ECE 153B Project Proposal - Mobile Health Monitor

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Website: https://sites.google.com/view/mobile-health-monitor/home

Goal / Purpose / Overview:

The goal of our project is to build a mobile health monitoring system that gathers biometric data from a user's body alongside current weather data from the environment in order to inform the user if their body is in a healthy state, and to advise them on safe activities based on the current conditions and their biometric data.

We will monitor and analyze user health by tracking three biometric factors: heart rate, body temperature, and electrocardiogram activity. Additionally, we will monitor four environmental factors: temperature, humidity, barometric pressure, and light intensity. Using these values, a computational algorithm will compare the measured biometric values to average/healthy ranges to determine the immediate normalcy or abnormality of a user's state of health. Additionally, the algorithm will analyze the measured environmental conditions in order to advise the user on what activities are suitable given their health data and the current conditions, and to advise against activities that may bring harm to the user.

The system will be built using multiple I2C peripherals capable of gathering the data, and will be interfaced through Termite. An enclosure will be built around the peripherals to improve the usability and accuracy of the monitoring system. Then using Bluetooth, the detailed results will be output to the user's phone or laptop allowing for the effective, quick and easy process of taking user inputs and providing the desired advisory information. Additionally, the user will be able to select between a number of simple data streams that can be displayed on an LED Matrix.

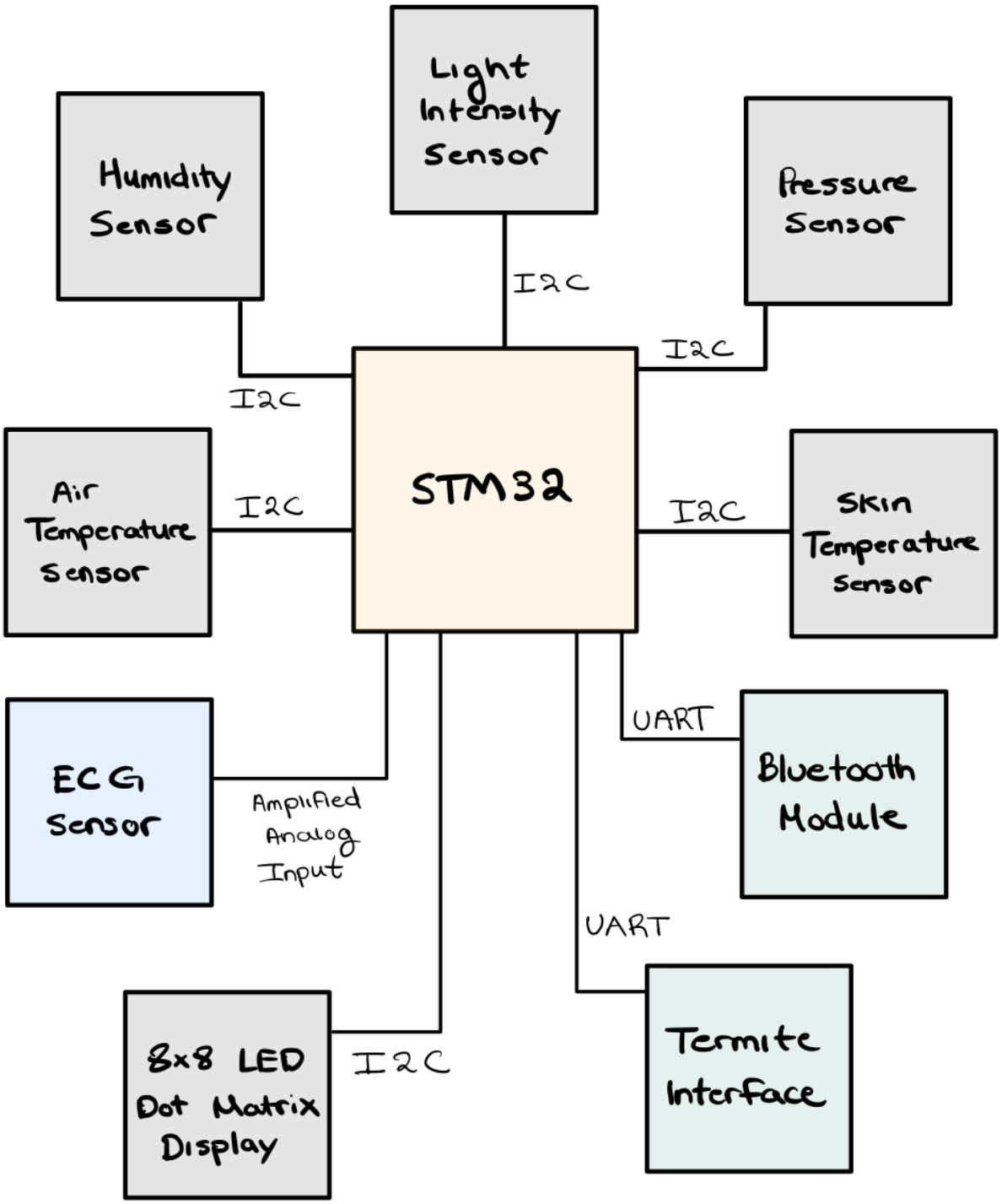
Peripherals:

- Air temperature sensor (TC74)
- Skin temperature sensor
- Humidity sensor
- Light intensity sensor
- Heart rate sensor
- Pressure sensor
- Bluetooth Module (HC-05)
- 8x8 LED Matrix

Serial Interface Protocols:

- I^2C: Used to interface with all data collection peripherals
- UART: Used to interface with the Bluetooth module and Termite

Block Diagram:



Responsibility List:

Julian will be responsible for:

- Testing the functionality and compatibility of all I2C peripherals
- Implementing constant data collection from the sensors
- Implementing the SysTick interrupt to monitor time-dependent variables, alongside the implementation of all other interrupts
- Verifying that the data received from the sensors is logical
- Testing to ensure the continued simultaneous functioning of all peripherals

Ben will be responsible for:

- Building an enclosure for the device
- Setting up Bluetooth communication with Termite.
- Testing the device's wireless functionality
- Build the code in main that loops and waits for interrupts while constantly outputting certain measurements and phrases to termite based on the data received from the peripheral devices

We will both be responsible for:

- Developing the algorithm that determines the advice that the user will receive from the device
- Developing the interface between the user and the device (such as text prompts and navigational menus)
- Researching normal levels of the measurements we are collecting and common methods of comparison

Software Structure:

The software will use the SysTick interrupt in a way that allows the accurate measurement of time-dependent data. Polling will be used to continuously gather data from the peripherals. As such, the peripherals will be sending data to the system hundreds of times a second and be stored in the STM32 registers. We then have to build algorithms that will retrieve the data from the registers, average it, compare it to average/healthy ranges, and then make an educated estimation of the user's health. This health data will be used in conjunction with the gathered weather data to generate the advice that is available to the user. The information will then be output through Termite every few seconds giving the user a current picture of their health, telling them their heart rate in BPM, body temp in Fahrenheit, or activities that would or would not be hazardous to the user. The information that is currently being displayed can be toggled by the user through the Termite interface. Finally, the device will include an 8x8 LED Matrix display that can display several different live data streams in various manners; the data and visual representation will be able to be toggled by the user through providing text inputs to Termite.