MAKERERE UNIVERSITY

COLLEGE OF ENGINEERING, DESIGN, ART AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

CMP4105 AUDIO AND SPEECH SIGNAL PROCESSING

MUSICAL NOTE IDENTIFIER/ CHROMATIC INSTRUMENT TUNER

CONCEPT NOTE

NAME:	RODRICK CALVIN WAMALA
COURSE:	BSC. COMPUTER ENGINEERING
REGISTRATION NUMBER:	16/U/12277/PS
STUDENT NUMBER:	216012196

In the world of music, some instrumentalists/musicians are tones or musical note deaf. This prevents them from being able to listen to the correct notes when someone sings or when they play a musical note. The reason may be caused by a note is too deep or in between two different notes for one to cognitively understand which musical key or note it is. They may also fail to tell that the instruments they are playing are out of tune or fail to tune their instruments. Currently, there are instrument tuners for string instruments that are used for tuning instruments like the ukulele.

Goals and Objectives

The main objective:

- To identify a musical note or key for a tone-deaf person from a played musical note.

Sub Objectives:

- To be able to be used a tuner for many string instruments like guitars.

Implementation

The system takes in sound from a musical instrument as an input sample. The sample is smoothed with at least 2-4 samples and a window function is applied. Using Fourier transforming represented it in the frequency domain.

The peak of the respective sample will be the frequency corresponding to the note played. The autocorrelation algorithm can be used to compare with an already existing defined note in the system storage.

The Harmonic Product Spectrum can also be used where the fundamental frequency can be determined by measuring the frequencies of its higher harmonic components and computing the greatest common divisor of these harmonic frequencies. The greatest common divisor can be determined by making an entry to a frequency histogram for each harmonic frequency and at integer divisions of the harmonic frequency. The frequency at the peak of the histogram represents the greatest common divisor, and hence the fundamental frequency.

The Zero Crossings can be also be used to count how many times the signal crosses the “0” level with the predefined number times a specific musical note signal crosses the “0” line. This technique is advisable for highly noisy signal inputs since it works in the time domain.

Tools to be used

The system can use scientific python libraries like NumPy, Pyudio and LibROSA.

Expected Results

A chromatic instrument tuner that can identify the musical note being played.