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

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Music Information Retrieval

Music Information Retrieval

Motivation

- Workshop (ISMIR 2015), Lewis et al: Addressing the Music Information Needs of Musicologists
- The gap between music theory and recent MIR applications

Goals

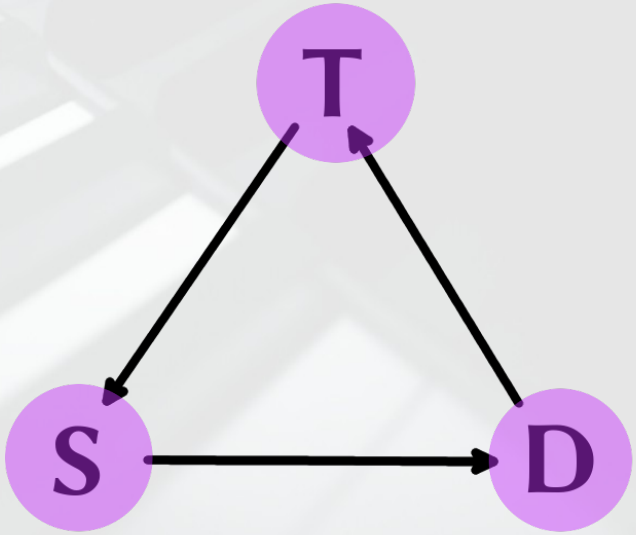
- Use and visualize information that musicologists and musicians will find useful
- Retrieve similar musical pieces in the way that will be understood by the musicians

Harmony descriptor - Chord Distances

„Most important in music is its harmony.“

Ilja Zeljenka, Slovak Composer

- Tonic
- Subdominant
- Dominant

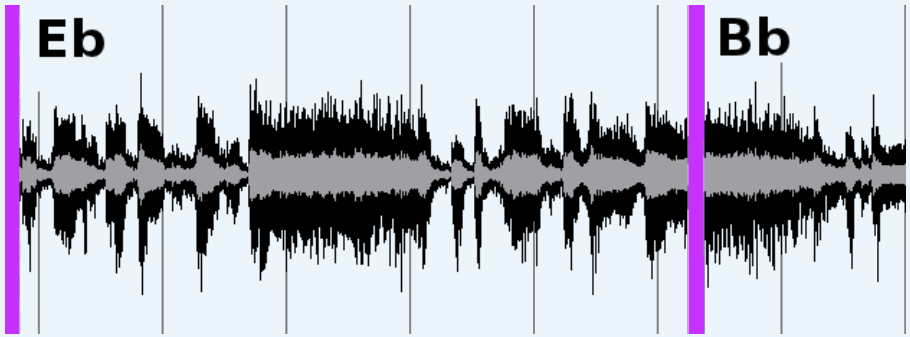


DEMO 1: Simple harmony movement

Folk song: Slovenské mamičky

Basic harmonic functions

T – D – T – D



DEMO 2: Complex harmony movement

Hiromi: 010101 (Binary System)

