MIDI Drum Kit with Adjustable Drum Sounds
ECE 153B Final Project

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Overview:
Our project will mimic a MIDI Drum Kit that will take in a drum hit by a user, and output a sound chosen by the user. The kit will consist of 4 drum pads that sit on top of piezo force sensors connected to GPIO input pins of the LPC4088. Upon reading a “drum hit”, the LPC4088 will output one of the many preset sounds stored in an SD Card on the board. The user has the ability to “set” the output sound of each individual drum pad. This is done through the combination of an LCD screen and a Rotary Encoder. The user will use the rotary encoder to first select which drum pad to program, then followed by which sound to program the drum pad with. The LCD screen will display a graphic that shows which drum pad is being selected, along with a “sound list” for the user to choose from when programming a sound.

Peripherals:

- 12 Piezo Sensors
- SD card
- 240x320 LCD screen
- Quadratic Rotary Encoder with Button
- Headphones

Software Design:

- The drum pads will be the input to the ADC. We will use 4 of the 8 ADC channels available which will be constantly polled. We will do analysis on the readings to determine if a pad was hit or not, and if possible determine the tap pressure to manipulate the audio’s volume output.
- After we determine if the pad was tapped, we will grab the user selected sound from the SD card and pipe this into the DAC where the AUX out will play the sound to headphones/speakers.
- Use a library to interact with the LCD screen. There will be two modes, one for pad select and one for sound select, which will allow the user to customize the pad environment. The user can select options by moving the rotary encoder and pressing the button. A state machine will be used to provide clear and intuitive human interaction with the system.

Goals:

1. Interfacing piezo sensors with GPIO and parsing analog input signal to distinguish what is a “hit” and what is just noise.
2. Construct a drum pad setup that will sit on top of the piezo sensors, to maximize the efficiency of reading a drum hit.
3. Read audio/sound files that are stored in on the SD card, and output that audio through the auxiliary jack to an external speaker.
4. Create interface between the LCD screen and the LPC4088
5. Create interface between the Rotary Encoder and the LPC4088
6. Properly implement device states, and keep track of peripheral states.

Group Responsibilities:

- Trenton will be working on interfacing the LCD Screen and the Rotary Encoder with the LPC4088, along with implementing the state logic for the devices.
- Tien will work with outputting audio for the LPC4088, along with reading files from an SD card.
- Chris will work on constructing the drum pads setup and sensor circuitry, along with parsing ADC values from the piezo sensors.