Raul Bertone
Elis Haruni
Muyassar Kokhkharova
Saidar Ramazanov
Xhoni Robo
Total Team Effort: 54h

Bi-Weekly Report 1

Weekly Plan (Xhoni Robo, 1h)

After the project proposal, the group members decided to meet twice during the following week. The meeting days are Tuesday and Friday. The meeting on Tuesday lasted **2 hours**, and the team members confirmed what they worked on during the weekend. Each member has already started on a specific task, following the already provided schedule with minor adjustments. On the meeting, the following topics were discussed:

- What each member was already working on
- General plan for the week
- Re-evaluation of the schedule, considering current progress
- Handing out of the weekly tasks for each member
- Getting started on the practical aspects of the application

The following is what each team members role for the next split, as decided on the meeting:

- **Raul Bertone and Xhoni Robo**: SensorTag implementation in C
- **Elis Haruni**: Bluetooth I/O
- **Saidar Ramazanov**: Fall Recognition Algorithm
- **Muyassar Kokhkharova**: Application GUI

During this week, until Thursday, 10.05.2018, the following was accomplished by each team member:

- **Raul Bertone**: Component Diagram, 7h
- **Elis Haruni**: Bluetooth I/O, 5h
- **Saidar Ramazanov**: Literature Research, Analysis and Sharing, 4h
- **Muyassar Kokhkharova**: Use Case Diagrams, 4h
- **Xhoni Robo**: Putting together the Weekly Report, 4h

Component Diagram (Raul Bertone, 7h)

Introduction

The diagram shows the main modules that make up our system: the Java application running onto the PC and the C application running on the two Sensortags.
The communication between the PC and the Sensortag happens over Bluetooth, with the former acting as central device and the latter as peripherals. The Sensortags don't communicate directly with each other.

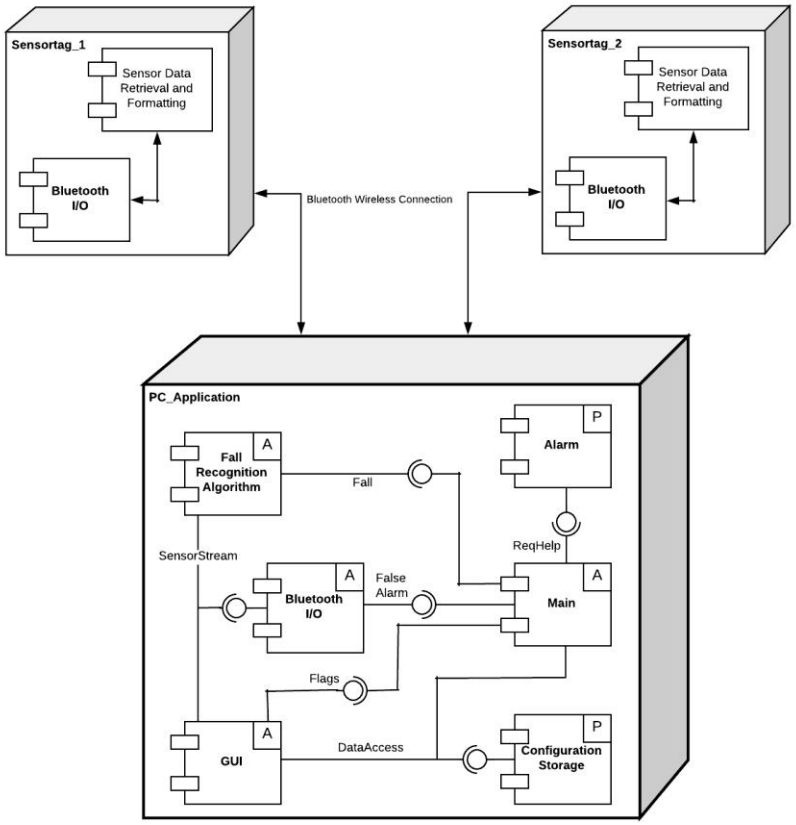


Figure 1: Component Diagram

Sensortags

There are two logical modules in this application:

- *Sensor Data Retrieval and Formatting*. It activates and configures the necessary sensors and actuators, receives the measured values from the sensors and formats them appropriately before passing in to the second module;
- *Bluetooth I/O.* Sets up the Bluetooth profile, services and characteristics; receives data from the previous module and forwards it to the PC_Application.

