WHEEL.ID

The chair that knows you

Group 01

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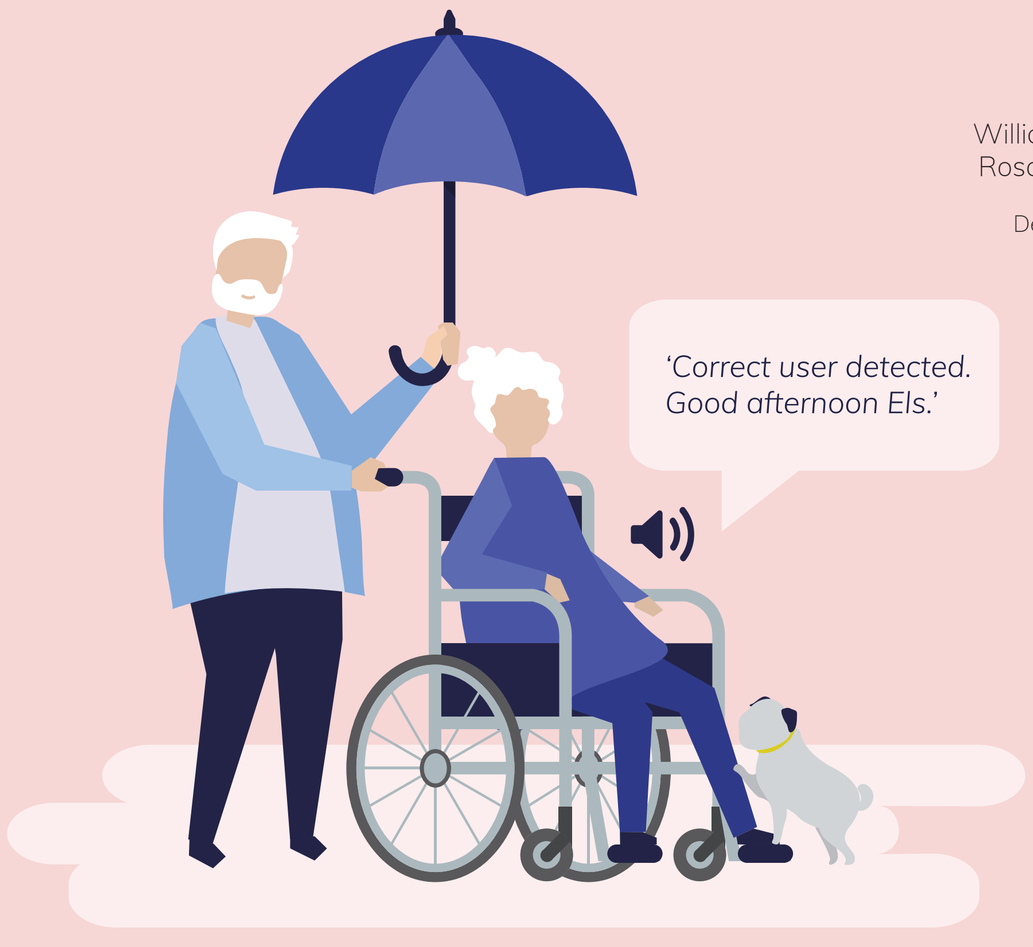
Developing connected products and services for IoT



CONTEXT

We want to build a safety system that is designed for the wheelchair owner, by making a profile of him/her in order for the system to understand who is sitting/ using the wheelchair. This system works based on the weight, way of sitting and the way someone handles the wheelchair. If the wheelchair is used by the wrong person (not saved in the recognised profiles) an alarm will go off, together with some LEDs.

SELECTION/MOTIVATION OF THE SENSORS

6 Force sensing resistors
The force sensors will be placed in the seating of the wheelchair and, based on data, these will shape a profile of the main user. This profile can then be differentiated from other users, because the differences in weight and posture etc. vary.

Accelerometer + gyro
The accelerometer is the second part of the two-step security system, it will measure the acceleration patterns of the main user. People might have very similar weight and postures, therefore this accelerometer will measure usage of the product, and act as a second security feature.

SELECTION/MOTIVATION OF ACTUATORS

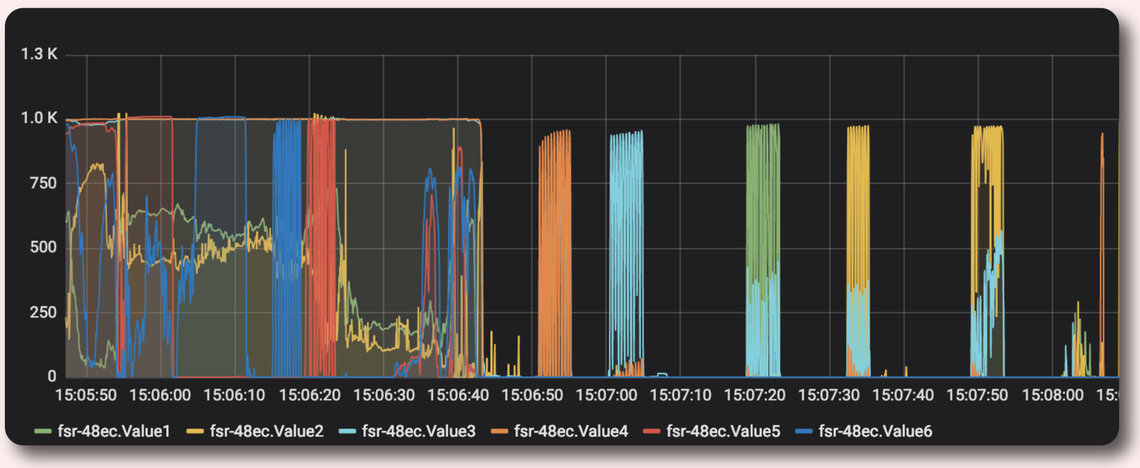
Whenever a person with the incorrect profile uses the wheelchair, the security system will let the surrounding area/people + the main user know that something is wrong. The faulty usage will be made clear on the phone of the user (it's connected) but also through different actuators on the wheelchair itself, namely:

