



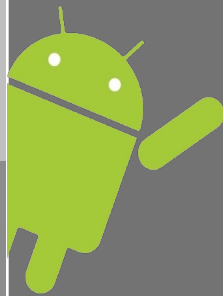
Native Visualization of Mobile Activity Pattern

Bachelor Thesis in Computer Science

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Aachen, September 1st, 2013

Christian Janßen

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Part I

Chapter 1 Introduction

In Europe, the number of the Internet users rose by 297.8% between 2000 and 2009. In 2007, 56% of the German population used the Internet on a daily basis [10] and in 2009, 73% of the private households in Germany were able to access the Internet [1]. As of June 2010, 79% of the German population are Internet users [13]. It is obvious that the Internet becomes more and more important. And if one takes a look at the rising amount of mobile devices that have been sold lately, one can say that *mobile* applications using the Internet are becoming more and more important. In the second quarter of 2010, the global smart-phone shipments rose up by 43% [5] while the shipment of ...based smart-phones rose up by 886% in the second quarter of 2010 [2]. According to the BITKOM [7], 10 million owners of cell-phones (including smart-phones) make use of the Internet capabilities of their devices (as of 2010). Applications for mobile devices are used regularly by 4 million smart-phone owners. This shows that there is a great potential in mobile devices, especially for those running the ... Operating System.

Mobile Internet
becoming
important

Social networks are a huge success concerning to their customers. According to the German StudiVZ, MeinVZ, and SchuelerVZ, they have over 16 million registered users [11] and according to a Facebook press release, Facebook has 500 million active users worldwide of which 50% log in on a daily basis [4]. The people get more and more used to online networks and online tools, in which email, instant messaging, blogs and wikis are among the most popular services for communication and collaboration [3].

Huge success for
social networks



Social networks with location-based services

Considering these two aspects – the rising sales figures of smart-phones and the success of social networks – there is a great potential in developing applications for mobile devices that enable their users to connect to each other. Due to the capabilities of modern mobile devices, the networking-factor can be extended by utilising the functionality of those devices to determine their current position. Thus, social networks with location-based services can be provided to enable real-time communication and collaboration.

1.1. Objectives

...



Chapter 2 Background

“The most compelling argument for the PLE is to develop educational technology which can respond to the way people are using technology for learning and which allows them to themselves shape their own learning spaces, to form and join communities and to create, consume, remix, and share material.”

—Graham Attwell

This chapter provides background information on the main three topics on which this diploma thesis is based. First, the idea of a Personal Learning Environment is explained. It is shown how such a system can help the learner to organise, share, and publish the information. Afterwards, the functionalities of ... are explained. It is shown that ... can be used as a basis of a PLE by extending its functionalities. At the end of this chapter, a short introduction to the ... Operating System is given. This is a relatively new ... (released in 2008) which is utilised by mobile devices such as smart-phones or tablet PCs. The application WaveLoc that was implemented during this diploma thesis runs on ... because this is a promising [2] open source system and one can develop for it without being charged – in contrast to developing for the iPhone [8].

2.1. Self reflection

2.2. Native Visualization

2.3. Provided Data

...



Part II

Chapter 3 Implementation

The project WaveLoc consists of two parts, the first one is the server-based API and the second one is the application running on the client's ... devices. Some details of how these parts have been implemented are shown in the following sections.

3.1. Paper Prototype

3.2. Time Schedule

3.3. Basic Layout

3.4. Data Management

3.5. Mapview

3.6. Chartview

3.7. Timeline

The WaveLoc API, as described in chapter ??, offers functionalities to handle the information about the users that are stored in the database up to date, to provide data about participants of WaveLoc (users or POIs) that are close by, and it maintains the friends- and favorite-lists of every user.

As already mentioned in section ??, this API uses *PHP*, *MySQL* and runs on the web-server *Apache*. It is possible to transfer this system from one server to another one by installing the whole set of files onto the destination server. One only has to adjust some

Transferring the
API



rights, the content of some files, and to set up the database. The scripts have to get write access to the folders `/smarty/cache`, `/smarty/configs`, and `/smarty/templates_c`. Thus, they have to get the required rights (`chmod 775`¹). The only three files that have to be adjusted are the `.htaccess` in the root directory of the API, the `/data/config.php`, and `/data/server.php`. In the first file, only the domain has to be adjusted:

```
1 ErrorDocument 404 http://wave.thues.com/404.htm
```

¹ Full rights for the root-user and the owner and rights to read/write for every other user



The second file contains six variables concerning the API that determine default values, among others:

```
1 <?PHP
    $mail_admin = "hendrik@thues.com";
    // the title of the application
    $appname = "WaveLoc";
5  // time when an inactive user is set offline
    $idle_time_sec = "300";
    // default radius
    $std_radius = "300";
    // default time to POI
10 $std_timetopoi = "15";
    // distance of offline-users
    $max_distance = "31337000";
    ?>

...
```



Chapter 4 Evaluation

To test and to improve the usability of WaveLoc, three sets of user-tests have been conducted. The first two with five users, the last one with three users. According to Nielsen [12], it is sufficient to conduct user-tests with five users. Thus, 17 user-tests with different students (including the final set of tests (see chapter ??)) are more than required. As stated, the number of usability problems that are found in a test with n users and a total number of N problems is

Amount of
test-persons

$$N(1 - (1 - L)^n)$$

L denotes the proportion of usability problems discovered while testing a single user with a typical value of 31%. According to this formula, about 84% of the N problems can be found if five users are tested. The second set of user-tests with five persons should reveal another 13% of the original N problems. Thus, conducting user-tests with 10 persons should result in finding about 97-98% of the problems concerning the usability.

Detecting most of
the problems

After conducting these three user-tests, a final test with 4 users has been conducted. The reason for this set was again to test the changes that have been implemented after each set of the first user-tests. The participants should consider the application operable intuitively.

The first two sets of user-tests have each been conducted with five students while the third one has been conducted with three students, each of them having different foreknowledge concerning smart phones.

...



Part III

Chapter 5 Conclusion

“Finally, in conclusion, let me say just this.”

—Peter Sellers

This chapter summarises the whole process of developing the application WaveLoc. It depicts where problems occurred while implementing the application and which future work arises from this diploma thesis.

5.1. Review

The WaveLoc system enables its users to connect with each other and to find others that are nearby. These functionalities can be utilised to offer and to gain help among students. As backend that is used to handle the data and to exchange information such as images, documents, or videos, the service ... was proposed. This tool enables its users to communicate with each other, to share information, to discuss about specific topics, to create content collaboratively, and to store data location-based that may be accessed by others. Speicher [9] stated that ... is capable of being the basis of a PLE as depicted in the chapters 2.3 and ??.

WaveLoc's
requirements

...



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