Pitch detection and correction

Abstract:

Audio Signal Processing

Digital signal processing has forayed into the world of music and sound recording and has significantly allowed the artists to fine tune their reproductions. The compelling and symbolic tools of DSP for pitch shifting and correction in real time in digital recording of music has been a boon for this industry.

Pitch is the characteristic feature of the quality of sound based on duration, loudness and timbre and this could be lowered or raised at periodic intervals with the assistance of pitch shifters. This is an important component of musical notes in vocal and instruments. Pitch correction aids in altering or changing the intonations in a musical performance with an effort to improve the quality of output and reduce the flaws. An analysis and study on the variations, either by lowering or raising the pitch of musical notes in vocal and instruments and their corrections has been undertaken in this research study. The sequence of steps in this process includes identifying the fundamental frequency of the signal with the help of algorithms such as auto correlation, average magnitude difference function Yin algorithm and Cepstrum. The use of template matching, machine learning approach have supported the capture of harmonic properties of the audio signal thereby aiding chord detection. Consequently, the study touched upon Scale detection using energy thresholding and Krumhansl Schmuckler Key finding algorithm. The enhancement of the audio output with pulsating effect such as vibrato which adds expressions to music has been undertaken here. The speed and pace of the harmonic transformation formed the next piece of study. The generation and music note display is examined with the help of Musical Instrument Digital Interface or MIDI protocol. The core of the research study which is pitch shifting with the application of algorithms such as harmonic transformation and phase vocoder is documented in the report. Other exercises in the investigation of the research included some editing options like cut, copy, replicate options and reference point and match singing or playing for accuracy in practice singing sessions.