Lillian Gonzalez

Individual Contributions

My roles in the Automated Coffee Brewing System senior design project consisted of Engineering Data Manager and software co-developer. As the Engineering Data Manager, I was largely responsible for compiling information into deliverables. In SDP 1, I designed the midterm presentation slideshow and the project design poster, then served as co-author/co-editor of the SDP 1 final design report.

In SDP 2, my duties encompassed writing software in the C programming language for user interfaces and system control. With regard to the user interfaces software, I developed an Android app from scratch to function as a GUI, where the user could specify the volume, temperature, brew strength, and the time at which the system would commence with that brew. The app uses Bluetooth to communicate with the system, and thus I developed software which utilized the UART communication protocol so our microcontroller could receive, parse, and acknowledge the brew data. Additionally, I created software to operate the built-in control panel, consisting of an LCD screen and push-buttons, to allow the user to enter brew data without the app. This control panel also alerts the user when there are problems in the system which prevent the brewing process from executing.

Developing the system control software consisted of writing and logically ordering higher-level functions which utilize the sensors and motors in coordinated activities, culminating in complete system operation. I worked closely with Tyler Moff during this development process, as he was responsible for developing much of the lower-level sensor functionality. In addition to developing the flow of control for this system, I also wrote the software for utilizing timers & delays, and reconstructed our stepper motor control code to utilize interrupts instead of timers.

Landon Miller

Individual Contribution

As the hardware lead, my role primarily involved the development of the electrical and mechanical systems of the project. In the early stages of the project, I conducted testing of stepper motor drivers and stepper motors using the development board for the PIC24 microcontroller. Since the development board was only used for testing, I created schematics for a PCB that would be used to control the final system. This involved the use of KiCad to connect the required components that were needed to support the microcontroller, sensors, and motors. The microcontroller, like most major components, had strict design rules contained in the data sheet that had to be carefully followed. Similarly, I researched and chose the voltage regulators, responsible for providing power to the entire system and particularly susceptible to issues if laid out incorrectly. The schematics also included DC motor drivers, stepper motor drivers, an RTC, and connections to sensors via I2C and UART, all of which were chosen to fit the needs of the project and laid out according to the design specifications. Once the schematics were completed, I used KiCad to design and lay out the printed circuit boards, ensuring that good practices were followed to avoid issues with sensitive components. After the PCBs were ordered and received, I took charge of populating the boards with components, many of which were surface-mount and required the use of a reflow oven. An extensive part of the project was working with the other team members troubleshooting the electrical systems for problems involving component failure, incorrect component placement, and other issues that developed during integration with the various mechanical systems. I also assisted in the modeling and 3D printing of the several parts using Autodesk Fusion 360. Finally, I worked with other team members to write design reports, manage part orders, and complete other required documentation.

Tyler Moff

Individual Contributions

My contributions to the Autonomous Coffee Brewing System project include but are not limited to, working as the Software Lead for the team, managing the GitHub for our project, handling merge conflicts, and helping debug code. Most of my focus on this project was on low level implementation to ease integration, including majority of the Queue struct, BrewQueue struct, sensor code, code for an I2C ADC, and DC motor driver code for the PIC24. The sensor code I wrote was for the VL6180X I2C Time of Flight sensor and the HC-SR04 ultrasonic sensor. I additionally wrote code for a One-Wire bus to interface with the DS18B20 temperature sensor, but that hardware ended up not being used in the final design. I additionally provided consulting and advice on decisions made for communications protocols at request.

As work on the project progressed and integration moved along, I assisted with integrating the water system and handling safety sensing in the system. Safety sensing in the system included, but was not limited to, the sensing of bean levels, the sensing of water levels, the sensing of water temperature levels, and the sensing of waste levels. Part of this work involved writing the aforementioned code for the I2C ADC, as well as characterizing our sensor values related to the levels of beans, water, and waste to determine values to tell the user they are low on a material.

Benjamin Vitu

Individual Contributions

As Team Lead, I ensured each team member had design responsibilities and the tools necessary to complete all tasks relating to the project. I was also responsible for submitting all parts request forms to the senior design coordinator (SDC), Mr. Lewis. In addition, I served as a co-hardware developer. I designed nearly all the final 3D CAD models of each subsystem using Autodesk Fusion 360. This includes the filter dispenser, the coffee bean grinder, the water heater, and the brewing subsystems. Using my personal 3D printer, I produced and assembled the mechanical design. With regard to circuit design, I constructed the rough draft of the electrical system schematics and selected several components for the final electrical and mechanical design. This includes, but is not limited to, the power supply used to convert 120Vrms to 12VDC, the relays used to switch on the bean grinder and the heating element, the lead screws, stepper motors, and motor drivers used for linear translational motion, and the DC motor used to dispose of the used filter and grounds. I designed the hardware used to measure and characterize the temperature of the heating element with a thermistor and conducted a test to verify the water heating system's legitimacy. Testing and troubleshooting the subsystems was a major contribution near the conclusion of the project.