

Group 08 FallPrevention

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Chapter 1

Introduction

Damage from falling is the main cause for hospitalization among the elderly. In addition to the enormous costs incurred to society, falling is also the cause of great personal tragedy. As the use of computational devices becomes more common, it seems natural to examine how such devices can contribute to preventing such accidents.

This project is a cooperation between SINTEF and a group of students at NTNU for the course IT2901. Its goal is to develop a model for risk level of movement based on common sensors found in Android smart phones, and build a API to make the model accessible for third-party developers.

1.1 Group introduction

The group consists of 5 members, four of which were from Norwegian University of Science and Technology, and the remaining student was an exchange student from Germany (Insert school here). The members had experience with programming and project development with the languages java and c, but little experience with Android applications.

1.2 Customer introduction

The customer was ”Selskapet for INdustriell og TEknisk Forskning ved norges tekniske hoegskole”, or SINTEF for short. The person representing SINTEF was Babak A. Farshchian, Adjunct Associate Professor at NTNU.

Chapter 2

Requirements

The requirements for the different parts of the project was about the requirements for the application, the underlying model and content provider, and the documentation for the model and content provider.

2.1 Initial requirements

According to the project description, the following should be developed:

- A model of physical movements based on common movement sensors found in Android smart phones.
- An Android content provider that stores and makes available the data in this model through an Application Programming Interface(API).
- An example application that can visualize this data.

2.2 Understanding the requirements

The requirements were specified after several meetings with the customer. The understanding the group had of the requirements before meeting the customer was not sufficient to create a set of requirements. The requirements were also subject to change as the project progressed.

The meetings served their purpose, and filled in a lot of holes that was missing from the preliminary description:

- The development process in question uses an iterative approach. This essentially means that the requirements expand as time goes on, and to define the requirements from the beginning is impossible. This decision was made in collaboration with the customer.
- The team at SINTEF got a wide range of experts to help the group with health-specific features, e.g. making the algorithms to recognize movements.
- The customer expected weekly meetings with the whole group present, and that goals had been achieved before each meeting. At each meeting a new goal until was set.

2.3 Functional requirements

2.4 Nonfunctional requirements

Chapter 3

Alternative solutions

The group has also made use of other applications, which has attempted to solvev similar problems, or had solutions which gave useful ideas about the implementation or design of the application.

3.1 Pedometer

This is an app which focuses on giving the phone a pedometer function. This means to measure the number of steps taken while wearing the phone. An open source app with a GPLv3 license that was compatible with the Apache 2.0 license used by the group. The app uses the same sensors that was needed to make the Fall-Prevention app work, and was therefore a good tool to learn and understand how such a thing could be done on Android. The licence compatability also means that anything of interest can be copied or studied as needed. The app was included in the project, as the functions were useful

Chapter 4

Project Management

4.1 Terms

Here follows a description of terms that are useful to understand how the project management functioned.

Sprint is a period in which work is planned and done. It has a duration of one week. At the end of each spring the group is updated on progress achieved, and set goals for the next sprint.

Kanban-board is a visual aid that was used to display work packages, with content, people assigned to each package, and status of work package (to do, currently worked on, finished). The intent was to simplify and organize the work being done and work needing doing.

4.2 Development process

The customer favored the use of an iterative approach to the development process, where every sprint added a new layer of functionality, either to the application or the underlying model. Each sprint lasted for a period of 1-2 weeks, and the exact content was worked out in collaboration with the customer. Short term plans were favored over longer plans, due to the flexibility provided. While this made formulating definite goals for the final

product difficult, the customer and the group were in agreement that due to the research intensive nature of the project, a high degree of flexibility was required.

It was decided by the developers that the developers would have online meetings twice a week and an offline meeting once a week. The working hours were set to not less than 20 hours a week, but the developers were free to choose when to work themselves. This number was the expected workload for the course, and made a reasonable target for work per week. The meetings with the team was set to two times per week instead of once per day, so it could fit with the schedules of the team members.

