ABAKABAR
a mobile social network

Semester Thesis

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Abstract

In this thesis we wanted to improve social networking services by developing a mobile social network, where people can socialize even more with other users. Through the mobile version, we can add new dimensions, such as time and place, which offers a lot more opportunities.

Our solution “Abakabar” (Indonesian for “how are you?”) offers on one hand a mobile version with people-in-range-Searching and the whereabouts of your friends, and on the other hand a website backend with common features. These services are possible through the live position tracking and data processing of the mobile application.
"Digital communities" are getting more and more popular. Every day, millions of people are using portals such as Myspace, Facebook or StudiVZ, looking for the big love, like-minded people or simply a chat.

These so-called "social networks" are an important part of the new Internet " (web 2.0) because they can interact with the user. They give the user the opportunity to express himself, to meet other users and establish communities with them.

However, the flexibility of the user is limited, since the entry of the data and the interaction thereof is bound to a computer.

Project, called Abakabar, which consists of a cell phone application and an webpage, tries to make these social networks more dynamic. The user should be able to find people or groups that matches his/her profile and interact more “social”.

The system characterizes each user with the help of “Location” data and classical information such as hobbies, interests and favourite movies.

These “Location” data can include the place, but also information about the kind of movement or the direction of movement. The location data is provided by GSM Cell information, GPS, WLAN and/or Bluetooth, since most of the cell phones support these systems. Thanks to the combination of the different kind of data the user can find people who are “close” to him, geographically and interest-wise. If the user found some interest people, he is able to gain access to the mobile Internet, get more information about people and to surf on other people’s profile sites.

Additionally, there is also the alternative of doing the same things on the personal computer. On the computer it is more comfortable and easier for example to add data.

Abakabar will change the networking system dramatically! This is because you can interact more actively, that means instead of writing an email, one can directly hit on the other person

Let’s look at it more closely:

Abakabar checks which users are close by. This is achieved with different location providers which they are embedded GPS system, GSM cell information, WLAN and Bluetooth. The “Location” data can be used to calculate the users who are within a certain range. In case the cell phone has not an embedded GPS system, Abakabar uses the embedded WLAN to find people within a closer range. It creates a WLAN footprint and downloads it in the system. The system compares the different footprints. If two users have the same footprint it can be assumed that they are very close. In case the mobile phone does not have an embedded WLAN, Abakabar uses Bluetooth to locate other users. This is also done with a BT footprint, so it can look directly for mobile phones that have the client installed.

When local users are detected, the users are narrowed down by comparing his profile with the profile of other users. The profile includes interests and also common friends.
At the end there is a list according to the profile. The user can see the list on the display and is also able to surf through it. If there is still nobody of interest in the result list or the user is not looking for finding new people, there is also the possibility apart from the intelligent search to display the whereabouts of the user’s friends, if they allow it.
Social Networks

A “Social Network” is a “a social structure made of nodes (which are generally individuals or organizations) that are connected over one or more specific properties, such as values, visions, ideas, financial exchange, friends, kinship, dislikes, conflicts, trade, web links, sexual relations, disease transmission (epidemiology), or other things.

This is what the scientific kind of social network is all about. There is also a major area of research called social network analysis that tries to analyze the connection between the nodes and their meaning.

Usually when people talk about social networking they mean social networking services. A social networking service is focused on building and verifying online social networks for communities of people who share interests and activities, or who are interested in exploring the interests and activities of others, and which makes the use of software necessary.

Most social network services are primarily web based and provide a collection of various ways for users to interact, such as chat, messaging, email, video, voice chat, file sharing, blogging, discussion groups, and so on.

The main types of social networking services are those which contain directories of some categories (such as former classmates), means to connect with friends (usually with self-description pages), and recommender systems linked to trust. Popular methods now combine many of these, with MySpace, Bebo and Facebook being the mostly widely used in the anglosphere, StudiVZ and Xing are the mostly used in the German speaking Area.

Overview

![Social network services](image)

Figure 1.1.1 – Social network services

One of the first social network site in the sense we are talking about, was the site www.classmate.com. The idea of the site was to meet or keep in touch with old classmates. The site was launched in 1995. The second very popular social network was sixdegrees.com. Sixdegrees.com, online from 1997 to 2001, was based on the theory that everybody knows everybody over at least six
hops. On the website you could enter your friends and relatives. In this way you could find out how you are in contact with everybody on sixdegrees.com. Users could also send messages and post bulletin board items to people in their first, second, and third degrees. Today, this feature with the relation to other people is a standard for all social platform websites. After these two early adopters the development aimed to “give the user more power”. The user got more and more possibilities to express himself in his profile with pictures or his own music or videos. The social network has taken over the function of the web homepage. There are a few 100 big social networking services. The most popular today are MySpace and Facebook.

Next to the development of social networks explained so far, there is also a development in using social networking services to do business. The company Epinions.com developed in 1999 a network to verify business contacts. It is a kind of a trust network. The idea is that you can trust somebody if a friend knows or trusts him. It was very simple at that time, with just a trust path and some information. Later, this kind of network was improved by adding multimedia and other features. One of the these popular networks is linkedin.com

**Mobile Social Network**

When developing applications for mobile phones there are more possibilities for interactions but also more restrictions compared to a usual computer.

Mobile phones are developing very fast and getting more and more features. Some things however will not change in the near future and should be kept in mind. These are the limited input (keyboard), limited output (screen) and the battery-based autonomy.

