

# Developing mTLU: A Smartphone Application for Tallinn University

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## ABSTRACT

We describe a project, which aims to support Tallinn University students and lecturers in their university-related activities, by providing access to course schedules and descriptions as well as campus navigation through an iPhone application.

## Author Keywords

Mobile devices; information systems; navigation.

## ACM Classification Keywords

H.5.m Information interfaces and presentation (e.g., HCI): Miscellaneous.

## General Terms

Design

## INTRODUCTION

Students and lecturers need to be aware of the availability of rooms and where their next lecture is going to take place. Usually this is not a problem, as plans are made in advance. However, sometimes people may have insufficient information regarding specific rooms, which might occur due to:

- Room management problems and re-scheduling of rooms;
- Lack of time, bad planning, miscommunication;
- Inability to access updated information.

Although Tallinn University is using an information system called ASIO for managing room bookings, quite often the most recent information does not reach the desired audience, which might result in students and lecturers being unaware of the room changes. One convenient way of accessing this information can be done on the spot by retrieving it through a mobile device.

We propose mTLU, a mobile phone application for accessing Tallinn University's scheduling system, as a solution to the outlined problem, as on the one hand people tend to carry their mobile phones with them at all times, and on the other - all auditoriums in Tallinn University have numbers assigned to them, which makes it easy to retrieve the relevant information about the events occurring in those rooms. In addition, all lectures are scheduled in ASIO, so the combination of these factors makes mTLU relatively fast in information retrieval in comparison to alternatives, such as accessing ASIO's web

version (which is not mobile-optimized) through a mobile device or planning everything in advance, while the user has access to a computer.

## DESIGN AND DEVELOPMENT

The project began in spring 2011 and over time went through several iterations, from a simple proof-of-concept web application to a more complex iPhone application prototype with the ability of displaying relevant course data and providing indoor campus navigation.

### Web Application

We developed an initial version of the mTLU prototype, which worked as a mobile web application. The application was displayed in a smartphone's browser after the user scanned a QR-code with a special URL embedded into it. The QR-codes were found next to several university auditoriums. When the QR-code was scanned, a web page would open and show a list of lectures taking place in that auditorium. Lecture details included a title, course code, time, and lecturer information. On the backend the application relied on a service built using PHP and MySQL. Our aim was to have the service acting as a middle-layer between mobile clients and the original information systems. The middle-layer was meant to connect to ASIO and eventually ŐIS (study information system) databases and periodically cache their contents. This would allow us to minimize the amount of resources needed to modify the existing systems, as they could be left intact. Further, we could ensure that if too many clients using mTLU at the same time would make the middle-layer unresponsive, the original systems would keep working and be accessible through their corresponding web interfaces.

### iPhone Application

Over time the design of the application evolved. We created wireframes and state transition diagrams to plan the application's logic and prepared high-fidelity mockups of the user interface (see Figure 1). The new design was implemented in code using the iOS SDK. We started working on the user interface, because the necessary web services weren't in place. While working on the UI we tried different approaches, trying to figure out the best way to make the application as usable and intuitive as possible. On the data side we had to rely on a copy of the ASIO database, because no API existed at the



Figure 1. View of the schedule for the selected auditorium

time. We wrote a PHP service that would translate database queries to XML and make them accessible to the iPhone application.

After the prototype was complete, we realized that additional features could be included in the application. The initial idea behind the application was quite simple, but after taking a closer look at what the ASIO database could offer us, we decided to add the ability to search for a specific classroom without having to scan a QR-code, as well as an option to display a course schedule for the whole semester. The addition of these features required a new design of the user interface, so wireframes were created and implemented in code. In less than two months a working version of the application was available.

#### Course Details and Campus Navigation

For the third version of the application we wanted to expand the functionality even further. The goal was to include course descriptions from ÕIS, so that all the relevant course information would be available from the mobile device. API-s for ASIO and ÕIS were created, so the middle-layer solution was no longer necessary, which made the system simpler.

As the university campus expanded to include 2 additional buildings (with a total of 6), navigation around the university became complicated. This triggered a need to include campus

navigation in mTLU as well. As GPS does not work well indoors and we were not able to implement positioning through Wi-Fi, our solution was to rely on the same QR-code mechanism we previously used to fetch scheduling information for the auditoriums. Therefore, users would be able to position themselves by either scanning a code on a close by room, or by manually entering the room number into the application's search field. This would enable the application to understand where the user was located and provide means of specifying the destination. Afterwards a route to the destination would be displayed and the application would guide the user through the campus. In order to make navigation work, we needed to find the shortest path between the start and end points of the user's route and display it in a clear way. We experimented with using the openFrameworks graphics library and the Dijkstra algorithm for pathfinding. Eventually we abandoned that idea in favor of a library that is fully supported by iOS - Cocos2d. Along with that we also decided to use a tile-based map with the A\* algorithm, which is one of most commonly used pathfinder solutions in many tiled-based applications, mostly in games.

#### FUTURE WORK

We intend to continue working on mTLU, with short-term goals including the creation of an Android version of the application, as well as adding QR-codes to all auditoriums in the Tallinn University campus. Further, we aim to make our solution available to the broader university community to be able to collect feedback based on real-world usage that will allow us to make the application better.

#### CONCLUSION

In this paper we described the purpose of creating mTLU - a mobile application for Tallinn University. The project began with a goal of displaying schedule information for auditoriums by scanning a QR-code with a mobile device. The idea later progressed to include course descriptions and campus navigation.

We see mTLU as a means of making existing information more accessible to students and lecturers of Tallinn University through their mobile devices at moments, when they need that information the most to support their activities or to make informed decisions.

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