

Student Research Abstract: Using Chord Distance Descriptors to Enhance Music Information Retrieval

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Introduction

Music Information Retrieval (MIR) is an established field that provides solutions to analyze, retrieve, classify, recommend, or visualize music. From many applications, however, only a fraction will provide results that are meaningful for musicians. We have developed a music analysis system which is based on music theory and contains visualizations meaningful for those interested in harmony aspects of music. Music is segmented to chords, and the distances between chords are evaluated and visualized.

Problem Definition

Display the music harmony progression in the way that is meaningful for musicians. Retrieve similar musical pieces based on the similarities in harmony.

Motivation

The gap between music theory and recent MIR applications has been pointed out by multiple researchers, calling for more work on how music theory can help recent retrieval tasks [2]. Even if the application provides valid results (e.g. retrieves a correct cover song), users may have difficulties understanding, why the result was made such. Our work is motivated by this fact and employs music theory in the proposed application.

Our Approach

We first employ standard music processing tasks - obtaining chroma vectors and chord segmentation. We use methods proposed by Mauch and Dixon [3]. Our approach differentiates from all known methods in the further steps: labeling (chord representation), key finding, chord distance and visualization.

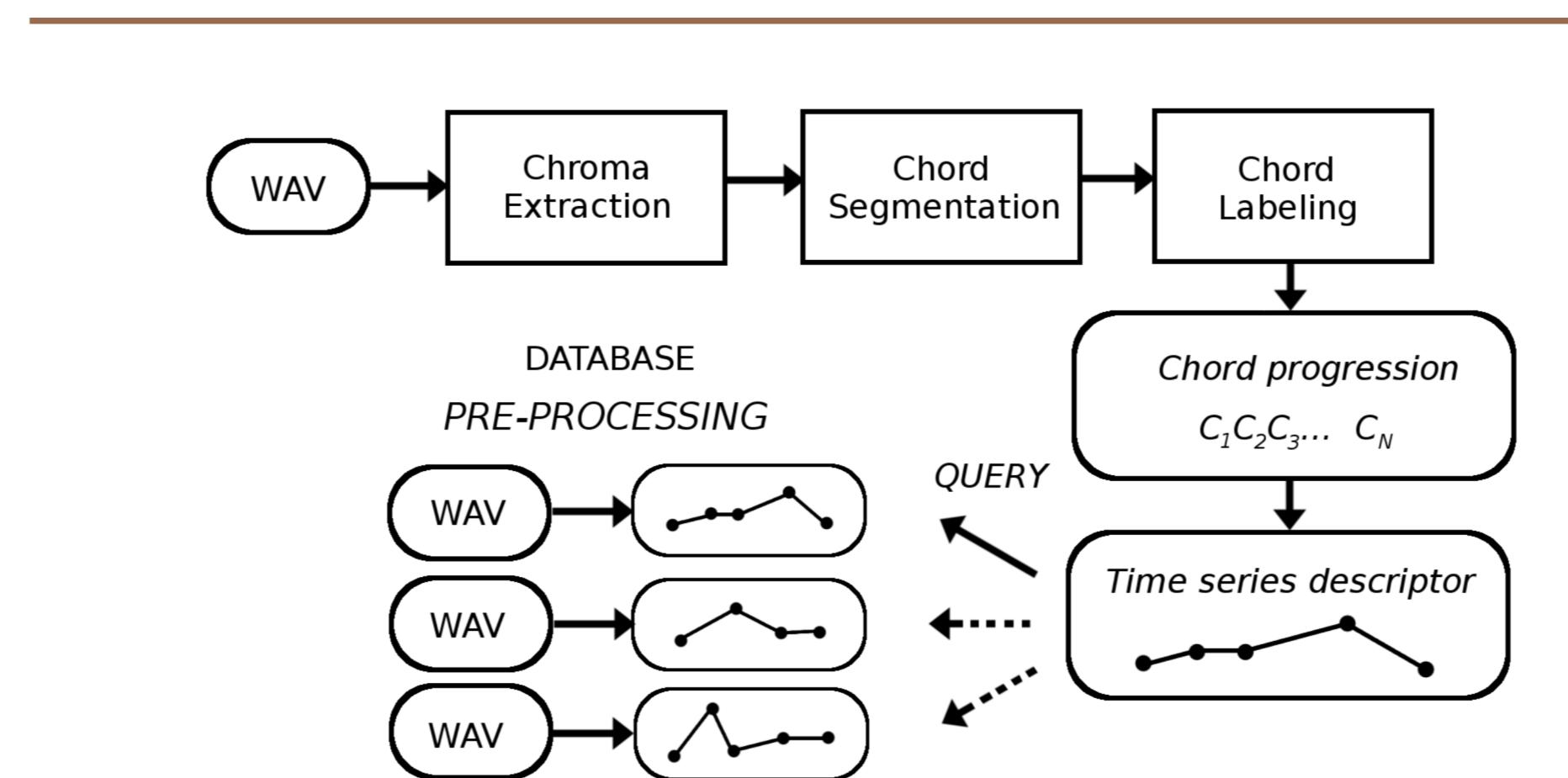


Figure 1: System outline for descriptor creation and retrieval query

After the chords are represented, we continue by evaluating transitions between every two subsequent chords and plotting them on the color temperature graph. TPS [1] can be also used, but we proceed by employing our new Chord Complexity Distance (CCD), based on a novel model, which is an alternative to TPS. Our innovation lies in taking every chord as a sentential form of a grammar-like system, and evaluating chord distance as the number of steps of derivation of one sentential form to another. This way we can work with dissonant tones.

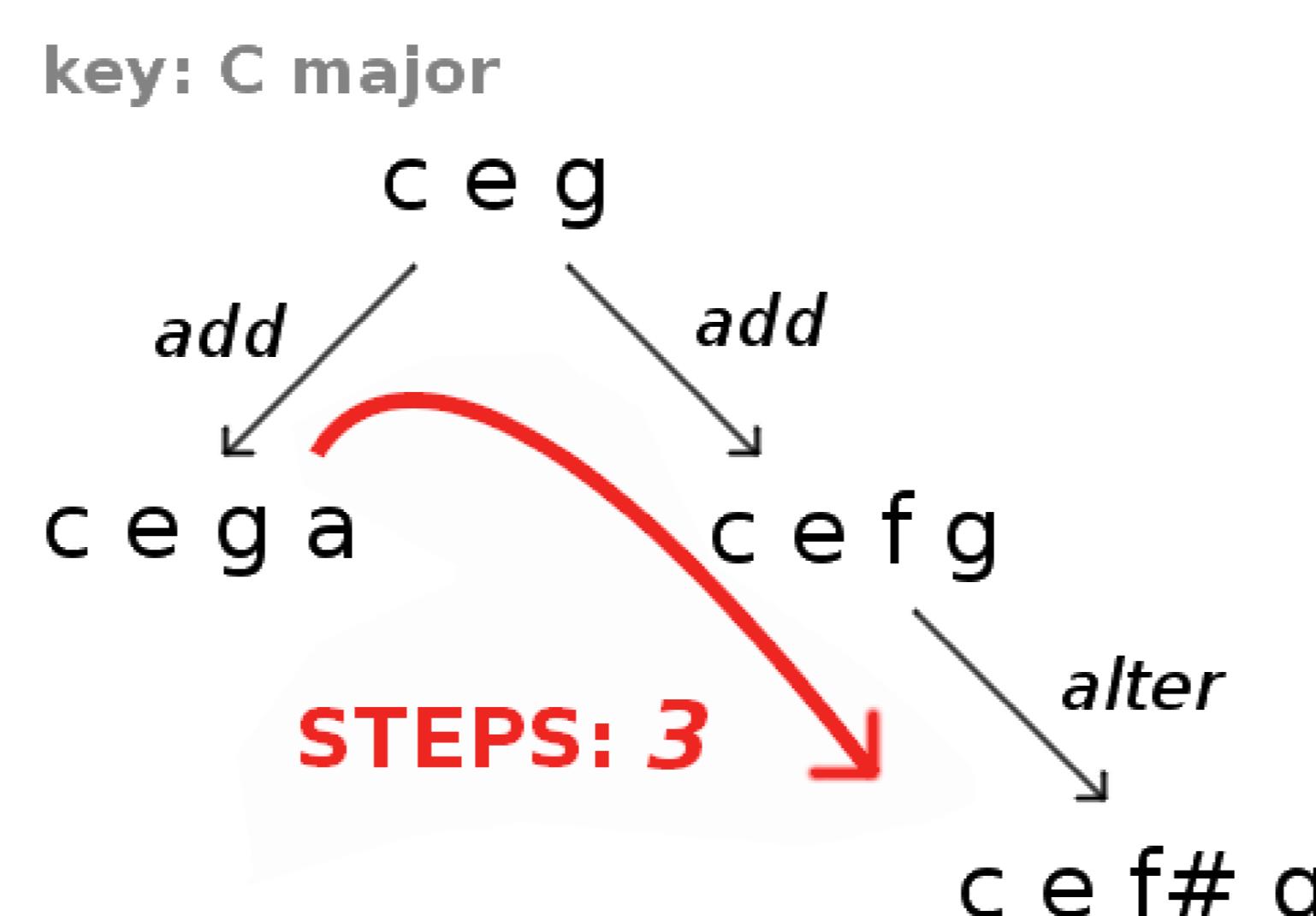


Figure 2: CCD model for distances based on adding/removing tones from the same key, and altering the tones outside the key.