It's important to note that the modules described above don't necessarily represent different files or libraries, but only different logical functions of the application, which might very well be implemented in the same file.

PC_Application

The application is composed by six modules. The modules marked with an "A" are active modules, that is, they are executed within their own thread. "P" modules are instead passive, and their code is executed only when accessed by an active module.

- *Bluetooth I/O.* Manages the Bluetooth connection and receives the data from the Sensortags; sends an alarm when a Fall Event is detected;
- *Fall Recognition Algorithm.* Fetches sensor data from the Bluetooth Input module and examines it to look for Fall Events. When one is detected, it informs the GUI module and sends an alarm to the Bluetooth I/O module;
- *GUI.* Displays the graphical user interface; fetches sensor data from the Bluetooth I/O module to produce the graphs; retrieves and saves configuration data in the Configuration Storage module;
- *Main.* Contains the business logic of the application. When a Fall Event is detected by the Fall Recognition Algorithm module, raises the *Fall Detected* flag in the GUI and sends a false alarm request to the Sensortags; if the false alarm request is not answered, it reads the help data from the Configuration Storage, requests help through the Alarm module and raises *the Help Requested* flag in the GUI;
- *Alarm.* Sends an "alarm", simulated here by sending an email;
- *File Access.* Reads and writes the configuration files.

On one hand, the separation into modules will allow the team to subdivide the development tasks and work in parallel, while on the other, the definition of formal interfaces will simplify coordination between this development efforts.
Like noted for the Sensortag application, the modules represent only a logical subdivision of the features, and don't necessarily correspond to specific packages. However, is reasonable to expect that several of them will be implemented as independent packages.

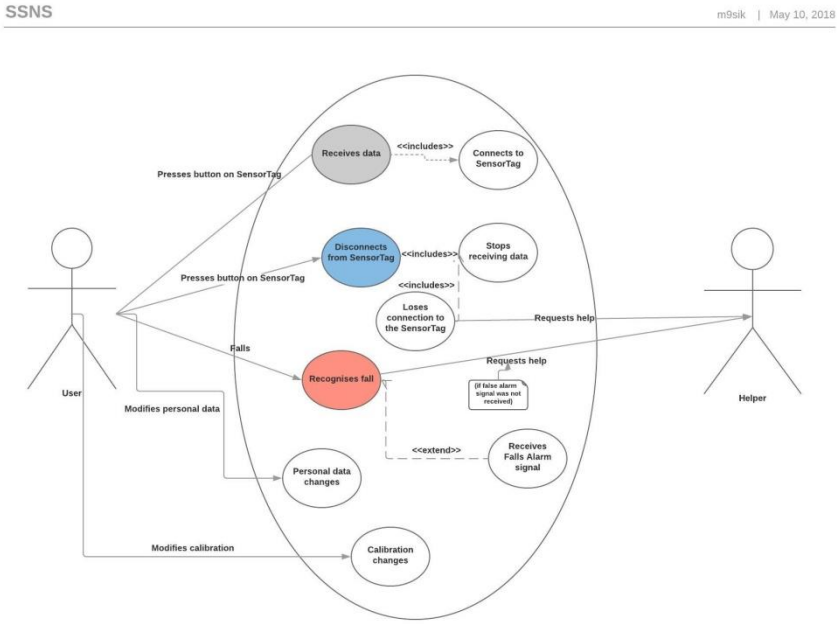
Interfaces

FalseAlarm
Module: Bluetooth I/O
Input: control over the buzzer in the Sensortags
Output: events (presses) of button_2 on the Sensortags
DataAccess
Module: Configuration Storage
Input: write access to the configuration file(s)
Output: read access to the configuration file(s)
SensorStream
Module: Bluetooth I/O
Input: none
Output: one data stream for each sensor

Fall
Module: Main
Input: none
Output: fall event detected
ReqHelp
Module: Alarm
Input: help message (email body); message address (email address)
Output: none
Flags
Module: GUI
Input: “fall detected” status (Boolean); “help requested” status (Boolean)
Output: none