Apart from these restrictions there are also a few opportunities. The important one is that a mobile user is always “on”. There can be a better interaction, because the mobile phone is next to the owner most of the time. The mobile phone is not only close to the owner, it expresses also a lot about the personality of the user. Through the calendar you can see if the user is busy or not, through address book you can see who knows the user and with whom is in regular contact. With an analysis of the saved music it is possible to find out the personal taste with pictures and with the localization and the tracking of the movements it is possible to find out a lot about his daily life. There are also more things that can be used to analyze a user.

**Some examples for mobile social networking services**

Of course Abakabar is not the first implementation of a mobile social network. In this chapter I will introduce some important existing systems.

*Lovegetyb*

Lovegety is a wireless-enabled, spontaneous matchmaking service that originated in Japan in 1998. Users enter their profile of interests into the device and when the device, with a limited wireless communications range, discovers a user with a "matching" profile, LoveGety notifies the user that
their matched partner is nearby. Notification is done via device vibration. LoveGety was the inspiration for countless Bluetooth-enabled matchmaking services for mobile phones.¹

**Social Serendipity**
Social Serendipity is a mobile-phoned-based system uses Bluetooth hardware addresses and a database of user profiles to cue informal, face-to-face interactions between nearby users who don’t know each other, but probably should. A special feature is that social serendipity is always tracking its environment with Bluetooth fingerprints. This way it is able to find “familiar stranger”. “familiar stranger” are people which you meet very day, e.g. while waiting for the bus, but you never talk with them.

Used Technology:
- Bluetooth
- Java
- Mobile internet
- Web Backend

**Jaiku²**
The Idea is that the user uses Jaiku as a phonebook. On the phonebook he can see who is online and if the person is busy or if he is nearby. The program gets this information by analyzing the calendar and the ringtone profile. The current position has to be added “by hand”. It is possible to add blog text and pictures that are available on the mobile phone and in the web.

Used Technology:
- Bluetooth
- Symbian
- Calendar Access
- Phone Book Access
- Ringtone Profile Access
- Mobile Internet
- Web Backend

**Telelogs**
The idea is that you get in touch with people who you see every day but you do not know, the so called “familiar strangers”. For example people who are always waiting with you for the bus or eating in the same restaurant. These people are called familiar strangers. In the implementation somebody who meets you more than once a familiar stranger.

With telelogs everybody can created his own audio blog or just blog which will be tagged to himself. This blog can just listen/read people that are familiar strangers to this person. That’s a way to learn more about people or get in touch with them.

Used Technology:
- Bluetooth
- Java

¹ [www.wikipedia.org](http://www.wikipedia.org)
² [www.jaiku.com](http://www.jaiku.com)
How people use social networks

To find out how people use social networks a survey during two months was made. I asked three different kinds of people about their use of social networks and the acceptance of a mobile social network. The three groups were:

1. Information Technology and Electronic Engineering Students of the ETH Zürich (ITET)
   - Interested in Technology, majority male
   - Age: 19-25

2. Biology Students from the ETH Zürich (BIO)
   - Usually not as interested in Technology as the ITET Students
   - Age: 19-25

3. High School students from Altdorf/Uri (Mittelschüler)
   - Age: 13-17

Between October and November 2007 around 500 people have participated in the survey. In this chapter I want to present some results of the survey. The whole survey is in appendix 1.

While we are developing a social networking service, it is important to know if people are using social networking services.

![Graph showing social networking services usage](image)

Figure 1.4.1 - Result of “Which social network services are you using?“

As you can see in figure 1.4.1 only 10%-20% of the students are not using a social network service. Most students are using StudiVZ followed by the Americans FaceBook and MySpace. It is different by the high school children. These social networking services are not so popular, around 70% are not using social network services.

Generally, it can be said that social networking services are very popular and widely used. In this thesis, we developed a special kind of social network service that can be used on the mobile phone, which facilitates the accessibility.
The result shows that there are already some people who are using the social network more and more. This is a good start position. Our conclusion is that people will use it with a mobile version several times a day, almost in every free time.

The next question is more detailed. Since we develop a mobile application there is the advantage that we can offer different services than a system which is computer based. In special we want to offer local based services. We asked people if they would use a social networking services with these features.

![Graph showing frequency of social networking](image1)

Figure 1.4.2 – “How often are you using your social networking services ?”

![Pie charts showing responses](image2)

Figure 1.4.3 – “Would you use a social networking service on your mobile phone which shows you people in range (the services is for free)”

Last but not least we wanted to know because of privacy matter, who it is allowed to see the own position.
Figure 1.4.4 – “For offer local based services, the system have to know your position. Who else could also see your position”

The result of this question is that either nobody or just friend can see the own position.

The conclusion of the whole survey is that people really using social networking services and most of them very regularly. People want to have local based services but in a way which protect their privacy.
Different location providers

Today almost everybody owns a mobile phone and most of the users carry it all the time. Because of this situation and because of the fact that the mobile phones are “always online”, these devices are well suited to locate people.

Locally users becomes increasing important. Because with that it is possible to develop new features. You can discover this in the development of the cell phones. In the past it was just possible to locate cell phones over some features of the GSM Technology. For a short time the manufactures include GPS receiver into the phones, which made if possible to locate the user with great accuracy. But not only with the GPS receiver and GSM Technology it is possible to locate a phone. This is also possible with parts of the cell phone which were not made to offer location information like WLAN or Bluetooth.