Modifications of basic harmonic functions

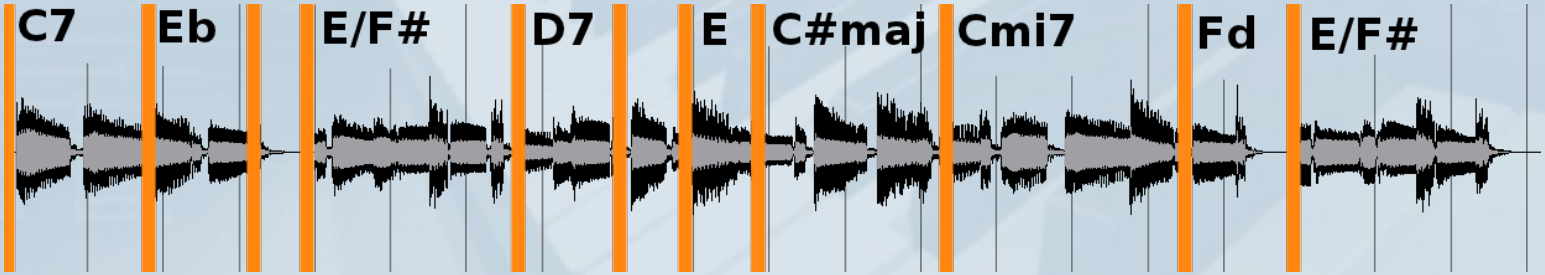
$T_7 - D_p - D_7$

$S_p - D_p - S_7$

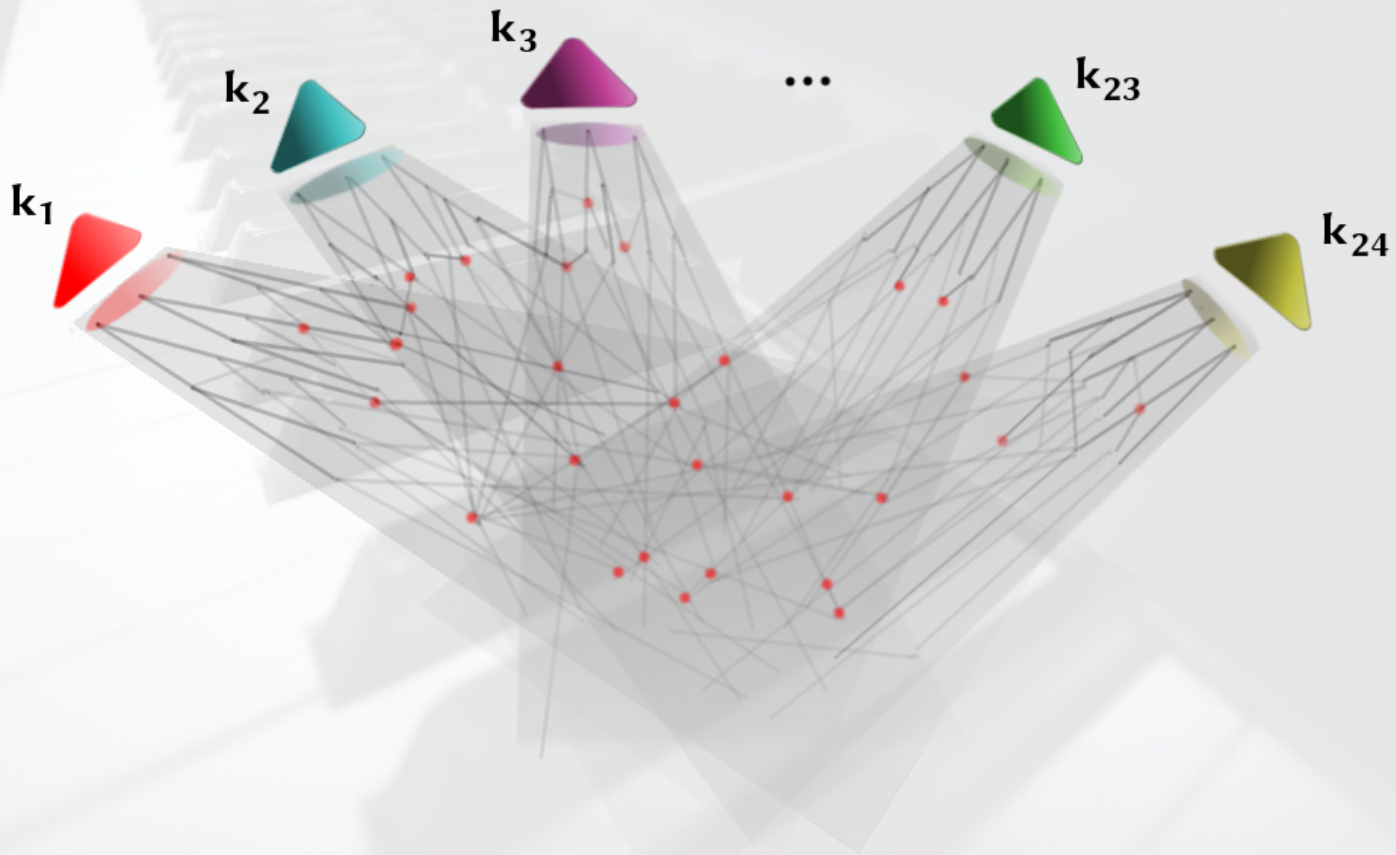
$S_p - D_{mi}$

$D_p - T_p - S_p - D_p$

$T_p - S_{dim} - D_p$



