Principles of Embedded software: Final Project Interview

- By Vishnu Kumar

Audio recorder and playback device

1. Feature scope changes from original proposal and the reason for the change.

I have additionally implemented a tone generator module to playback a tone of 440Hz for 1 Second. I have implemented this module to better demonstrate my audio playback capabilities.

2. What works or you feel confident in getting working in the revised proposal.

I am confident in my MCP4725 DAC module working. I was able to implement all the features outlined in the datasheet such as DAC fast write, DAC normal write, DAC and EEPROM write (By writing the DAC value to the EEPROM, the DAC shall be able to output a preset value on power-up).

I am also confident in my speaker setup, and I am able to generate a tone of any given frequency using the TPM modules with the aforementioned DAC module, which was tested across a wide range of frequencies and cross-checked using an oscilloscope.

3. What did not work in the revised proposal or you had to tweak.

My audio input module was not working as expected. I initially thought my ADC module was not working, but I was able to rule it out by using a potentiometer as an input to the ADC module, which gave me expected values.

Upon further inspection, I found that the microphone module I was using (KY-037) did not have the capability to capture human voices, although it was able to capture whistle sounds pretty well.

Also, as I further went down the road, I realized that the KL25Z did not have the memory capacity to store audio data for 5 seconds. As I was using a sampling frequency of 44.1KHz, this translated to total number of samples to 44100 samples per second, which would mean it would take 2,20,500 samples to captured data for 5 seconds. The maximum samples I was able to capture on the KL25Z was just a measly 6,615 so I was not able to achieve the initially targeted 5 seconds of playback.

4. What did you learn from the project.

I have learned the working of I2C protocol and how to make the I2C peripheral on the KL25Z work at various speeds supported by the I2C standard. I have also learned the basics of audio processing and I have learnt how important it is to interface external memory to our microcontrollers for these kinds of projects.

5. What could you have done differently.

Given the chance, I would interface a SPI based SD card to increase my data storage capacity so that I would be able to achieve my initially targeted playback time of 5 seconds.

I would also like to use a better microphone sensor so that the output audio is of better quality.