

Electrical and Computer Engineering

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MS Thesis Announcement

Frequency-Time Domain Tracking of Musical Notes from a Human Voice

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Objective:

A frequency-time domain algorithm is developed to track the musical notes in human voice. Musical note tracking consists of determining fundamental vocal frequencies over time and post-processing these results to display a time-ordered sequence of notes and rests.

Method:

The developed frequency-time domain algorithm for note tracking begins by reading in a WAV audio file, extracting header information and the audio data. The algorithm then consists of four steps. The first step computes the 2-D frequency-time distribution of the audio data at specific frequencies that are sampled (equispaced in a specific log-frequency transformation) within the human vocal range (notes E2 to C7 where the number following the note denotes the octave). The second step improves the resolution of this result through a maximum likelihood algorithm for removing the frequency noise and blurring due to sampling within a finite time window. The third step extracts the 1-D fundamental frequency vs. time domain plot from the improved 2-D frequency vs. time plot, separating the fundamental frequency from the harmonics of each note. The fourth step of this algorithm applies a sequence of signal processing algorithms to estimate the meter of the music and segment the 1-D fundamental frequency vs. time domain plot into notes and rests. Along with the detection of these parameters, the algorithm also computes a measure of vocalist accuracy. Deviation from musical note duration and frequency is registered in percentage difference and Hertz respectively.

Results and Conclusion:

A comparative study is carried out between the developed algorithm and an existing pitch tracking algorithm 'RAPT'. The study reveals positive results and shows a relative progress in tracking pitch versus the algorithm 'RAPT'. The developed algorithm further processes the obtained pitch or fundamental frequency to display a sequence of notes and rests. The algorithm additionally provides a measure of whether each note is on or off key along with the offset by which the note differs.

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Place: N-137
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Time: 3 pm