Project Proposal

Harshit Mahapatra
Dept. of Computer Science
Aarhus University
Aarhus, Denmark
au608727@post.au.dk

Patrick Lewandowski
Dept. of Computer Science
Aarhus University
Aarhus, Denmark
au614714@post.au.dk

Tomas Manuel Rebelo Mota
Dept. of Computer Science
Aarhus University
Aarhus, Denmark
au614711@post.au.dk

I. Introduction

Our project is about using IoT to monitor a walker user's health and walker's use.

We plan on fitting the following sensors into a walker:

1) An accelerometer that will allow tracking of how much the walker is being used.
2) A GPS that will allow the municipality to have an overview of the position of each user.
3) Pulse sensors on each handle, in order to track the user's heart rate overtime.

   These sensors will the be connected to an Arduino that transmits the data through LoRaWAN to a Raspberry PI that will be a LoRaWAN gateway connected to a server.

II. Use case

The people using the walker will be streaming their sensor data to a central server belonging to the Municipality. This data is then used to analyse both the overall use of the walkers, something that interests the manufacturing companies, and the over-time change of the health indicators in order to track long-term progress of the user's well-being.

III. Usage of Internet of Things

How: We will use sensors to gather data and send it to a remote server

Why: IoT seems like a good way to gather data from a moving object like a walker. Since the infrastructure for LoRaWAN is already considerably developed in Aarhus, we thought it would be a good protocol to use for streaming data from walkers to the central server owned by the municipality.

We considered the possibility of getting sensors with built-in LoRaWAN capabilities, but doing so would increase cost of the project, restrict our choice of sensors, and the work to be done by us would be reduced, meaning a smaller "delta" in our project. Thus, we decided on an architecture where individual sensors are connected to an Arduino which has a LoRaWAN tranceiver.

IV. Questions we seek to answer

Some of the questions we seek to answer are as follows:

- Can we help make better walkers by analysing how and where they are used?
- Is it possible to have a walker that measures some health parameters of its user?
- Can we track the health progress of a user by analysing the measured health parameters?

It should be noted that we will probably not get to the analysis point because our project intends to be the foundation for a larger scheme with the next steps including the analysis of collected data.

V. The envisioned architecture

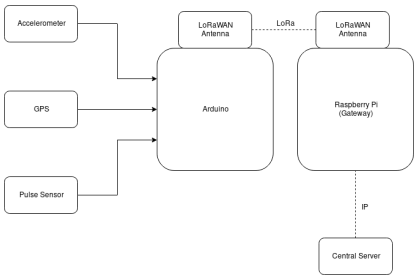

Fig. 1. Schematic representation of the Architecture

VI. Weekly milestones

A rough sketch of our weekly plan is as follows:

1) Have the Raspberry Pi(Gateway) communicating with server.
2) Have Arduino communicating with Raspberry Pi using LoRaWAN.
3) Connect Accelerometer to Arduino and get its data on Server.
4) Repeat step 4 for GPS and pulse sensor.
5) Fit Components on the walker and preliminary tests
6) Test the system, collect and plot data.
7) Write the report

VII. Strech Goals

If we have addtional time, we can work on the following goals:

1) Measure pressure applied on handles
2) Analysis of collected data
3) Measure durability/wear and tear
4) Measure blood pressure
5) Analyse gait
6) Include a gsm adapter in the arduino, that way we can have bigger upload speeds, allowing us to have real-time updates which in turn would allow for use-cases of emergency situations and we would also be able to send video.