Locate with the GSM Technology

Cell ID Method – Terminal Based

The GSM Technology

GSM was developed in the 1980s in Europe as a full digital and cellular network standard called “Groupe Spécial Mobile”. The goal was to create a standard digital network for mobile communication. Before GSM there were many incompatible analog networks across Europe. GSM became very successful and in 1989 they changed the name to “Global System for Mobile”. Until today GSM is the most used standard for Mobile communication. 77 % of all mobile customers over the world - almost 1.68 Billion people - use the GSM Technology today.
Figure 2.1 shows the architecture of a GSM network. There are four subsystems, the mobile station, base station system, network subsystem and the operation subsystem.

In our case the mobile station is the mobile phone. Every mobile phone which is turned on is connected to a BTS (Base Transceiver Station). The BTSs are antennas that are responsible for the communication inside cells (in most cases three cells). Cells in mobile communication are areas with special condition e.g. use of frequencies and timeslots. The BTS (10-100) are wired connected to a BSC (Base Station Controller). The job of the BTC is the controlling of the antennas. The BTS manage radio channels of the antennas and the handover (MS changes from one cell to another). BTS and BSC form together the Base Station System. In Switzerland, the company “Swisscom” owns approximately 1300 antennas and 40 BSC.

Since GSM is cell based, it can be used for localization. If we know in which cell the user is we know more or less in which section of the city the users is. The size of a cell also determines the accuracy of a mobile subscriber location and can therefore be changed. If a mobile subscriber is moving in a
city, the cells are small and have an extension of 200 – 300 meters. This means the location of mobile subscribers can be determined with a high accuracy. However, in the country-side the cells have an extension of several kilometers. Also, in the mountains there are very large cells.

The largest cell in Switzerland has an extension of 70 kilometers. It is technically not possible to have a larger extension because the phone cannot connect to an antenna with a distance more than 35 kilometers.

The shape of a cell is a much more complex structure than what is normally assumed. It consist of between 1 and 90 polygons and each polygon can be based on up to 5000 coordinates (See figure 2.2).

![Figure 2.2 Swisscom Cell Layer of Bern, Switzerland](image)

We can identify each of these cells because every cell over the world has a unique identification number, the so-called CGI (Cell Global Identity). The CGI structure is illustrated in Figure 2.3:

\[
\text{CGI} = \text{MCC} + \text{MNC} + \text{LAC} + \text{CI}
\]

- **MCC** = Mobile Country Code (228 = Switzerland)
- **MNC** = Mobile Network Code (1,2,3)
- **LAC** = Location Area Code
- **CI** = Cell Identify

![Figure 2.3 CGI](image)
The MCC identifies the county in which the cell is. The MNC identifies the Net Provider. In Switzerland there are three of them (1 = Swisscom, 2 = Sunrise, 3 = Orange). The LAC identifies the Area e.g. “Zürich City” or “Oerlikon”. The LAC Number is different for every provider. For the same area there are different LAC numbers, depending on the provider. [1]

**Timing Advance Method – Network Based**

Next to the Cell information there are also other parameters essential for the mobile communication. One of this is the so called “Time Advance” parameter. The “Time Advance” parameter is a 6 bit long number which is used for synchronization and says something about the distance between cell phone and antenna.

In the GSM standard the signal is transmitted with frequency division multiplexing (FDMA) and time division multiplexing (TDMA). In the GSM standard the bandwidth which is given for the communication is shared in different channels with a smaller bandwidth (FDMA). Each of these channels is subdivided in timeframes with 8 timeslots (TDMA). Each of this timeslot is a channel witch can be used for a voice call. (Figure 2.2.1)

![Diagram](image)

Figure 2.2.1 - A GSM Timeslot

Obviously the timing is important in GSM. The data should come to the antenna not to late and not to early. An antenna has to provide cell phones which are very close to the antenna and others which are 32 kilometers (in theory) away. Because of the fact that a signal from 32 kilometers away needs longer than one from a couple of meters away, there have to be methods to handle this. This Method is called the Time Advance. It scales the distance into steps with a width of 550 meters. It to
this through the calculation of the delay of the signal. Depending on the time advance, then earlier the phone has to send the data to the antenna.

The accuracy of this method is not good because the step width is 550 meters and there is no information about the direction. In figure 2.2.2 illustrates the possible areas where a user can be when the location is extended with TA. This method has also problems special in urban areas, because the signal does not always takes the direct way. It reaches the antenna with a few reflections which alters the measurement.

![Figure 2.2.2 – Positioning with TA Method](image)

On the other hand the method is not too difficult and the network provider has not to improve the infrastructure. The TA is also available on the phone. However in reality it is not possible to receive the information even with Symbian or Java.

**Time of Arrival Method – Network Based**

The time of arrival method is a positioning method that works very similar like GPS. The condition for this method is that all antennas and the cell phones have accurate clocks. If this condition is fulfilled, the positioning works as follow:

The cell phone sends a signal with a timestamp in all directions. An antenna in its range receives the signal and compares it with the current time. With the time different it calculates the distance between the cell phone and the antenna. The same thing happens at least with 2 more antennas. With the knowledge of the three distances and the position of the antennas it is possible to calculate the current position of the phone.
The disadvantage of this method is that all involved devices have to have an accurate clock and like in the TA method which throws signal reflections especially in urban areas, they will produce an error.

