ECE 49022 Project Agreement

Student instructions: Replace all highlighted brackets with your team's content. Do not delete or alter anything else.

Team name: CIVIC team Section: 001 Date: September 27, 2017

TA / Professor: Nathan Conrad / Prof. Lehnert

Agreement

This document serves as an agreement between the team and ECE 49022 as to what the team's senior design project is, the scope of that work, and which portions each team member is expected to individually oversee. Substantial completion of a prototype that achieves the below product description is necessary for the team to complete the course.

This agreement is accepted, and replaces any old versions of the agreement, when fully completed and signed by each team member and either the section's TA or Professor. The most current version of this document should hang from the team's bench, near the team photo so that the course staff can easily review it at any time. The course staff reserve the right to require the team to generate a new agreement given any event that renders the original agreement significantly out-of-date and/or no longer achieves the course's outcome for one or more team members.

Acceptance

Team member 1: *Haoyu Zhang*

Team member 2: *Veronica Vera*

Team member 3: *Dongjin Kim*

Team member 4: *Junyan Zhai*

TA / Professor: *James S. Lehnert*

Overall product description

Our team will create an armband with a GPS module, heart rate sensor, step counter, thermometer and Bluetooth low energy (BLE) module. The rechargeable battery pack will be charged through a USB power source (5V) and will interact with the user through an Android app. Data will be stored in the armband until downloaded to a phone through BLE and measured in 6-hour intervals. The device will gather step-counting data constantly (not only during intervals). Additionally, the armband starts gathering data upon request from the user. The app will display daily heart rate, step count, temperature, and location (on a map) data. A small red LED will tell the user that the battery is under 20%, and a green LED will indicate that the battery is over 20%. A blue LED will light up while there is a connection to a device through Bluetooth. Lastly, the user can set thresholds for warnings in case the heart rate, temperature or daily step counts reach the thresholds.

User stories

Jane the Jogger

Jane the jogger likes to run in the evenings. Jane has already lost her phone several times during her evening runs but wants to track her workouts without worrying about losing her phone again. Jane does not enjoy running with her phone, because she is clumsy and it might shatter easily if she dropped it while running. While she runs, she also dislikes carrying her phone's weight in her pocket or her hand. However, she likes the idea of knowing tracking her heart rate, temperature and her speed with a single, portable device that has a user-friendly app.

Graham the Grandpa

Graham the grandpa is too old to take care of himself. His family is too busy to check on him constantly, but they worry about his health. Graham has a history of getting high fevers and anxiety, causing his heart rate to raise. Graham is also a very lazy grandpa, but the doctors say he needs to walk regularly to reduce his anxiety and lower his pulse. Graham's family is looking for a device that can warn them in case his temperature or heart rate increase too much, and check if Graham is getting his daily steps in and check in on his location.

Final acceptance test

Demonstration tests

(User: Jane the jogger) The band will also count the steps of the user, even without a connection to a phone through BLE. The user should be able to start data gathering through the app, and stop once they have finished gathering data (running). When the user connects to the phone again, the Android app displays the new data acquired.

(User: Graham the grandpa) The band should save the temperature, heart rate and general location within 6-hour intervals throughout a day (24 hours). While someone wears the band, another user should be able to see the temperature, heart rate, general location, and daily steps on an Android app that has connected to the band.

Acceptance tests

- **GPS module:** Test that the location is accurate within 5 meters.
- **BLE:** Show that the connection is stable for a determined time.
- **Heart rate monitor:** Use a product with an IR emitter heart rate monitor to check that the sensor is accurate within three beats per minute. If the heart rate is too high, there should be a warning that the pulse has reached the threshold set by the user.
- **Step counter:** Reset the counter, walk/run a certain number of steps and check that the count is within a 5-step accuracy.
- **Thermometer**: Use a household thermometer to check that temperature is accurate within 3° C. If the temperature is too high, there should be a warning that it has reached the threshold set by the user.
- **Battery LEDs:** When the battery reaches 20% or less, the red LED should turn on, otherwise the green LED should be on. When the BLE module connects with an Android device, a blue LED should also be on.

Overall system block diagram