4.3 Team Roles and Organization

There was not much place for specific roles among the group, as it was a small group, and the project required that all the members were capable and willing to work at all the tasks. This makes a difference from development models with specific roles and tasks assigned. Roles that were set for the group were therefore mainly organizers, so that one person was to keep awareness of what work needed to be completed in a particular domain, and share it with the rest of the group:

Group Leader Elias was made organizer, and got the responsibilities of reminding the group of what to do.

Document-organizer Johannes was tasked with organizing documentation and distributing the work of writing the report to the group.

4.4 Comparison

The development model used by the group was a form of agile development. Other well-known examples of agile methodologies were scrum and extreme programming.

4.5 Management Tools

Trello was a collaboration tool with the ability to create interactive kanban boards online. This use of this tool was to allow the group to coordinate tasks that were to be done, and the progress on the tasks, and which members were to work on which task.

It's learning was used to distribute information that was not time -critical, with a message board being used. It's learning would not send messages when a new topic or message appeared, so it's use for time-critical messages or making sure that everyone would read it was limited.

Email was used for time-critical communication, and for information that needed feedback swiftly, often within the same day.

Github was used to share code, and to describe and mark issues found in the code when problems were discovered. The relevant issues could then be discussed on the website

Chapter 5

Development Environment

5.1 LaTeX

LaTeX was used to write this report. LaTeX is a typesetting language, with support for varied formatting, including images and including other document. It

5.2 Github

It was requested that the group would use the tool Github to share code and perform version control. Github had browser-based interfaces and downloadable clients, meaning all the members of the group could make use of it.

5.3 Eclipse with Android Development Tools Plugin

The demands from the Integrated Development Enviroment(IDE) was as following:

- Had support for programming applications for Android
- Was understood by at least some members of the team

To fill these requirements, and because there was plenty of tutorials that could be found, the group decided to use the Eclipse IDE, with add-on's to more easily code and deploy towards Android.

Chapter 6

Implementation

6.1 Plans

Nearing the end of every spring, the customer and group agreed upon the content of the following sprint. This list has been placed in Figure A.2, and provided a short summary of what was accomplished in a particular time-frame.

6.2 Work Breakdown Structure

6.3 Architecture

The application is made in a way that is common for all android applications. This means that

User interface is described in xml layout files that is called in java code. Strings and resources is placed in a separate folder and file, to be accessed by the code as needed. This is to separate content and layout in the UI.

Appendix A

Appendix

Appendix content goes here.

A.1 Mockups

After the second meeting with the customer, the group had a sketch that was to be used as a starting point for the mock-up application.