**Angle of Arrival Method – Network Based**

The angle of arrival method (AOA) works similar like the TOA method. Instead of the distance the AOA method calculates the angle of the received signal of the cell phone. At least one more antenna repeats this process and we have enough information to calculate the position.

If the network provider wants to use this service or want to offer the service he has to improve the whole infrastructure. He needs special antennas for calculating the angle. Usually it is not possible to measure the angle. These special antennas are expensive and not well working.

Like TOA this method has problems with the propagation in urban areas. This can produce useless information.
Locate with the GPS Technology

The Global Positioning System (GPS) is currently the only fully functional Global Navigation Satellite System. More than two dozen GPS satellites are in the medium Earth orbit, transmitting signals allowing GPS receivers to determine the receiver's location, speed and direction.

Since the first experimental satellite was launched in 1978, GPS has become an indispensable aid to navigation around the world and an important tool for map-making and land surveying. GPS also provides a precise time reference used in many applications including scientific study of earthquakes, and synchronization of telecommunications networks.

The cost of maintaining the system is approximately US$750 million per year, including the replacement of aging satellites, and research and development. Despite this fact, GPS is free for civilian use as a public good.\(^3\)

Compared to the GSM cell GPS is much more precise. With GPS it is possible to locate a device with an accuracy between 5 to 10 meters. A GPS receiver calculates its position by measuring the distance between itself and three or more GPS satellites. Measuring the time delay between transmission and reception of each GPS radio signal gives the distance to each satellite, since the signal travels at a known speed. The signals also carry information about the satellites' location. By determining the position of, and distance to, at least three satellites, the receiver can compute its position using triangulation. Receivers typically do not have perfectly accurate clocks and therefore track one or more additional satellites to correct the receiver's clock error.\(^4\)

The Disadvantages of GPS is that sometimes the device needs a very long time to find a satellite and there is no GPS information available inside a building.

Locate with WLAN and Bluetooth

Beside the GSM method technologies, mobile phones also offer short distance wireless communication technologies, that can be used for location purposes. Today almost all phones has Bluetooth and more and more they also support WLAN. The two methods works very similar. The device makes a footprint of the current environment. That means it is searching for all WLAN Antennas or Bluetooth devices in range and saves their MAC addresses. The MAC address of a device is unique. The fingerprint give a relative position. It is possible to find out if somebody is close the same devices. To estimate the absolute position is WLAN the better solution, because WLAN antennas are usually fixed at one place and not mobile like Bluetooth devices. If you know the position of the WLAN antennas you know the position of the user with a accuracy of 25-30m.

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\(^3\) From Wikipedia www.wikipedia.com
\(^4\) From Wikipedia www.wikipedia.com
Because it is impossible to collect all position of the antennas, you have use a combined system, that means e.g. a device with GPS and WLAN with save always the current position when a WLAN net appear.

The accuracy by WLAN fingerprint is very good. The advantage is that, instead of GPS, it also works inside buildings. The disadvantage is that the position is just relative. To estimate a absolute position it has to known the antennas absolute position.

Instead of the WLAN fingerprint the Bluetooth fingerprint gives no information about the absolute position because most Bluetooth device are mobile. Because the a Bluetooth device are typically carried around by people it is possible to find out which people are close to somebody.

Bluetooth has a few disadvantages. It needs a lot of power. A Bluetooth fingerprint needs a lot of time that can be around 10-15 seconds. Therefore it also is not well suited to detect people in dynamic environment.
Implementation

The first step of this project was to implement a location tracker on the mobile phone. The tracker
collects different kinds of location data, as it is running all the time and has to be very robust. When
ever the information changes, the new footprint is stored in a central database.

The next step consisted of transmitting and saving the information in a suited structure on a web
server and to do a basic interpretation of the collected data.

The last step was to implement a user interface on the web and on the phone with some social
networking features that build on the collected data.

Building the Tracker Application

The tracker application has to collect location information like cell id, GPS coordinates Wlan devices
in range and Bluetooth devices in range. It depends on the kind of cell phone which information is
available. At least it should have the cell id for location identification. Because with J2ME it is still
difficult (or impossible) to get the cell id we decided to implement the tracker in Symbian. Symbian
has also the advantage that it is much faster than J2ME and runs without any signing. First I created
the tracker which was logging always all information. Then I decided to create it event oriented. This
has the advantage. That it saves memory and can interpret the movement better, since it creates an
event only if the user is in move.

All function which are used to get location are members of the newly created class CTrackerEngine.

In the table you see the important functions

\begin{verbatim}
TBuf16<100> CTrackerEngine::GetCell(TInt mode)
TBuf16<500> CTrackerEngine::MakeBTFingerprint()
CDesCArrayFlat* CTrackerEngine::MakeWlanFingerprintArray()
TReal64 CTrackerEngine::GetLong()
TReal64 CTrackerEngine::GetLat()
\end{verbatim}

The main function in the class is the LogControll(…). This function controls the entire tracking. The
function uses a few parameters which are introduced in the next chapter. These are the saved last
position which I will call “iLocation”. “iLocation” comprises of the cell information (cellid, loc, mnc
and mcc ), gps information (longitude and latitude) and an array with the MAC address of all Wlan
devices. Next to this location information there is also a the livelflag which represent the mode of
saving the information.
The functionality of the logControl is like that:

The timer is launching all “TimerInvervall” seconds the function logControl. The calling parameter are the current time and the current cell, current coordinates and current wlan fingerprint. As a first step the function checks if the call is part of the current logging session or if it is a new logging session. A new logging session can happen when the user starts the application new or he stops and starts again the logging session. Next, the function checks the status of the session and compares the current time with the time of the last logging entry. If the current time is approximate the same as the saved time plus the logging interval, the controller also checks if some values are saved in the local location variable. If one of these two checks fail, the function knows that the data are from a new logging. It passes the data to a special saving handle that saves the information on the memory or upload it to a server in a special format. The saving handler decides through the liveflag if he uploads it immediately or save it in a file.

