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Project Lab #2 (11/29/16)

Reflection:

Extenuating circumstances prevented delivery of the finished project boards for preliminary testing with the firmware that was developed, though the board design was completed and submitted on time. In the meantime, all firmware for the product was developed as the final iteration and was confirmed to compile and function using Atmel Studio’s simulator. When the final project boards are delivered, the firmware will be fully tested and finalized.

The project’s firmware was the main scrutiny for this lab, as well as finalizing of the EAGLE designs for submission. The goal of firmware development for this lab is the conversion of code from the previously used Arduino libraries to use with Atmel Studio and avr-gcc. The advantage for using Atmel Studio and avr-gcc over Arduino is that while Arduino’s C code is abstracted (and therefore can be easier to use), it increases code size, which can be a constraint with the ATMega328P’s anemic on-chip storage. The use of Atmel Studio is also conducive to loading commercial real time operating systems, although such use of an RTOS is not being considered for this project.

The main consideration when converting code from Arduino to Atmel is removing the helpful abstraction that Arduino libraries offer such that these headers and code blocks with compile and function correctly with Atmel Studio. Even though many of these sensors and actuators are well known, this required extra research to see if any more information about the parts’ interfacing can be found. Such information is plentiful, and the group has found (and cited) many sources that were helpful for this goal; much of this info came in the form of completed C code and headers that required little modification. These were all tested and implemented into the firmware to be loaded onto the product board.

Conclusion:

Project Lab 2 saw the team moving forward with the final EAGLE design and firmware adaptations for the final hardware choices. The board design had its final optimizations and downsizings and were submitted for fabrication during this project lab. Although the boards have not been received in time for testing, this allowed for more focus on preparing the firmware for development of the product.

For the final version of the firmware, this project lab focused on moving away from the Arduino environment to development in Atmel Studio. Arduino’s abstraction was helpful in the beginning steps of the design project, but reducing code size to fit the ATMega328P’s storage and more traditional (and familiar) C programming fell in favor, bringing about new requirements for the firmware development. These requirements were converting the Arduino libraries to C code, which the team researched and either developed new code or adapted existing C files and headers into the real-time control loop, depending on the device in question. With the combination of the finalized board design and firmware developed for this finalized design, the team can move forward with the final steps of the design project, which is to ensure the working state of the system as a whole using the newly updated firmware and a model environment for testing.