetooth dongle to the USB port of the Bluebox, which maintained the connection with the mobile phones. The range of the dongles was the bottleneck of the system. It was only 8-10 meters maximum, and when a user left the covered area, the connection was lost. In some cases in order to cover the whole location we had to use multiple boxes.

Mobile Clients. When the system detected a new mobile phone with a Bluetooth device turned on, the user got a message to download the Java based (J2me) mobile phone client application from the Bluebox. If they accepted the message, they could install the application. This was the most sensitive part of the interaction, as most of the users did not know the source and the purpose of the program they were about to install. The functionality of the client was very similar to a text messaging system.

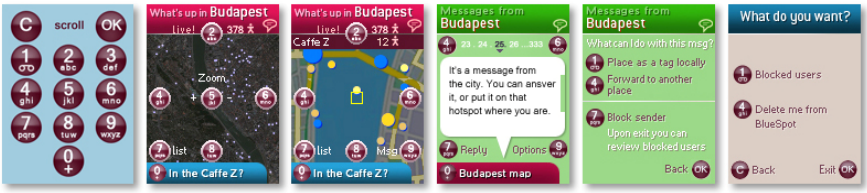

Fig. 2. Our first GUI concept, where the positions of the keys were constant on the screens, but they were representing different functions on every screen. This made the interaction similar to the ones on touchscreen devices, but with a normal mobile numeric keypad. Usability tests proved it to be difficult for the users to learn.

The messages were displayed in threads of discussions. Besides this the map of the city with the participating places was another important function. Each place was represented with dots of different sizes on the map. The magnitude corresponded with the number of logged in users at the location, and the color of the dot showed how active their communication was at the moment. The users could browse and reply to previous messages, but also had the possibility to start a new conversation with another location.

3.2 Graphical User Interface

Originally we wanted to enable average phones to have functions that only smartphones have. Besides their GPS capability these phones also have a bigger display and the interaction does not only rely on the numeric keyboard, but a touchscreen or a stylus as a pointer is also being used. In our original interface design we wanted to create a pseudo-touchscreen, where 10 areas of the screen correspond to the 10 numerical buttons of the keyboard (See Fig. 2). The corresponding areas of each button remained the same during the whole interaction, so the user could learn the positions of each key and did not have to pay attention on pressing the right button.

As we tested this idea with paper prototyping we had to accept that the users rejected this concept. Although when using up/down/left/right navigation on simple mobile screens they use the keyboard in a similar way, the constantly changing functions of the keys confused the users.

As a result of the usability tests, we decided to return to the commonly used mobile menu system (See Fig. 3).[8] This proves that composite metaphors in mobile interfaces are as important as in a desktop environment. When we repeated our usability tests with the menu driven interface all the users could easily learn the navigation in the menu system. A major and unsolvable usability problem was that when entering a message the text editor interface was the native editor surface of each mobile phone. This meant that by replying or writing a message, the users often thought they have exited the program, and started to enter a normal text message in their mobile phones` menu system. Unfortunately we could not get around this problem, and had to put up with this disturbing part of the interaction.

Fig. 3. The same screens in the final version of the GUI (in Hungarian) The contents of the screen from left to right: 1. Notification when receiving a new message; 2. Map of locations with the number of users logged in; 3. Content of an incoming message; 4. Menu of incoming messages; 5.Login screen.

4 Results

Since BlueSpot was an academic experiment, and it only ran for 3 months, it did not get a lot of publicity from the media. Still, with its 47 locations (+1 web client), and its 1500 users it was one of the biggest Locative Media projects at the time. Most of the users were informed about the service from the welcome messages of Blueboxes at the public locations. The routers could only notify those mobile owners, who had the Bluetooth service turned on their phones permanently. In this period there were approximately 40000 users notified, out of which only 2600 user initiated the software download. Due to software installation problems only 1500 users succeeded, and were able to use the service. One third of the users actively participated in the discussion, by not just reading, but also writing messages to others. In the social media scene this ratio of passive and active users is considered to be high. According to a contemporary survey of Pew Internet Research, only one fifth of the blog readers wrote blogs at that time [9].

Unfortunately the average BlueSpot user wrote only 2.5 messages and the number of simultaneously logged in users rarely exceeded 10. As a result of these conditions the service has not reached a critical mass, thus did not evolve to become a synchronous communication channel of locations. Opposed to other location based tagging services, which do not demand parallel presence of their users, and could successfully rapidly increase their number users.

One major portion of the messages was related to the BlueSpot service. Every user initially sent a "*Hello world*" type of message, to test the system. After this first message those who were brave enough to continue were either expressing their enthusiasm or asked a question related to the system. Messages sent for abroad through the web client also had similar content.

The *Web2Location* type of conversation was initiated by the users of the web client. As the web users were located at their homes, these messages were about asking information about a specific location. Most of the time the web users were thinking about visiting that spot, and wanted to know if there was free table, if it was crowded, or asked about the current atmosphere. In the cases of open air spots, most often they were asking about the whether situation. These dialogues were good examples of synchronous communication between “home” and a location, as the immediacy of the information was a key factor in the discussion.

A smaller, but still significant portion of the dialogues belong to the *Location2Location* type, and took place between two public spaces. The users were planning to leave a location, and asking whether it was worth to travel to the other spot (bar hopping). In some cases users organized common activities, like invited users from another locations to join their foosball tournament or simply to come over to party with them. The participants of these activities often used the system to write short coverages on the current situation, their moods etc.

As a small group of the users regularly logging into the system had a kind of "*BlueSpot user identity*". One a bartender, who was actively participating in the discussions, offered a free beer to everyone who came over to his place and said "abt natural", which is a well known joke from Woody Allen's "Take the Money and Run" movie.

5 Conclusion

BlueSpot system was an experiment to convert the screen of the mobile phone to a public display: everything the user wrote to someone at another place, everybody else could see in that location, and everything he received, all the people around him/her saw as well. Although there was no limitation of message size, users usually sent short SMS size messages, as they were used to do so from their mobiles. They did not know who is going to read their message so they addressed the public place as a whole. The contents of the messages showed that all users enjoyed the experience of these locative chat rooms.

The system was working for a relatively short period of time and the vast majority of the people got introduced to it by an automatic notification message sent by the Bluetooth router, and an installation of unknown software from an unidentified source was required initially. Despite these factors the system was a great accomplishment with over a 1500 users at the time. The original goals of the BlueSpot, to provide a free infrastructure for people with simple mobile phones, and making it possible for the average mobile user to experience location based synchronous communication was successfully met.

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