If the submited data from the timer passes the first two checks the function checks if something changed from the last function call. If the data is identical the function transmits a ping. The ping is required because when you turn of the application and submit it you do not really know until when the information was logging.

If the submitted data is not identical to the latest fingerprint the function informs the saving handler about the change. A special case is the gps information. Because if the cell phone has gps information they are always changing and will never be the same. Therefore there is a function which calculates the velocity of movement. The function will just report a change if the velocity is higher than 2.5 km/h. The already implanted velocity calculator can be used in a future version to interpret the way to move.
Save information into the database

As we can see the tracker has two ways to save the information. Either it saves it locally or it uploads it immediately, the first option was implemented since the mobile internet is still expensive and should give the user the possibility to save it locally and upload it all at once, e.g. when the user is at home and can use the Wlan. But the main idea is that the data will go immediately online so than they can be used for social networking services.
Figure 3.2.1 - The ways to save the data online

Depending of which mode is chosen the data goes to one of the two php files. These files do approximately the same thing. They parse the different location information out of the entry or entries and save them in the database.

If the upload mode is offline it means that it an upload of the file then the information goes to the tables.

Figure 3.2.2 - Structure of the database
The database consists of thirteen tables. The different GSM cells are saved in the table cells. These cells consist of the Cellid, LOC, MCC and MNC (see chapter X). These cells are also the unit the system is working with. This means, the whereabouts of a user is only in the range of the cell. Moreover, the cell will be anonymous. The user only know in which “Area X” (x = number between 1 and N) he is. “Area X” means that he is in the cell that has the id = x in the table.

In the table “wlan_addr”/“bt_addr” the MAC addresses from WLAN and Bluetooth devices respectively are saved.

Normally, there is more than one WLAN devices within a certain range, so I created a new table called “wlan_footprint”. It relates several WLAN devices to one reference. This reference is saved in position declaration, as it is used in tables “ActPlace”, “LastPlace”, “myPlace” and “history”.

The places that the user has saved as “myPlaces” are saved in the table”myPlaces”. MyPlaces can denote all sort of places, normally it refers to places where the user can be found frequently, e.g. ”office”, “school” or at “home”. By saving a place in” myPlace”, the area has a more specific name, instead of a simple “Area X”.

Apart from these tables there are also 3 more that have more administrative tasks. Nevertheless, they are very important. There is the table “history_user”, “stat_cell” and “stat_bt”. The table history saves the whole movement profile of the user. All cells that have ever been visited and the passed WLAN devices are saved. The tables “stat_wlan” and “stat_cell” saves the frequency with which cells and WLAN devices are visited.

The statistic tables are current used to propose candidates for “myPlaces” to the user, in the future it should be used for profile settings and movement analysis.

**User Interfaces**

The last step is to turn this tracking tool into a social network. With the tracker and the online availability or the general access of the phone to the internet we have a good base to set up a social network. There are a lot of possibilities and I implemented a few of them.

First of all, the system needs a web interface. The user can sign up there for the services, change settings easily because he is using a computer and also uses the same function as on the phone only with more pictures and services. You can find the web interface under www.abakabar.com. If you once register you can have a look on your movement information, looks who is in range or who else is also using Abakabar and see their profile. The user can also add a person as a friend and if there are a double matching the user can always see the position of his friend users if this is known by the system.
Figure 3.3.1 – Screenshot of the web interface, mainpage

There is also information about your current position your last position and your favorite place. The system shows the user always the places where the user has been very often. This places can be added as “my Places” as e.g. office or home. Then places can be associated with a certain place instead of abstract numbers.

Figure 3.3.2 - Screenshot of the Web interface, detail view of a place
On the mobile phone there are also some features. On the main screen the user always sees if the included GPS is ready or not. He sees also the name of the current position and the mode (Live mode or offline mode) which it is current using.

Abakabar 1.0 supports also two social networking services. These are “Find friends” and “myFriends”. “Find Friends” lists all users which are in range (Figure 3.3.3). The mobile phone asks the “FindFriends” Module (getPeople.php) who’s in range. The “FindFriends” Module check with the DBHandler which other user is in the same cell or has a common WLAN device in range. The “FindFriends” Module gives back a list of people who are in the same cell order by distance, that means people who are very close, because they are in range of the same WLan devices, coming first in the list.

There are also another services implemented, which always shows the current position form the friends of the users (Figure 3.3.4).

The mobile application shows a list with the usernames of the friends and the current position below. The current position are just the names which the friend of the user saved as his myPlace. If a friend of the user is in an area which has no “myPlace” name, then it displays “unknown”. If the mobile client is off, then it displays “offline”.