Audio
When the correct user uses the wheelchair, the built-in speaker system will welcome him or her and, automatically, the wheelchair will adjust to the user's preferred settings. When an unauthorized person sits down in the wheelchair, the same audio system will says so.

Light
There is also a LED-strip that is connected to the wheels. It will shine bright red or green depending on the user.

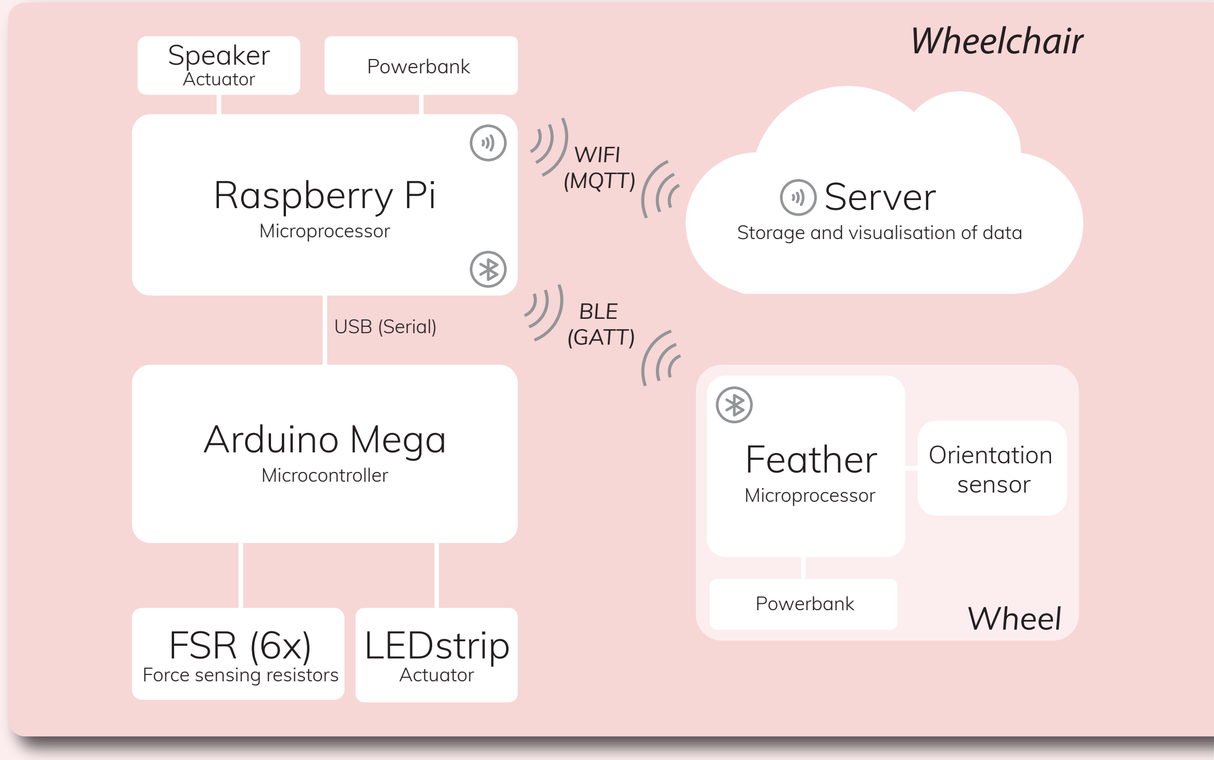
DATA VISUALISATION

The generated sensor data is being pushed to the server by the Raspberry Pi. From the server we can then import this data to Grafana. Grafana is a tool that is used to visualize the generated data. In this example we can see different seating profiles of multiple users. Visually we can already see a difference in profiles. The problem is however, that we cannot know the absolute values of different profiles since the data is too extensive. Therefore, a machine learning algorithm is used to predict which user that is sitting on the chair. If this user is classified as "unknown" the alarm will sound to alert unauthorized use.



In order to collect the data we ran python code which collected data of 4 users: "no user", "Jelle", "Rosan", "William". Of each person 2000 data points were collected based on their seating. This data was then used to train and verify the algorithm. This algorithm is specifically trained for these users. In the future it would be preferable to easily train the algorithm to any new user that needs to be added to the system.

TECHNICAL ARCHITECTURE



DATA FLOW