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Project Title

Are You in Tune? A Program to Make You a Better Musician

Abstract

Objectives/Goals

When a musician is learning to play an instrument, they must learn to hit all of the notes in tune. This can be more difficult on instruments that can produce continuous variation in pitch (e.g. Violin, Trombone). This project demonstrates a software program to make and analyze a recording, showing which notes were out of tune.

Methods/Materials

The Python language was used to develop this program. In order to find out the tuning of notes, an algorithm was needed to calculate frequency. To do this, a modified zero-cross algorithm was used. The standard zero-cross technique only works on "pure" tones, not those with complex harmonic components. The custom version identifies other features of the waveform and uses those features plus the zero crosses to correctly calculate the wavelength and frequency. The program also interpolated cross points and averaged multiple waves to increase precision.

Results

The program was tested with different musical instruments and different notes. The program can correctly identify the pitch of a note, and if it is sharp, flat, or in tune.

Conclusions/Discussion

A modified zero-cross algorithm is able to determine the frequency of notes within recorded musical passages. The program is able to identify if a note is out of tune, and how much. This program could potentially help train beginning musicians to improve their intonation (ability to play notes at the correct pitch).

Summary Statement

I wrote a computer program to analyze a musical recording and display which notes were in our out of tune.

Help Received

None. I wrote my software program myself.