Results

On a sample analysis, we can notice chord distance peaks around 0:40, 1:30 and 2:30, which correspond to the A5 chord followed by B7sus4, as well as a dissonance in the end caused by a guitar ornament. Preliminary results also show different average chord distances for different genres and promising results for music classification task.

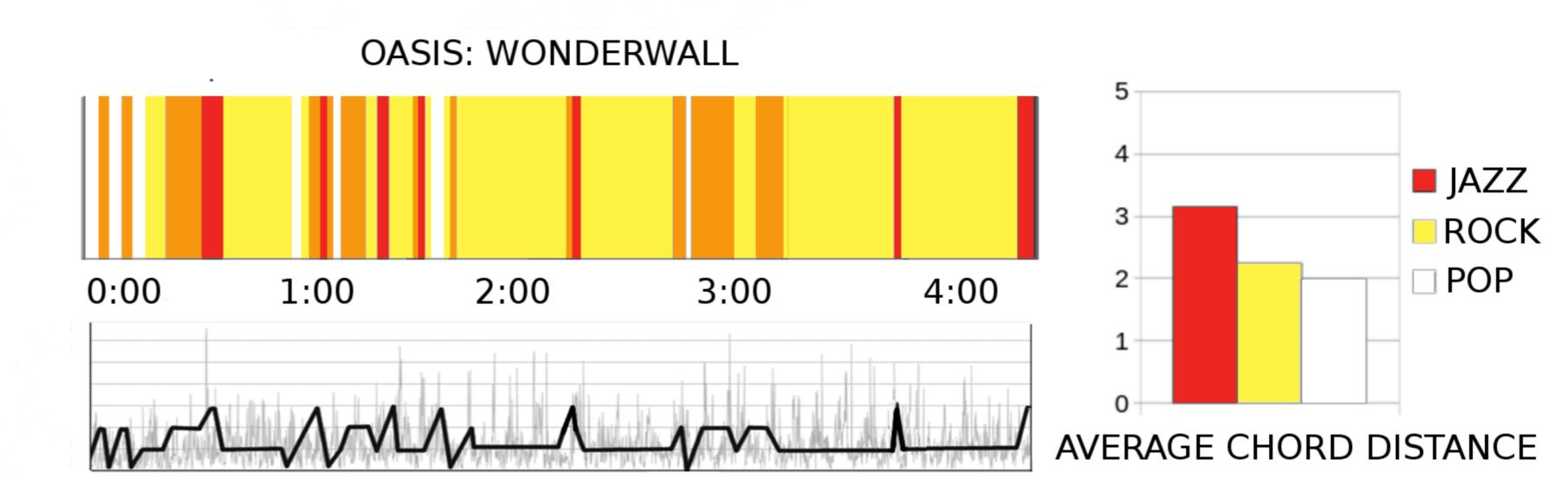


Figure 3: Visualization of the song Wonderwall by Oasis. The chord progression is shown as a color temperature graph and a line graph. The average chord complexity distances for 3 genres: Jazz, Rock and Pop is promising for genre classification.

We further continued in using our approach for Cover Song Identification Task. We tested the algorithm on covers80 dataset and achieved an **Average Rank of 21.5** (Chroma vector distances) and **26.69** (Chord distances) out of 80 songs.

Conclusions

We have developed a system capable of automatic analysis described in this poster. The application provides visualizations which are easy to understand for musicians. Such system can popularize MIR research among musicians and can be a useful plugin for today's music players. The system is distributed under GNU Public License, under harmony-analyser.org domain.

References

- [1] Lerdahl, F. Tonal Pitch Space. Oxford University Press, Oxford, 2001
- [2] Lewis, R. J., Fields, B. and Crawford, T. Addressing the Music Information Needs of Musicologists. ISMIR 2015
- [3] Mauch, M. and Dixon, S. Approximate Note Transcription for the Improved Identification of Difficult Chords. ISMIR 2010