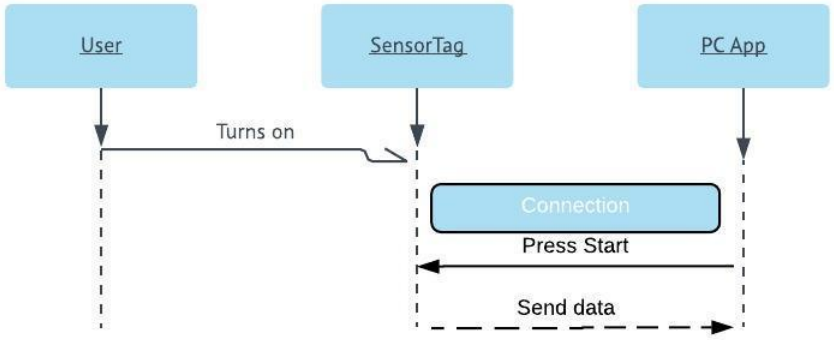
Use case diagram (Muyassar Kokhkharova, 4h)

Activate: User presses button on SensorTag to turn it on. PC app connects to SensorTag and starts receiving data
Deactivate: PC stops receiving data from SensorTag, disconnects from SensorTag and User presses button on SensorTag to turn it off
Out of Range: PC app stops receiving data, loses connection and sends help request to Helper
Fall: User falls, system recognizes fall and requests help
False Alarm: User “falls”, system recognizes fall and receives False Alarm signal
Modify personal data: User modifies his personal data and system saves changes
Modify calibration: User modifies calibration and system saves changes

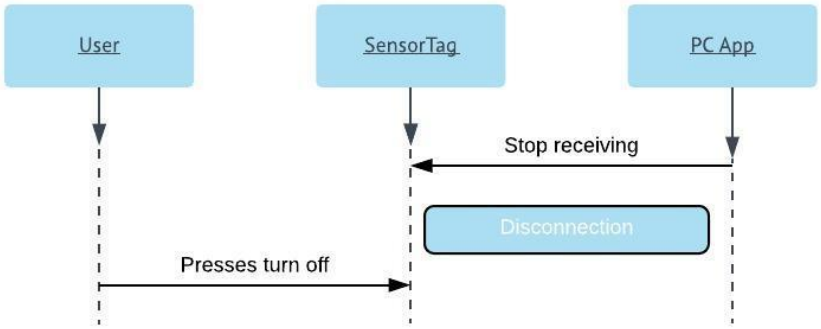


Sequence diagrams

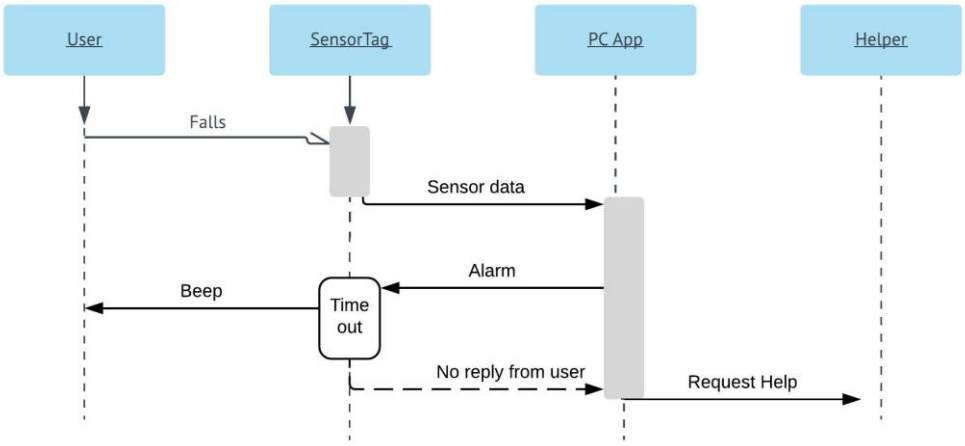
Activate:



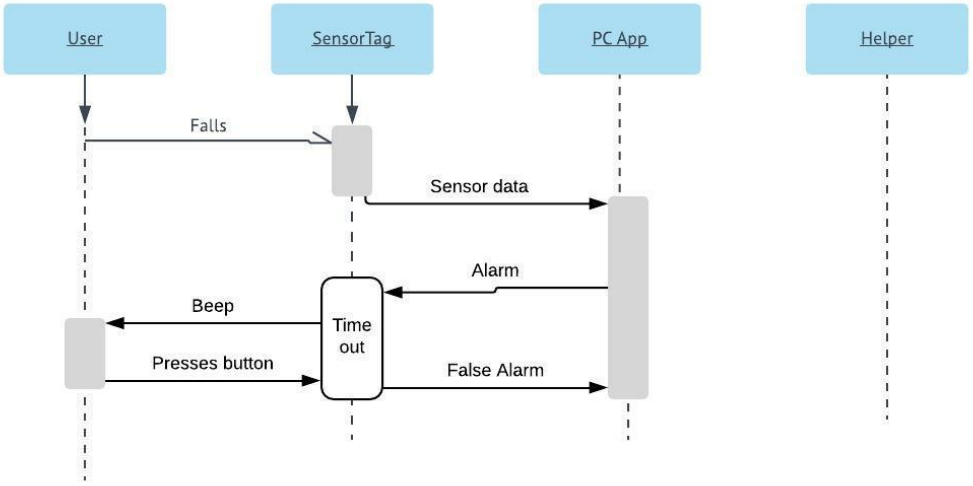
Deactivate:



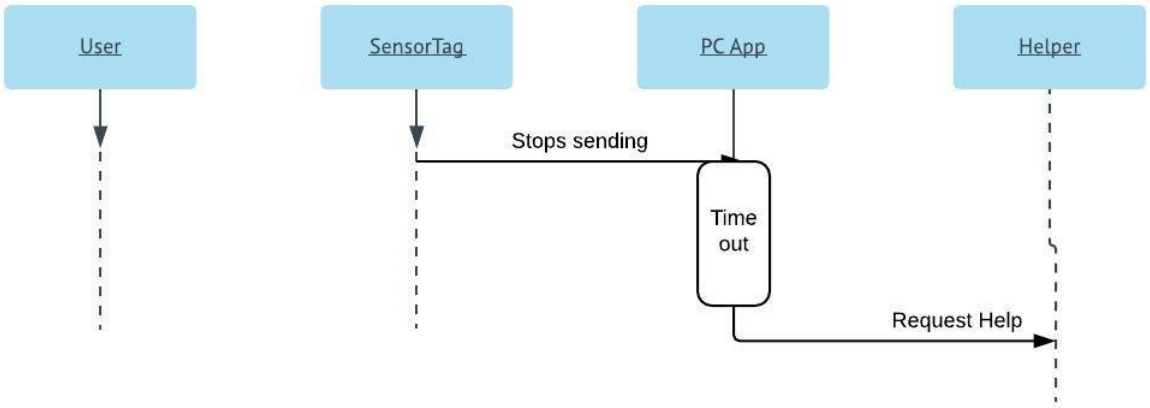
Fall:



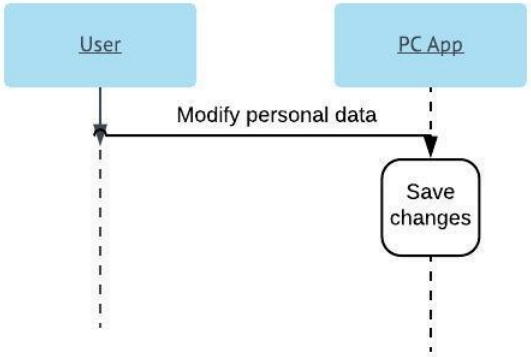
False Alarm:



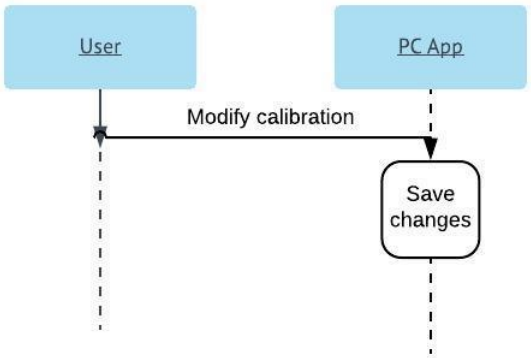
Out of range:



Modify personal data:



Modify calibration:



Conclusion

This is what was accomplished so far in the week, however there is still a group meeting on Friday before class time. So far, there have been no problems with the project. For the next two weeks, the goal is to have a completed application with only the most basic features. More will be discussed before class time.