![Figure 3.3.3](image1.jpg) –The mobile interface, the mainpage (left) and in the “FindFriend” mode (right)

![Figure 3.3.4](image2.jpg) –The mobile interface, the menu (left) and in the “myFriend” mode (right)
Conclusion and Outlook

Conclusion
Unfortunately, the vision as described in chapter 1 could not be realized due to the time frame given by the semester theses. However, Abakabar provides a good base for further development because it has implemented all important components including tracking data and a interface to a webserver. The next steps for development are to use this collected tracking data in a proper way and improve the whole usability.

To the best of our knowledge the system is unique in the sense that Abakabar is the only mobile social network to establish a movement profile, to memorize visited places and to show the whereabouts of friends automatically. Additionally, it shows which Abakabar users are close by. Abakabar uses technologies such as GPS, Cell information, WLAN and Bluetooth for localization and interaction with other users.

However, there is still room for improvement. The version does not run on Java yet, but on Symbian. In order to make Abakabar accessible to everyone, the costs for the mobile Internet have to drop significantly. The current design is a prototype and therefore needs improvement, especially the user interface.

Outlook

Abakabar has proven to have a lot of potential and should therefore to be continued as a cooperation between the ETH and Kooaba.
The aim is to provide an API which allows engineers to develop a social network on their own. The biggest potential lies in the processing of data, because at the moment, the data can only processed basically. The improved version could be used for collection data for analyzing movement and interaction of people.
In addition, others platform should also be addressed, such as Android (Google mobile operating system) or the mobile operating system from Apple and J2ME.
Finally the whole system have to be test with a lot of user, instead of three as done in this theses.
Bibliography

Stefan Müller Arisona. The script of the lecture “Mobile System Architecture” SS07 ETH Zürich

Nathan Eagle and Alex Pentland: “Social Serendipity: Mobilizing Social Software” 2005, MIT Media Lab

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**Appendix 1: Survey**

Between October and November 2007 around 500 people have participated in the survey. There were three different group of people. The three groups were:

1. Information Technology and Electronic Engineering Students of the ETH Zürich (ITET)
   - Interested in Technology, majority male
   - Age: 19-25
2. Biology Students from the ETH Zürich (BIO)
   - Usually not as interested in Technology as the ITET Students
   - Age: 19-25
3. High School students from Altdorf/Uri (Mittelschüler)
   - Age: 13-17

Bemerkung: Durchschnitt = (Wert Gruppe ITET + Wert Gruppe Bio + Wert Gruppe Mittelschüler) / 3

**Welche Social Networking Plattformen benutzen Sie?**

![Social Networking Platform Use Chart]

**Durchschnitt aller drei Gruppen:**

![Average Use Chart]

32
### In Zahlen:

<table>
<thead>
<tr>
<th></th>
<th>ITET</th>
<th>BIO</th>
<th>Mittelschüler</th>
<th>Durchschnitt</th>
</tr>
</thead>
<tbody>
<tr>
<td>StudiVZ</td>
<td>73%</td>
<td>86%</td>
<td>0</td>
<td>53.20%</td>
</tr>
<tr>
<td>FaceBook</td>
<td>22.40%</td>
<td>19.30%</td>
<td>4.60%</td>
<td>15.40%</td>
</tr>
<tr>
<td>MySpace</td>
<td>6.90%</td>
<td>11.40%</td>
<td>26.20%</td>
<td>14.90%</td>
</tr>
<tr>
<td>Xing</td>
<td>9.30%</td>
<td>1.40%</td>
<td>0</td>
<td>3.60%</td>
</tr>
<tr>
<td>LiveJourni</td>
<td>2.10%</td>
<td>0</td>
<td>0</td>
<td>0.70%</td>
</tr>
<tr>
<td>Orkut</td>
<td>2.10%</td>
<td>0</td>
<td>0</td>
<td>0.70%</td>
</tr>
<tr>
<td>LinkedIn</td>
<td>1.70%</td>
<td>0.70%</td>
<td>0</td>
<td>0.80%</td>
</tr>
<tr>
<td>Last.FM</td>
<td>15.50%</td>
<td>5%</td>
<td>0</td>
<td>6.80%</td>
</tr>
<tr>
<td>Keine</td>
<td>18.60%</td>
<td>10.70%</td>
<td>70.80%</td>
<td>33.40%</td>
</tr>
</tbody>
</table>

### Wie häufig besuchen Sie Ihre Social Network Site?

![Diagramm der Nutzungshäufigkeit von Social Network Sites](image)
Durchschnitt aller drei Gruppen:

In Zahlen:

<table>
<thead>
<tr>
<th></th>
<th>ITET</th>
<th>BIO</th>
<th>Mittelschüler</th>
<th>Durchschnitt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mehrmals täglich</td>
<td>8%</td>
<td>5%</td>
<td>0</td>
<td>4.33</td>
</tr>
<tr>
<td>Einmal bis zweimal täglich</td>
<td>18.30%</td>
<td>23.90%</td>
<td>11.60%</td>
<td>17.93</td>
</tr>
<tr>
<td>Mehrmals in der Woche</td>
<td>33.70%</td>
<td>45.50%</td>
<td>14.00%</td>
<td>31.07</td>
</tr>
<tr>
<td>Einmal pro Woche</td>
<td>16.80%</td>
<td>11.20%</td>
<td>16.30%</td>
<td>14.77</td>
</tr>
<tr>
<td>Weniger</td>
<td>23.40%</td>
<td>14.20%</td>
<td>58.10%</td>
<td>31.90</td>
</tr>
</tbody>
</table>
**Wofür benutzen Sie ihre Social Networking Site? (Mehrfach Antwort möglich)**

