

How would you continue project development if given time?

If given more time to develop the project we would implement a low power mode when switching to battery power. Low power mode would dim the seven segment display so there is only one brightness level. When the display is on full brightness and the speaker goes off while its on battery power the Arduino will reset without the speaker making a sound. Low power mode would increase the reliability of running on battery power and make it clear to the user what functions would be available during backup power.

What lessons did you learn from the project?

The main lessons we learned from this project were how to design a PCB and increased familiarity with debugging Arduinos. This was our first time designing a PCB and we learned about the many criteria you have to juggle while designing a PCB. These criteria include having the proper footprint size for components, having large enough traces so we aren't current limited, and creating a layout that allows each component to function properly. Halfway through the design we realized that the pin arrangements we had initially assigned for the seven segment display wouldn't physically work on the PCB so we had to reassign the pins. Our biggest takeaway was being more aware of decisions we previously took for granted when our projects did not use PCBs.

What would you do differently if you could do it over?

If we could do this project again we would try to make the system completely analog. We initially created the system as a digital system because it was what we were most familiar with. We had programmed Arduinos and timers before so by choosing the microcontroller route we had a clear path in mind. After doing this project with a microcontroller I would like to do it without one to gain more experience with analog circuitry.

What was the biggest challenge, and how did you approach it?

The biggest challenge of our project was making the speaker create a tone at 440 hz. The function we used in Arduino allowed for the user to put in the desired frequency and length of time you wanted the tone to sound but we found out that this function was unreliable and needed to be called repeatedly. When using this function we ran into resonance issues where the frequency would start at 440 hz and then transition to 220 and 110 hz. We deduced that it must be a timing issue within the code since we had to run other functions while the tone was being produced eventually, with a custom wait loop, we were able to solve this issue and our speaker meets the project requirements of creating a tone at 440 hz +/- 1 hz.

What is the most impressive thing about your project?

The most impressive thing about our project is the automatic switch to backup power. Our system was designed with a battery pack built in so that if the timer was ever disconnected from power it would still be able to function. Although it isn't designed to run on just battery power, for a short while it could run on battery power without initially being plugged into the wall. This makes our timer portable and able to be moved between power sources while still keeping time.