**ECE342 Project Proposal - Sound Recorder/Audio Effects Board**

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## *1. Overview*

This project involves a user speaking into a microphone and using the Nucleo board as a sound recorder and effects board to add a sound effect to the audio input (by pressing a button to enable the sound effect) and save it as a WAV/MP3 to replay it on the computer (or output it through peripheral speakers for embedded systems). Therefore this project mainly involves the Nucleo board interfacing with a microphone peripheral.

We plan to demo successful reading from the microphone using the Nucleo Board ADC (I2S bus), storing the audio data, manipulating the audio data to perform an effect, and save the data as a WAV/MP3.

## *2. Background/Technical/Literature Review*

- STM32 Development Boards Document (which lists Nucleo Expansion Boards for peripherals
  -https://www.st.com/resource/en/product_presentation/stm32_eval-tools_portfolio.pdf
- X-NUCLEO-AMICAM1 analog MEMS **microphone expansion board**
  **-**https://www.st.com/resource/en/user_manual/um2649-getting-started-with-the-xnucleoamicam1-analog-mems-microphone-expansion-board-based-on-mp23abs1-for-stm32-nucleo-stmicroelectronics.pdf
  - Will be connected to the NUCLEO-F401RE board using the outer Morpho Pins

-X-NUCLEO-CCA01M1 **Sound terminal expansion board**
  **-**https://www.st.com/resource/en/product_presentation/x-nucleo-cca01m1_quick_start_guide.pd
  - Will be connected to our NUCLEO-F401RE board using the outer Morpho Pins
- After speaking with Aslan Hepdogru, we learned that there is a **Pmod MIC3** microphone module available from the lab that uses SPI to read audio data from the on-board microphone. The module includes its own ADC. Therefore this module provides an easy interface to retrieve audio data
  -https://digilent.com/reference/pmod/pmodmic3/start

## *3. Milestones*

**Milestone 1:** Interface with microphone module, correctly read from ADC (most important!)
**Milestone 2:** Save the audio data as a WAV/MP3, and be able to playback the audio on the PC
**Milestone 3:** Write the audio signal effect code to manipulate the data received from the microphone
**Milestone 4 (If Possible):** Interface with speaker expansion module, be able to output audio data through speakers

## *4. Contingency Plans*

We have 2 module options for the microphone (expansion board X-NUCLEO-AMICAM1 and Pmod MIC3), therefore if our first option Pmod MIC3 doesn't work we can try using the Nucleo-specific X-NUCLEO-AMICAM1.