

Guitar Tuner

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Brief Description:

For our final project in the Signals and Systems class, our team decided to build a digital guitar tuner. For this to be accomplished, we are thinking of using an Arduino UNO microcontroller or a Raspberry Pi. We are considering using a Raspberry Pi because it provides us with Python libraries, such as numpy that makes frequency analysis easier. Writing our own code on Arduino to do fast fourier transform (FFT) would be very difficult. We want to experiment with frequency detection and given a certain audio input, determine the appropriate characteristic frequency and indicate to the user how to reach the specific, correct frequency of the note.

Minimum Viable Product:

For our minimum viable product, we want to build a functioning tuner that can tune all of the notes on the guitar accurately. We want to hook up the microcontroller with LEDs to display if the note is in tune, sharp or flat.

Analog Extension:

In the process, we want to investigate the analog version of the tuner, prototyping some basic circuitry that perform that same functionality. To accomplish this task we are thinking of using a bank of bandpass filters combined with an oscillator circuit that spans a wide range of frequencies. In addition, in order to effectively work with this audio input signal we may need to amplify it to a range that is more detectable.

Stretch Goal:

A stretch goal is to implement a system that is able to detect the chord that is being played by an instrument. We believe that this task will be pretty difficult since we have to be able to detect a combination of notes. Another stretch goal that will be interesting is implementing a mechanical system that tunes the guitar by itself. The microcontroller will send a signal to a servo that will be attached to the guitar tuning machine to tune the note.