Objective

The objective of this project was to build a music reactive LED strip that ran on KL25Z, with the help of FreeRTOS. A neopixel strip was connected to the microcontroller, which glowed in different colors based on the amplitude of the sound sensed by the external microphone sensor.

Setup

A sound sensor that provided an analog output was connected to the FRDM board.Three threads were spawned - one for collecting audio input from the sensor, one for processing the analog data, and the third to control the LED strip based on the processed data. The thread synchronization was handled by FreeRTOS, and mutex was used to protect the data from multiple accesses by different threads. A queue was used to pass the collected audio sample from the first thread, to the thread for data processing.

The KL25Z FRDM board was configured to accept analog data based on the sampling rate determined by TPM1. TPM0 and DMA were used to generate the required PWM pulses to be able to transfer 1s and 0s as per the WS128B protocol. All timing requirements were met to send the data onto the strip. A library was developed to control handling the data sent to/received from the neopixel strip.

Hardware Used

- KY038 sound sensor - to collect audio data
- KL25Z FRDM Board - Microcontroller to run the code
- Neopixel LED strip - To output color trails

Testing

Testing: For the purpose of the project as a whole, the testing was manual / visual, based on the colors glowing on the LED strip. All ranges of colors were observed for varying degrees of amplitude.

The WS128B protocol for the neopixel strip has very strict timing requirements, so no testing was required since it was obvious that the LEDs would not glow otherwise.