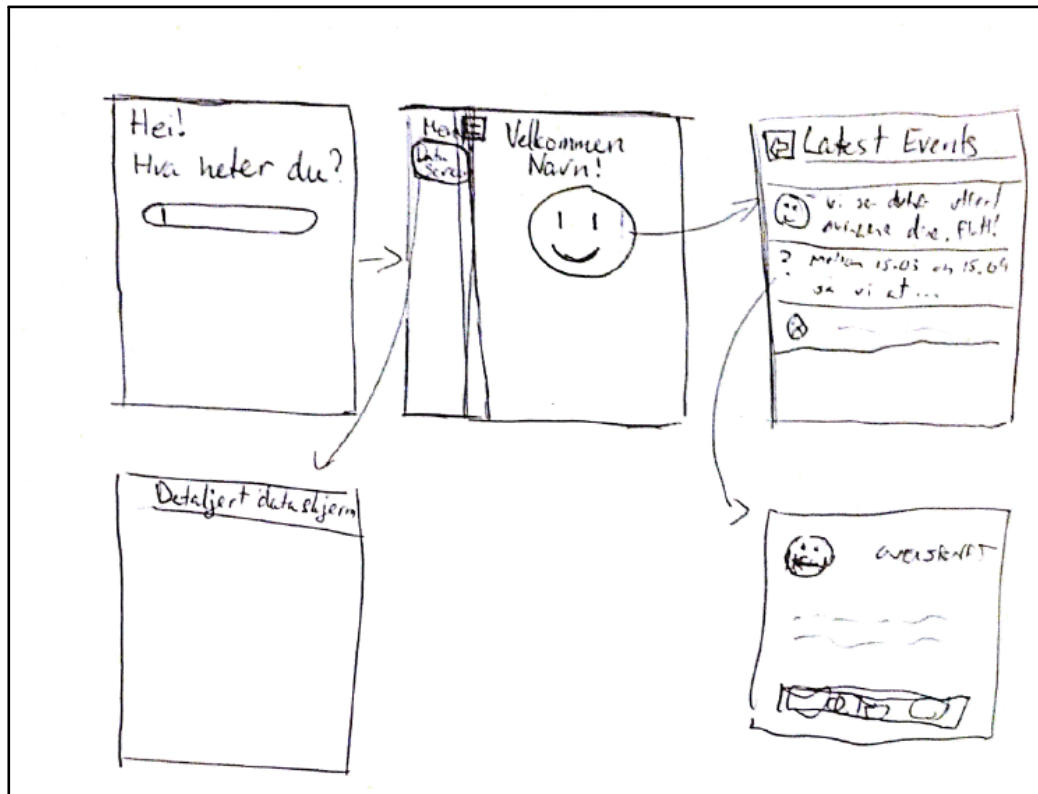


Figure A.1: A mockup of the program flow, text is just scribbling

A.2 Reports

The work done was described as short periods called sprints.

Figure A.2: Short summary of work done sorted by sprint

Sprint nr.	Date	Summary
Sprint 1:	03.02.13 - 08.02.13	Developing user stories and paper prototypes of the GUI.
Sprint 2:	08.02.13 - 15.02.13	Developing a mock-up application demonstrating the GUI.
Sprint 3:	15.02.13 - 22.02.13	Improving UI and functionality for the prototype, researching medicinal factors.
Sprint 4:	22.02.13 - 01.03.13	Improving secondary functionality for the prototype (settings, statistics, relatives screens), researching content-providers and alternative solutions.
Sprint 5:	01.03.13 - 07.03.13	Creating content-provider, creating presentation, finishing secondary screens (as described above), including pedometer, writing test-cases.

A.3 Meeting summaries

Regular status reports was a part of necessary documentation. Of particular importance was reports to the supervisor, and reports done to the other group members. This status report was written during sprint 4.

Project FallPrevention Group 08

Status report for week 09

1: Progress summary

Prototype:

- The mock-up application has been developed further, in particular with a better-looking GUI and several more screens to display data.
- A database has been build with the application to store all the required data.
- Enabled localization for the application, and included Norwegian and English text. File for the german version are available, but not yet translated.

Research:

- The group has learnt about ContentProviders, which Android uses to encapsulate data from outside of the application.
- A short summary on consequences of, and what factors results in, falling among the elderly, has been written and read by the entire group.

2: Open/Closed problems

- **Group members out of town:** Some group members had trips out-of-town, resulting in less work being done. This was solved by not planning more work to be done in those time frames, than what the remainder of the group could accomplish. With group members remembering to inform the rest of the group in advance, it does seem like this problem is closed.
- **Customer taking vacation:** The group had to skip one meeting with the customer, as the customer took some time off for vacation. As the product is still in a very primitive state, and any further work need to be discussed with the customer, this caused a delay of almost a week, as there was limited work to do in the meantime.

3: Planned activity for next period

The plans for this week are as follows:

- With the graphical and persistence-related parts of the prototype mostly implemented, the details and implementation of the ContentProvider handling interaction between the application and the motion detector seems like it will need more work.
- Complete the implementation of the GUI, and polish it by making it more readable, and adding the rest of the icons necessary to display all the intended permutations.
- Prepare a demonstration for the experts the customer will put the group in touch with, as the expert is not experienced with application development and might need a more user-friendly demonstration.
- Research applications that use sensor technology.

The plans for the period beginning this friday will need to be discussed with the customer and any medical expert the group has yet to meet.

4: Updated risks analysis

While we will not discuss updating the risk analysis until the meeting this wednesday, it is evident that some risks need to be updated:

- “Customer not able to meet with the group” will need to be added to the risk list, although it does not seem very likely to happen more than once. As the group has some understanding of what parts of the project needs working on, it will not become a large delay unless it happens several times in a row.
- “Computer problems” has had a larger influence than we have expected.
- A new risk, “participant not able to work as much as required” will need to be added.