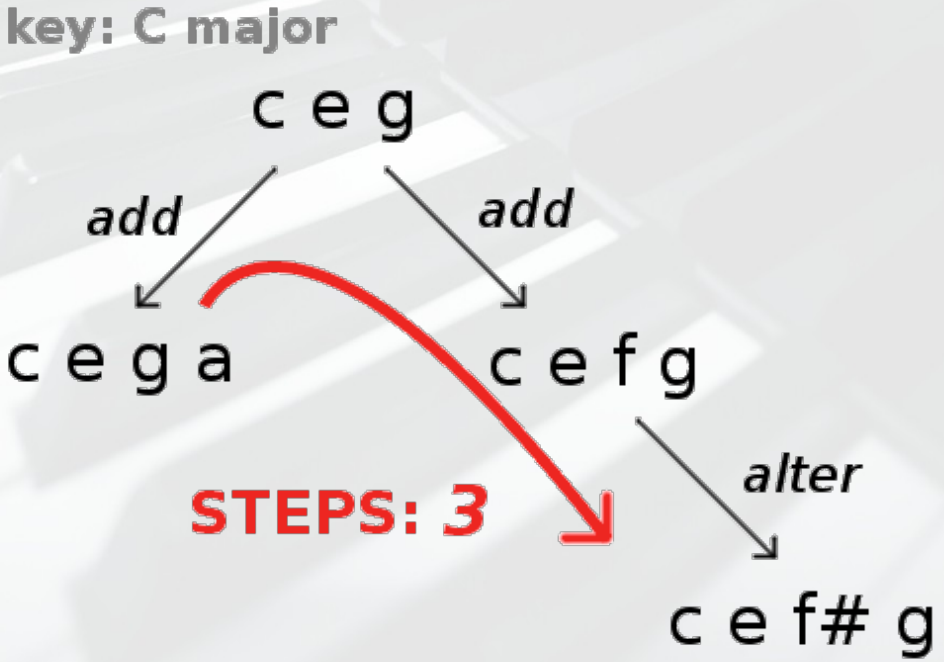
Harmony descriptor: Chord Distances



Harmony descriptor: Chord Distances

- Our novel concept: Chord Complexity Distance

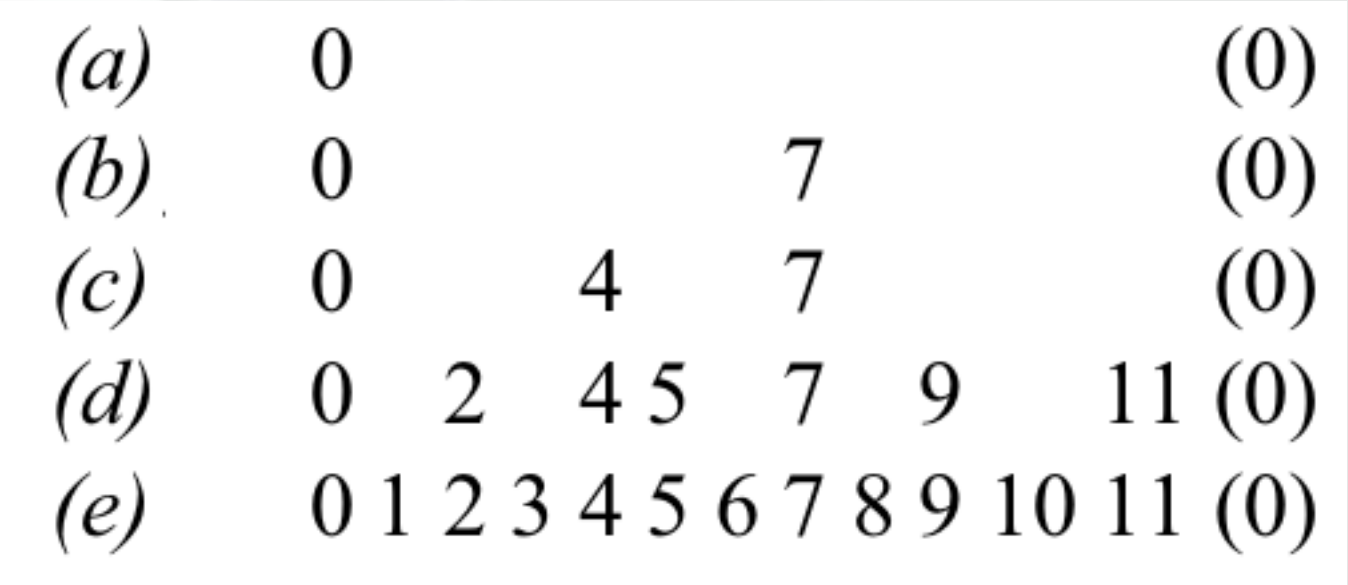
  (a variation of Edit Distance)