**Durchschnitt aller drei Gruppen:**

**In Zahlen:**

<table>
<thead>
<tr>
<th></th>
<th>ITET</th>
<th>Bio</th>
<th>Mittelschüler</th>
<th>Durchschnitt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kontaktpflege mit Freunden</td>
<td>81%</td>
<td>91%</td>
<td>41.70%</td>
<td>71.43</td>
</tr>
<tr>
<td>Neue Leute kennenlernen</td>
<td>17.80%</td>
<td>21.40%</td>
<td>33.30%</td>
<td>24.17</td>
</tr>
<tr>
<td>Businesskontakt pflegen</td>
<td>5.80%</td>
<td>3.20%</td>
<td>0.00%</td>
<td>3.00</td>
</tr>
<tr>
<td>Suche nach einem Partner/in</td>
<td>4.60%</td>
<td>0.80%</td>
<td>0.00%</td>
<td>1.80</td>
</tr>
<tr>
<td>Rumstöbern</td>
<td>73.40%</td>
<td>64.30%</td>
<td>69.40%</td>
<td>69.03</td>
</tr>
</tbody>
</table>
Welche Kriterien sind für Sie wichtig, damit Sie ein Profil genauer anschauen?

**ITET**

**Bild- ITET**

- Sehr großer Einfluss: 42%
- Grosser Einfluss: 37%
- Einfluss: 15%
- Fast kein Einfluss: 4%
- kein Einfluss: 2%

**Hobbys- ITET**

- Sehr großer Einfluss: 3%
- Grosser Einfluss: 23%
- Einfluss: 32%
- Fast kein Einfluss: 29%
- kein Einfluss: 13%
Beruf - BIO

- Sehr großer Einfluss: 2%
- Einfluss: 37%
- Grosser Einfluss: 11%
- Fast kein Einfluss: 35%
- kein Einfluss: 15%

"Wenn er ein Kontakt eines Kontaktes von mir ist" - BIO

- Sehr großer Einfluss: 34%
- Einfluss: 25%
- Grosser Einfluss: 23%
- Fast kein Einfluss: 11%
- kein Einfluss: 7%
Gleicher Musik Geschmack - BIO

Selben Ort Wohnt/Studiert - BIO
Mittelschüler

Bild - Mittelschüler

- Sehr großer Einfluss: 49%
- Großer Einfluss: 25%
- Einfluss: 15%
- Fast kein Einfluss: 4%
- kein Einfluss: 7%

Hobbys - Mittelschüler

- Großer Einfluss: 31%
- Einfluss: 24%
- Fast kein Einfluss: 17%
- Sehr großer Einfluss: 16%
- kein Einfluss: 12%
Beruf - Mittelschüler

- Sehr großer Einfluss: 4%
- Großer Einfluss: 11%
- Einfluss: 20%
- Fast kein Einfluss: 29%
- kein Einfluss: 36%

"Wenn er ein Kontakt eines Kontaktes von mir ist" - Mittelschüler

- Sehr großer Einfluss: 11%
- Einfluss: 37%
- Fast kein Einfluss: 18%
- kein Einfluss: 17%
- Großer Einfluss: 17%
Würden Sie ein Social Networking Programm auf ihrem Mobiletelefon benutzen, welches ihnen die Profile von Leuten anzeigt welche sich in ihrer Nähe befindet ? (Voraussetzung kostenlos)

<table>
<thead>
<tr>
<th>ITET</th>
<th>BIO</th>
<th>Mittelschule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nein: 60%</td>
<td>Nein: 58%</td>
<td>Nein: 44%</td>
</tr>
<tr>
<td>JA: 40%</td>
<td>JA: 42%</td>
<td>JA: 56%</td>
</tr>
</tbody>
</table>

Durchschnitt:
| Nein: 54% | JA: 46% |
Damit das oben genannte System möglich ist müsste „das System“ immer wissen wo Sie sind. Dürfte auch jemand anders diese Informationen sehen?
<table>
<thead>
<tr>
<th></th>
<th>ITET</th>
<th>BIO</th>
<th>Mittelschule</th>
<th>Durschnitt</th>
</tr>
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<tr>
<td>Nein niemand</td>
<td>58.40%</td>
<td>34.60%</td>
<td>34.40%</td>
<td>42.47</td>
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<tr>
<td>Nur in anonymisierter Form</td>
<td>k.A</td>
<td>13.40%</td>
<td>8.20%</td>
<td></td>
</tr>
<tr>
<td>Nur Freunde</td>
<td>32.10%</td>
<td>45.70%</td>
<td>45.90%</td>
<td>41.23</td>
</tr>
<tr>
<td>Nur Freunde von Freunden</td>
<td>4.70%</td>
<td>3.90%</td>
<td>3.30%</td>
<td>3.97</td>
</tr>
<tr>
<td>Jeder</td>
<td>4.70%</td>
<td>2.40%</td>
<td>8.20%</td>
<td>5.10</td>
</tr>
</tbody>
</table>

Was für ein Mobiltelefon benutzten Sie?

