Contributions

Patrick Davis

During the senior design project, I was able to help facilitate the progress of the team by making sure that everyone was aware of the expectations of the semester and tried my best to abide by the Gantt chart that was made near the start of the year. Along with the responsibility of being the team leader, I was able to help with the accelerometer, create the mechanical housing for the kettlebell, create a solder board that will be utilized for the final implementation of the system, as well as assist wherever needed to help push the group forward. This senior design project allowed me to learn a lot of skills that I was lacking coming into my senior year and I believe through this project I was able to make myself a better well-rounded engineer.

Ryan DeBoer

For my subsystems of the senior design project, I worked on the Bluetooth communication between the kettlebell and the mobile application as well as the developed application itself. The Bluetooth communication consisted of a circuit board connected to Bluetooth module that would transmit information (number of repetitions performed) to the Android phone application to be used when the user finished a workout. This subsystem required me to code the hardware of the circuit board using UART communication protocols to send data wirelessly to the phone. This was done using C language and MPLAB X IDE to program the board. On the Android side, I developed a full stack application to function as the user interface for users to do workouts that could be saved to their individual accounts. The setup used Java to code the backend, XML for the front end, and all tied together with a Cloud-based Firebase Database. The app supports Google-authorization for account security, custom user profile setup, displays a list of user accounts, allows the user to create a new workout session with extensive customization, connects to the kettlebell via Bluetooth, and allows the user to track their workouts through a log system that records the outputs of all workouts. When creating a new workout, it takes in the user's parameters, provides a timer for the workout, and then outputs the number of repetitions of the chosen exercise that were completed, and the calories burned. The app also supports password reset with email confirmations, and new account setup as new users are added to the roster. These subsystems took a lot of time to implement since these technologies were completely new to me. I put a lot of effort into researching Android programming for this project since I have never done mobile app development and have always owned iOS or Windows devices.

Cole Russell

For our senior design project, I was responsible for the distribution of power throughout the system. Most of my time was spent on the wireless charging system used to charge the kettlebell when not in use. I used inductive charging between two coils to wirelessly transfer power. The charging system took a 5VDC input from a wall wart adapter and provided a 5VDC output to the battery management IC for the 3.7V lithium-ion battery used to power the kettlebell. To

successfully transfer power wirelessly I had to design a circuit that took in a DC voltage and converted it to a high frequency oscillating signal through the primary coil so that the secondary coil could receive the signal through electromagnetic induction. The receiving end would then convert the oscillating signal back to a DC voltage through a rectifier circuit. All of this took a lot of time and research to not only understand the process of wireless power transfer, but to then design converter/inverter circuits and complete the analysis of parameters of the circuits. When the charging system was complete, I designed and built a PCB for the system using Eagle CAD. As a backup, I designed a 3.7V to 9V step-up converter to power the explorer 16/32 board within the kettlebell in case the PCB build was unsuccessful.