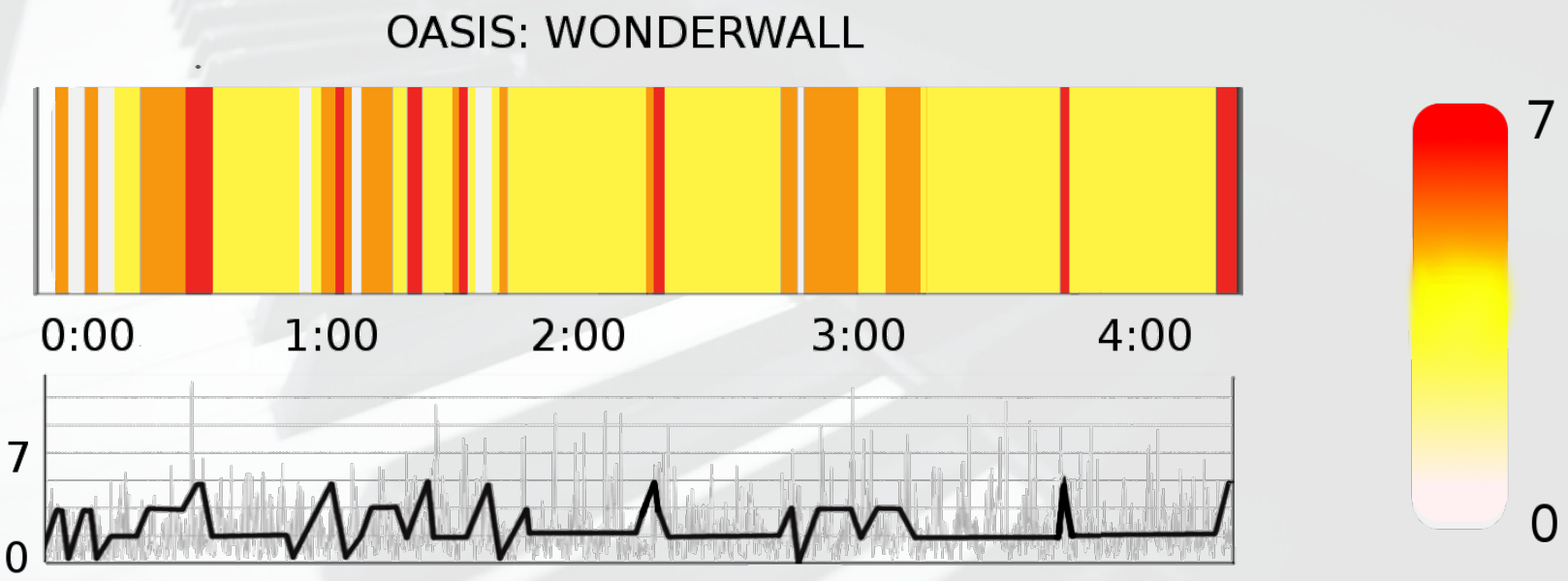
Chord Distances

- Tonal Pitch Space (Fred Lerdahl)

