

Theremin with LED visualizer

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Website: <https://ebony0wl.github.io/153B-Project.html>

Overview:

In this project we will connect 2 ultrasonic sensors to the Stm32 Nucleo board to act as audio inputs (like in a Theremin!). 1 sensor will control the pitch while the other will control the sound level. We will then take the distance calculated by the sensors and convert them into 8 musical notes. We will then use Bluetooth (USART) and termite to set the key of the notes played. As the sound plays we will also display a visual representation of the sound on a Bicolor LED Square Pixel 8x8 Matrix that will use I2C to communicate with the board.

Goal:

Our aim is to create a theremin with a visual LED component. As the sounds change the board will display different visuals to represent the auditory sound.

Purpose:

The purpose of this project is to combine two mediums of communication(sound and vision). Approximately 15% of American adults (37.5 million) aged 18 and over report some trouble hearing according to the NIH*. Approximately 12 million people 40 years and over in the United States have vision impairment*. We want to create something that more and more people can share and experience together.

Peripherals:

- 2x Ultrasonic sensor
- 1x Bluetooth Module
- 1x [Adafruit Bicolor LED Square Pixel Matrix with I2C Backpack](#)
 - <https://learn.adafruit.com/assets/36418>
 - <https://cdn-shop.adafruit.com/datasheets/ht16K33v110.pdf>
- 1x [Audio Transducer Piezo 7mA 3VDC 2800Hz to 3800Hz](#)
 - <https://www.jameco.com/Jameco/Products/ProdDS/673900.pdf>

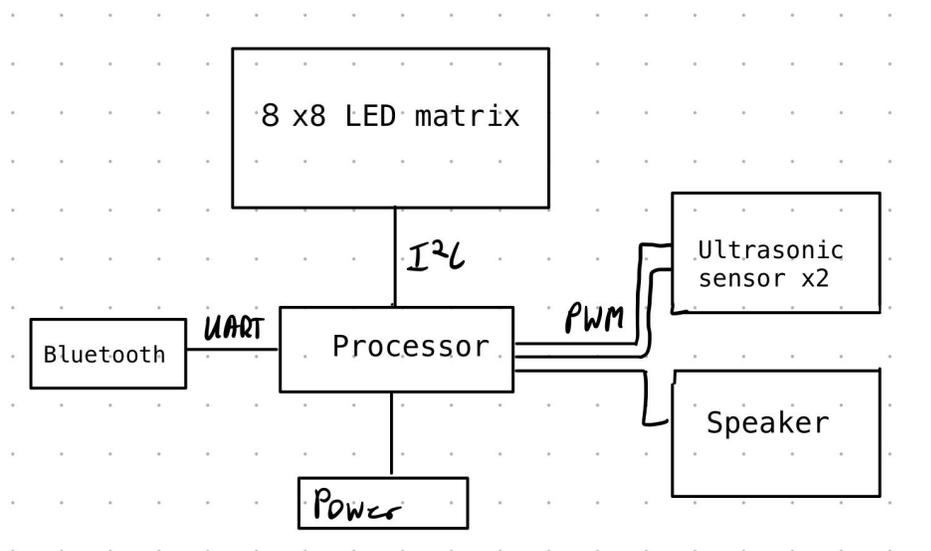
Serial Interface Protocols:

- I2C
- USART (Bluetooth)
- PWM

Software Structure:

The ultrasonic sensor will send an interrupt to the CCR register to determine the distance which will be stored in an internal register that will be polled to determine the pitch of the speaker and change the visuals on the LED screen. Termite (through bluetooth) will generate an interrupt to change the octave that the speaker plays in.

Block diagram:



Member Responsibilities:

Joshua Kim - Setting up the ultrasonic sensor, configuring timings for PWMs, project video.

Ebony Warren - Setting up the bluetooth interrupt, configuring I2C communication with LED, project website.