EE/CprE/SE 491 WEEKLY REPORT 2

2/2/2020 – 2/16/2020

Group number: 26

Project title: From Bodily Sensors to Cloud and Back

Client &/Advisor: Goce Trajcevski

Team Members/Role:
Justin Worley: Cloud Engineer
John Kivley: Electrical Engineer
Richa Patel: Database Engineer
Isaac Zahau: Front-end/UI
Michael Lauderback: Embedded Systems Engineer

- **Weekly Summary** *(Short summary about what the group did for the week. This should be about a paragraph in length. These are just a few questions to help you get started. What was the overall objective for the week? In general, what tasks were completed? Were there any changes made to the project?)*

Over the last two weeks our group focused on research for each or our roles. We looked into: sensors and boards, databases, cloud platforms, coding platforms, and different scenarios for the project. We also looked into the budget of the project.

- **Past week accomplishments** *(Please describe/summarize as to what was done, by*

  whom, when and, collectively as a group. This should be about a paragraph or two in length. Bulleted points are acceptable as well. Please keep only your technical details related to your project. Figures, schematics, flow diagrams, pseudocode, and project related results are acceptable, but please ensure that they are legible (clear

enough to read) and to provide an
explanation. If researching a topic, please add a few details about what was learned and how it is relevant to the project. If two or more people worked on a single task, be sure to distinguish how each member contributed to the task. Specific details relating to the assistance provided to other members may be included here. ***Do not include classwork, such as individual reflection assignments, and group meetings as part of your duties.)***

• Justin: Worked on narrowing down the types of cloud platforms. Justin brought 3 items to choose from: AWS, Azure, and local ISU server. Justin learned that AWS offers better rates and has a long more feature to help aid the project that Azure. Justin also learned that while the server at ISU would be free for students, the university still has to pay for it. Justin also learned that AWS has a free tier that would greatly minimize the monthly expense of running all services on the AWS cloud platform.

• Isaac Zahau: Did more research on multiple front-end frameworks such as VueJS and AngularJS. Looked into different libraries that support converting data into plots and charts. These libraries include ChartJS, Victory, and Plotly. Also weighed the pros and cons of each framework as well as prioritizing web app vs mobile app. Finally, looked into the advantages of doing IOS vs Android first. Ultimately decided on Android due to experience and team decision.

• Richa Patel: Did research on which database to use for the project. I looked into a couple of databases such as Redis, MongoDB, Oracle, Teradata, MySQL Workbench, and Amazon DynamoDB. I chose Amazon DynamoDB because it’s a NoSQL database and it's a fully managed, durable database with built-in security, and in memory caching for internet-scale applications. It also provides quick and predictable performance with seamless scalability.

• John Kivley: Researched and analyzed two different heart beat sensors that could be implemented in the IoT system. Both sensors require significantly low power and are wearable. After discussing with some experts in embedded systems projects and doing a pros/cons analysis, a heart beat sensor was picked for the design to be tested first. Additionally, research was done on different temperature sensors. Most of these sensors were thermal dependent resistors (thermistors and RTDs). With the group advised to focus on getting one sensor to work at a time, and the heart beat sensor picked for testing already, the list of potential temperature sensors has been reduced to two, but requires further analysis before deciding which one to test first. Furthermore, I researched different ESP8266 boards to connect the sensors wirelessly to the microcontroller, and battery tech to power each sensor and the microcontroller.

• Michael Lauderback: I researched different options for embedded platforms. Specifically the teensy board, raspberry pi zero w, and custom build solutions. There are multiple pros and cons for each solution. The teensy board is a great solution for tight-knit implementations of our IoT, but does not support wifi or bluetooth without a riser or some kind of dongle. The raspberry pi zero w is a full fledged system with wifi, running on linux which makes programming it very easy, but it does not support bluetooth and the GPIO does not have the kind of support we need for the sensors we are using. The pi zero also has a pre-designed battery pack. The custom solution has the benefit of being anything we want it to be at the expense of time spent designing and debugging.

• ... ○ **Pending issues** *(If applicable: Were there any unexpected complications? Please elaborate.)*

- Isaac Zahau: None
- Jusitn Worley: None
- Richa Patel: None
- John Kivley: None
- Michael Lauderback: None

Team Member	Contribution	Weekly Hours	Total
John Kivley	Met with ETG and conducted research on sensors for the design, battery technology to be used for the power supply, and ESP boards to be used for wireless connections from the sensor to MCU.	6	12
Justin Worley	Research into cloud platforms and their supported databases.	5	10
Richa Patel	Researched the databases	5	10
Michael	Met with ETG to discuss different	6	12

Lauderback	platforms for our system and researched more information of those platforms.		
Isaac Zahau	Researched front-end frameworks and potential libraries that can be used for plotting and charting data.	4.5	9

- **Comments and extended discussion** *(Optional)*

  Base scenario: An athlete wants to track their run. They attach our sensors, pocket the MCU, and open the app on their phone. While on their run they check their real-time heart rate. Once back from their run they go to our website. From there they are able to see a detailed breakdown of their work out.

  Alternate scenario is that this is used by a doctors office to track a patent for life threatening issues. We want to fully complete the athlete scenario before moving on to the doctor scenario if possible.

- **Plans for the upcoming week** *(Please describe duties for the upcoming week for each*

  member. What is(are) the task(s)?, Who will contribute to it? Be as concise as possible.)

• Justin Worley: Further look into the pro's and con's of cloud platforms. Work with FrontEnd and DataBase to create a general diagram for reference. Start

• Isaac Zahau: Since our team decided on doing Android first, I will be doing research on using the bluetooth function on the Android device to connect to the sensors. I will also be doing research on libraries for plotting and charting data on Android.

• Richa Patel: Look further into the databases for the project.

• John Kivley: Order the heartbeat sensor for testing through etg. Test the sensor using oscilloscope readings and information on the datasheet. Assist Michael with designing our own microcontroller/master control unit of the system. Research the best option for a test-MCU that can be used to test as a control versus our experimental new MCU design.

• Michael Lauderback: Design embedded architecture and determine what functionality the embedded system needs. From there, start designing a block diagram of components for the embedded system and work with John to design a schematic.

- **Summary of weekly advisor meeting** (*If applicable/optional)*

  (Provide a concise summary on the contents and progress made during the advisor meeting.)

  In our advisor meeting we each went over your research, giving the pro's and con's of each item. Our advisor then gave feedback into what we should do more research into. Our advisor also recommended making diagrams, both block and user, to help others visualize what we are trying to accomplish.