  TPS of C major chord in a C major key



Chord Distances in a Time Series



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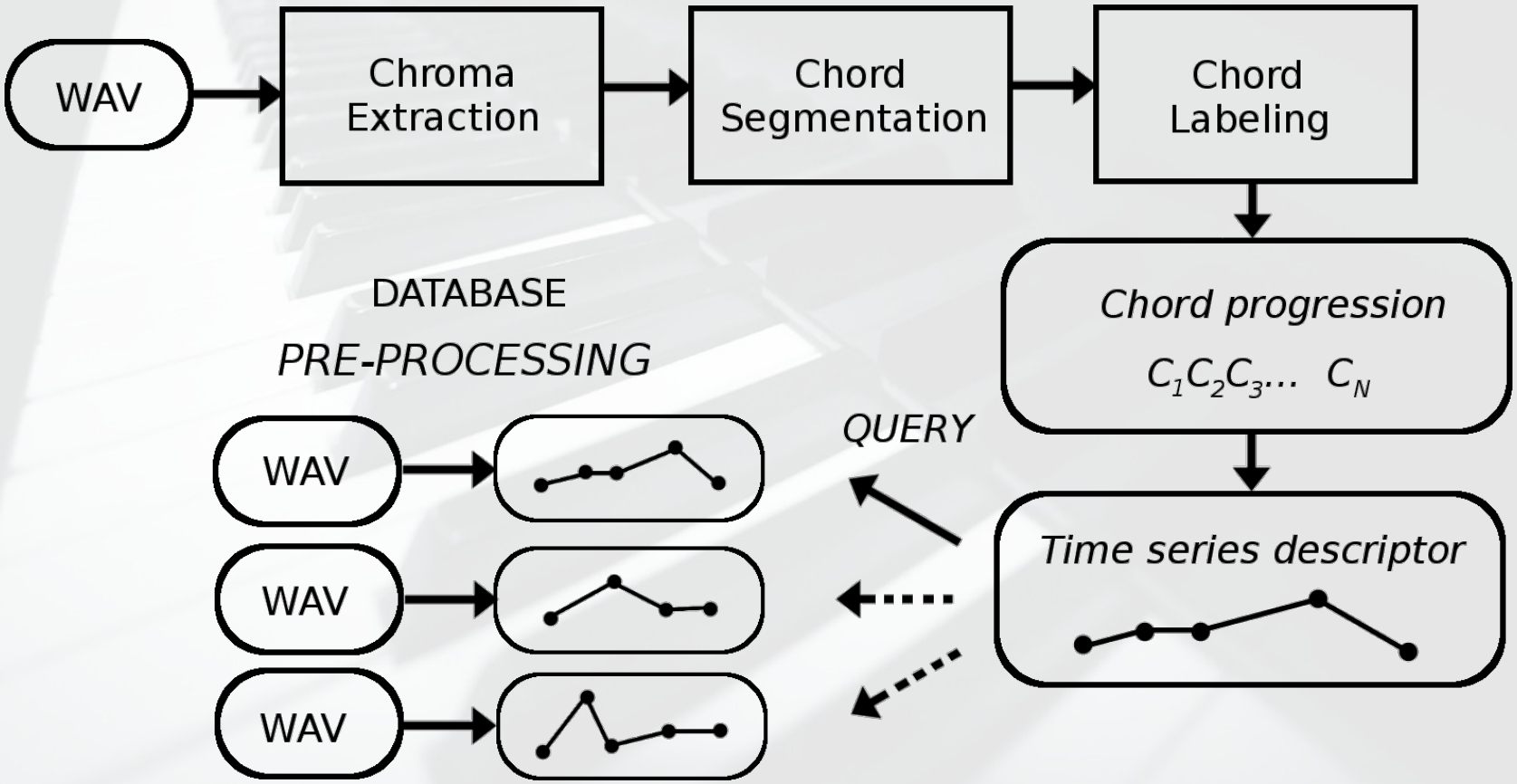

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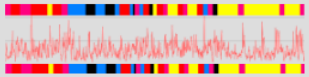


harmony-analyser is a set of visual tools for music harmony analysis of WAV/MIDI input, powered by JHarmonyAnalyser library

The difference we bring is the approach based on music theory, chord and chroma distances. JHarmonyAnalyser uses recent music theory models to extract musical meaning and distances between chords and chroma vectors. We aim to develop open-source music player, which is musician / musicologist-friendly and aid recent music information retrieval tasks.

harmony-analyser tools and JHarmonyAnalyser library are licenced under the GNU GPL License.

