WheelZoo

Marianne Langrand   4764420
Thom Masselink   4460545
Salvatore Luca Cucinella 4624440

Proximity sensor

By measuring the distance of a person to the wheelchair we can know if there is a person pushing the user. This information is then used to determine if the covered distance should be counted or not, since covered distance while being pushed doesn't make the user tired.

Orientation sensor

By measuring the amount of rotations we can know the amount of distance that is covered by the user. This can be calculated when the circumference of the wheel is known.

Vibrators

When the user covered a certain distance on his own, the user will be warned by the vibrating motor, that is placed on the back support of the wheelchair. It will vibrate for a short period of time, to make sure the user doesn't get annoyed by continuous vibrating in his back.

Led strips

LED strips indicate that an user might need some help in moving. When the user gets tired the light will turn from green to yellow and other visitors of the park will know that this user is tired.

sensors

State of use

a. Self-pushing b. Being pushed

Distance covered

Total amount of rotations x circumference

actuators

Degree of tiredness

Recommendations

Take a break
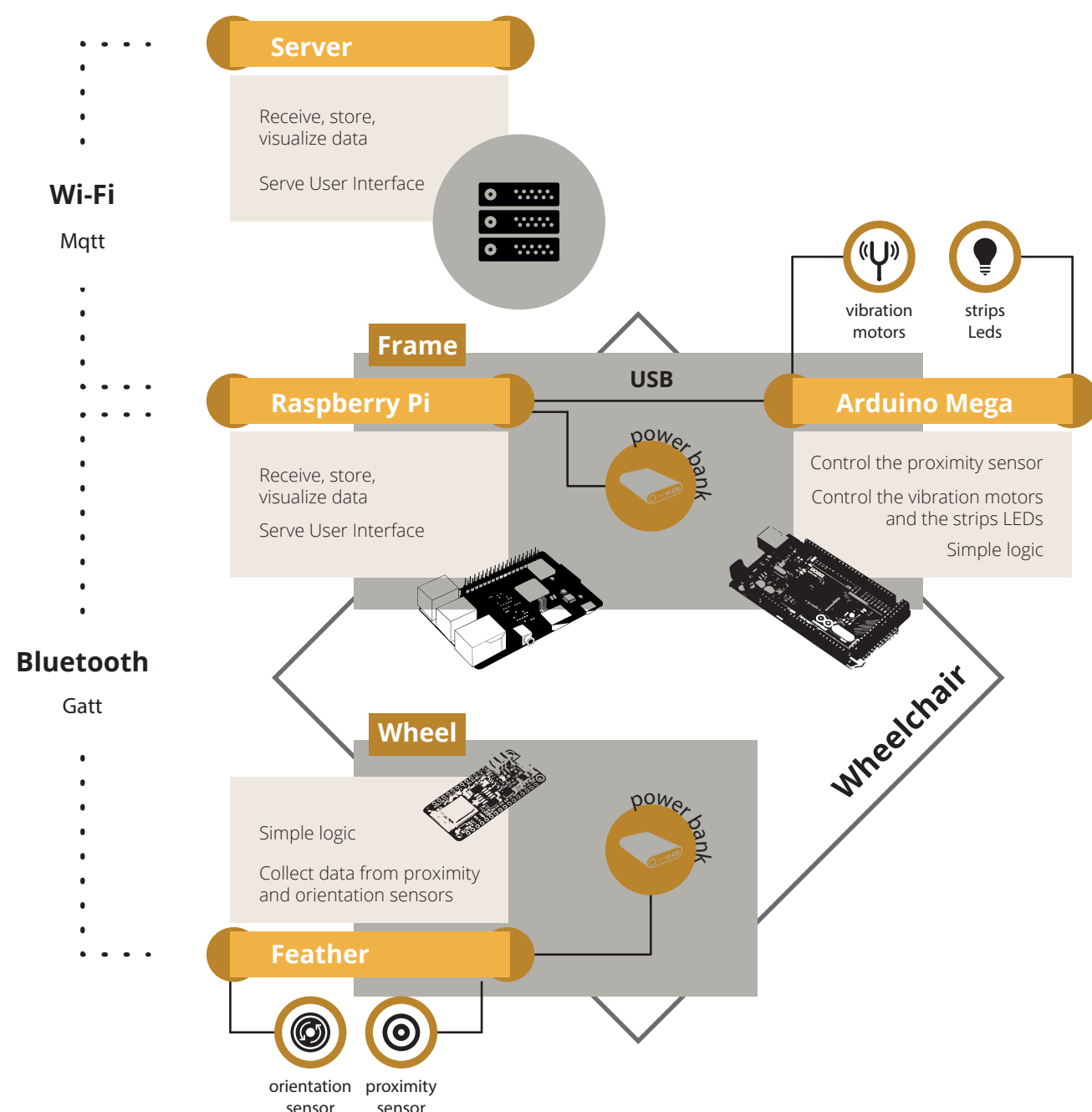Being driven to someone else

Context

The chosen context is the zoo, a public facility that maintains a collection of animals displayed to the public. It is a leisure space that often requires visitors to travel long distances walking to explore the establishment. The zoo offers wheelchair service for visitors with difficulty walking. WheelZoo is a wheelchair able to sense if a user gets tired and to communicate this to the user and bypassers. Visitors are made aware of the wheelchair's user state and can choose to help him/her by pushing. This is done by sensing the distance covered, and whether the user is being pushed whilst doing this. When the wheelchair senses that the user is tired, vibrating motors will let him/her know, and lit up the Leds strips on the handles of the wheelchair will make bypassers aware.

Purpose of the prototype

WheelZoo is an internet-connected wheelchair which support visitors by providing them recommendations about the need for a break. WheelZoo make visitors aware about the need for help that a person riding it might have. Its inviting others to grasp the handles and push the user untill he/she will be rested. Users on the wheelchair can decide to stop or keep pushing.

System architecture

Wi-Fi
Mqtt

Server
Receive, store, visualize data
Serve User Interface

Frame

Raspberry Pi
Receive, store, visualize data
Serve User Interface

USB

vibration motors

strips Leds

Arduino Mega
Control the proximity sensor
Control the vibration motors and the strips LEDs
Simple logic

power bank

Bluetooth
Gatt

Wheel
Simple logic
Collect data from proximity and orientation sensors

power bank

Wheelchair

Feather

orientation sensor   proximity sensor

Working principles

start

Green LEDs

Is there someone behind me?
yes
no

Start counting rotations [R] of the wheels

No Tired

yes

Is there someone behind me?
no

Start with Timer - 5 min -

No Tired

if

R = 50

Turn LEDs from Green to Yellow

Start with vibrations - 3 times -

Tired

Blue LEDs

vibrator vibrator vibrator vibrator

Actuators
proximity sensor   orientation sensor   vibrator motors

Sensors
strip LEDs