Goals for the Week 14 May - 20 May 2018

After receiving feedback from the previous week, the group decided on the following goals in the next sprint:

1. Ensure that the SensorTag uses only the required sensors for our application (i.e. Accelerometer and Gyroscope), using EXLUDE statements
2. Implement the SensorTag Bluetooth I/O functions in C
3. Implement the SensorTag Alarm function in C
4. Ensure connection between SensorTags and PC
5. Gather Measurements
6. Create a Fall Algorithm

Weekly Meeting (2h)

On Tuesday, 15. May 2018, the group met to discuss the progress done so far, and spread out the tasks for the rest of the week in the following way:

- **Raul Bertone and Xhoni Robo:**
  i) Use Exclude Statements to ensure only Accelerometer and Gyroscope sensors send data
  ii) Implement the SensorTag Bluetooth I/O functions in C
  iii) Implement the SensorTag Alarm function in C
- **Elis Haruni:**
  i) Implement multi-core library in LaunchPad
  ii) Connection between PC, LaunchPad and SensorTag
- **Muyassar Kokhkharova and Saidar Ramazanov:**
  i) Make a simple Fall Algorithm
  ii) Improve the Algorithm if time permits it
  iii) Measurement Gathering

Some of the members had setbacks during the completion of their individual tasks:

- The SensorTags do not work unless plugged in through the debugger (Battery Problem)
- Could not find libraries in Java to connect the SensorTags directly to the PC, therefore LaunchPad is required

Individual Reports

Raul Bertone and Xhoni Robo

Using EXCLUDE statements to use only the required sensors on the SensorTag was partially successful. It took a small amount of time to realise that the EXCLUDE statements need not be put in the code directly, but used as a compile option in CCS. Despite that, there is still an issue with the Magnetometer. In order to exclude it, one has to find the exact place in the code where it is initialized and comment that section out. That is difficult to do as the structure of the SensorTag code is fairly complicated. The code to ring the Alarm is already implemented in the SensorTag by default. All that has to be done is create an application that calls this function. Unfortunately, almost all the SensorTags do not work. At first it was believed to be a battery problem, however changing the batteries did nothing. The only way to work around it so far is to use the Debugger and connect the SensorTag to the PC, in which case the SensorTag turns on. All that is left is to implement some basic I/O services. After all the individual tasks are finished, we will move on to helping the other members with their respective tasks.

Elis Harruni

The initial goal of the group was to implement the application without requiring the LaunchPad to connect to the SensorTags. This would be done using the Laptops own Bluetooth and some Java libraries. However, none of the libraries worked. Therefore that idea was discarded in favour of using the LaunchPad with the multi-core library to connect to more than one SensorTag at a time. Using the JSSC library, it was possible to connect the SensorTag to the LaunchPad and transfer data, but so far only as a byte array. The next step is to transfer data as a stream, as well as make it possible to send commands to the SensorTag.

Muyassar Kokhkharova and Saidar Ramazanov

We managed to create a very simple algorithm to detect falls. This algorithm is based mostly on using the Accelerometer for measuring the *g-force*. As explained during class time last week, during a fall there is a specific change in force. However, this algorithm is far too simple, and should only be used as a starting point to be improved upon. This week the goal is to gather measurements, which will be used to improve the algorithm to be able to differentiate between actual life-threatening falls, and other non-life-threatening activities.

Conclusion

The members put in the following amount of hours in this week:

- Raul Bertone: 6h
- Elis Harruni: 5h
- Muyassar Kokhkharova: 4h
- Saidar Ramazanov: 4h
- Xhoni Robo: 5h

Total weekly hours (including meeting): 26h