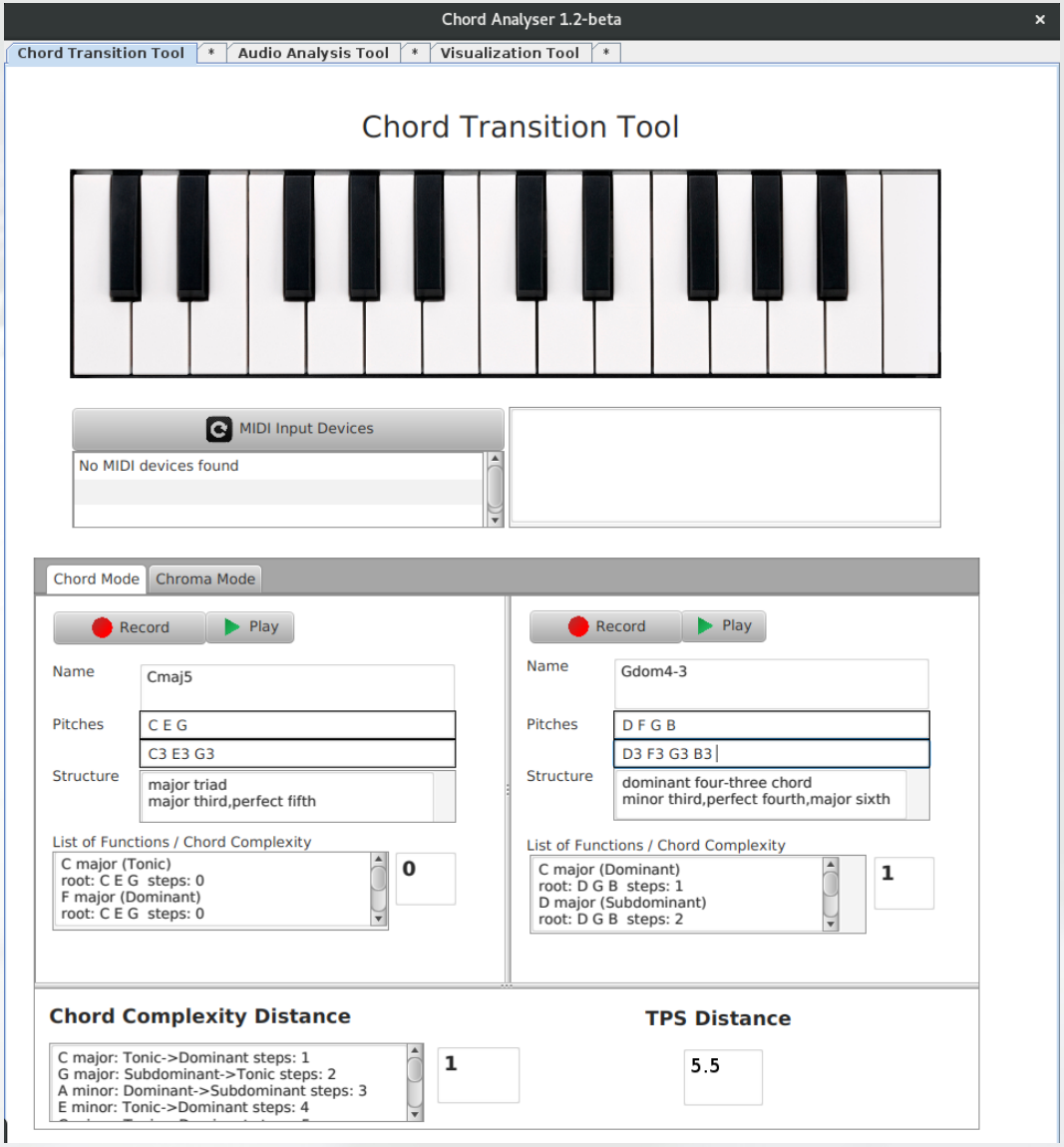
Tools are compatible with GPL Licensed Vamp plugins which can be used for additional analysis.