**ITET**

<table>
<thead>
<tr>
<th>Rang</th>
<th>Marke</th>
<th>%</th>
<th>Anzahl</th>
</tr>
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<td>1</td>
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<td>40.25%</td>
<td>97</td>
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<tr>
<td>2</td>
<td>Sony Ericson</td>
<td>39.83%</td>
<td>96</td>
</tr>
<tr>
<td>3</td>
<td>Samsung</td>
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<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Motorola</td>
<td>2.90%</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>LG /SAGEM</td>
<td>1.66%</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Sharp</td>
<td>1.24%</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Keins</td>
<td>0.83%</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Andere</td>
<td>6.64%</td>
<td>16</td>
</tr>
</tbody>
</table>

**BIO**

<table>
<thead>
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<th>Rang</th>
<th>Marke</th>
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<th>Anzahl</th>
</tr>
</thead>
<tbody>
<tr>
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<td>42.74%</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Nokia</td>
<td>33.33%</td>
<td>39</td>
</tr>
<tr>
<td>3</td>
<td>Samsung</td>
<td>9.40%</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Motorola</td>
<td>8.55%</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Sharp</td>
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<td>3</td>
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### Mittelschule

<table>
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<th>Anzahl</th>
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<tr>
<td>2</td>
<td>Nokia</td>
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<tr>
<td>3</td>
<td>Motorola</td>
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<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Samsung</td>
<td>7.30%</td>
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</tr>
<tr>
<td>5</td>
<td>LG</td>
<td>5.50%</td>
<td>3</td>
</tr>
</tbody>
</table>

### Welche Eigenschaften besitzt ihr Mobiltelefon?

#### ITET

<table>
<thead>
<tr>
<th>Eigenschaft</th>
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<th>Weiß nicht</th>
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<td>Farbbildschirm</td>
<td>85.0% (219)</td>
<td>11.0% (27)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>71.1% (175)</td>
<td>27.2% (67)</td>
<td>1.6% (4)</td>
</tr>
<tr>
<td>Symbian</td>
<td>8.1% (22)</td>
<td>56.8% (157)</td>
<td>34.3% (93)</td>
</tr>
<tr>
<td>Java 1.0</td>
<td>52.5% (124)</td>
<td>24.2% (67)</td>
<td>23.3% (60)</td>
</tr>
<tr>
<td>Java 2.0</td>
<td>30.8% (86)</td>
<td>27.4% (86)</td>
<td>32.8% (98)</td>
</tr>
<tr>
<td>WLAN</td>
<td>8.8% (21)</td>
<td>82.8% (199)</td>
<td>8.4% (20)</td>
</tr>
<tr>
<td>GPS</td>
<td>9.7% (23)</td>
<td>85.5% (199)</td>
<td>4.8% (12)</td>
</tr>
<tr>
<td>Musik-Player (Fähigkeit Musik zu speichern und abzuspielen)</td>
<td>65.0% (160)</td>
<td>23.2% (61)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>Kamera</td>
<td>73.1% (174)</td>
<td>28.9% (86)</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>SMS</td>
<td>79.9% (195)</td>
<td>19.8% (44)</td>
<td>2.0% (5)</td>
</tr>
</tbody>
</table>
### BIO

<table>
<thead>
<tr>
<th></th>
<th>Ja</th>
<th>Nein</th>
<th>Weißes nicht</th>
</tr>
</thead>
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<td>0.0%</td>
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<td>5.7%</td>
</tr>
<tr>
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<td>18.7%</td>
<td>80.8%</td>
</tr>
<tr>
<td>Java 1.0</td>
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<td>68.1%</td>
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<tr>
<td>Java 2.0</td>
<td>17.3%</td>
<td>17.3%</td>
<td>68.9%</td>
</tr>
<tr>
<td>WLAN</td>
<td>26.4%</td>
<td>12.2%</td>
<td>52.1%</td>
</tr>
<tr>
<td>GPS</td>
<td>10.2%</td>
<td>1%</td>
<td>80.0%</td>
</tr>
<tr>
<td>Musik Player (Fähigkeit Musik zu speichern und abzuspielen)</td>
<td>73.8%</td>
<td>20.5%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Kamera</td>
<td>87.6%</td>
<td>12.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>MMS</td>
<td>93.5%</td>
<td>6.5%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

### Mittelschule

<table>
<thead>
<tr>
<th></th>
<th>Ja</th>
<th>Nein</th>
<th>Weißes nicht</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farbbildschirm</td>
<td>93.0%</td>
<td>4.8%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>77.0%</td>
<td>19.7%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Symbian</td>
<td>7.1%</td>
<td>18.2%</td>
<td>74.5%</td>
</tr>
<tr>
<td>Java 1.0</td>
<td>28.8%</td>
<td>19.8%</td>
<td>53.3%</td>
</tr>
<tr>
<td>Java 2.0</td>
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<td>14.5%</td>
<td>44.5%</td>
</tr>
<tr>
<td>WLAN</td>
<td>25.0%</td>
<td>25.0%</td>
<td>50.0%</td>
</tr>
<tr>
<td>GPS</td>
<td>23.6%</td>
<td>32.7%</td>
<td>43.6%</td>
</tr>
<tr>
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<td>15.5%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Kamera</td>
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<td>9.9%</td>
<td>1.6%</td>
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<tr>
<td>MMS</td>
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<td>7.9%</td>
<td>3.2%</td>
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