To contribute, please follow our guideline in GitHub repository.

Releases

Please choose from the releases below:

harmony-analyser.org



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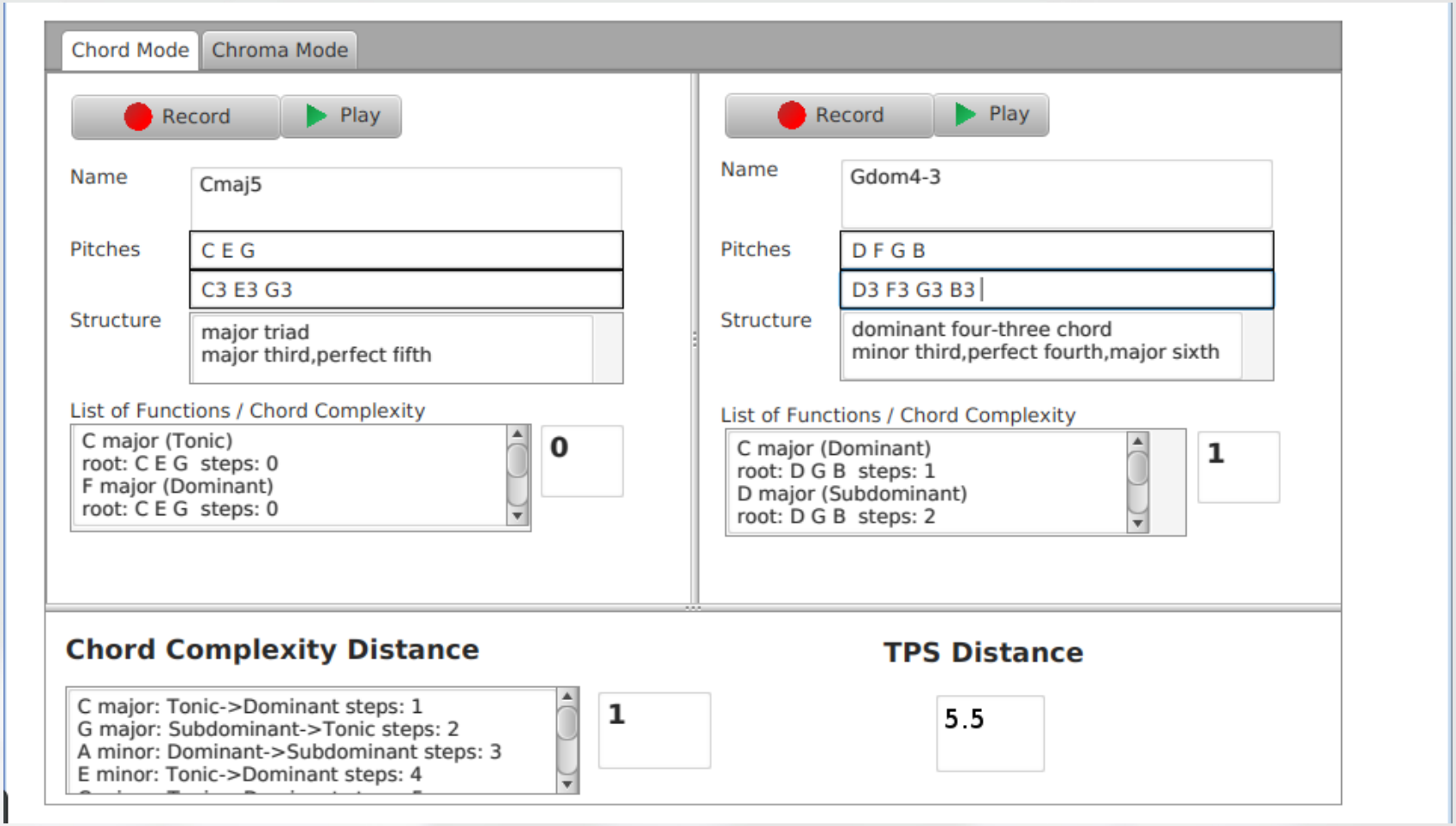

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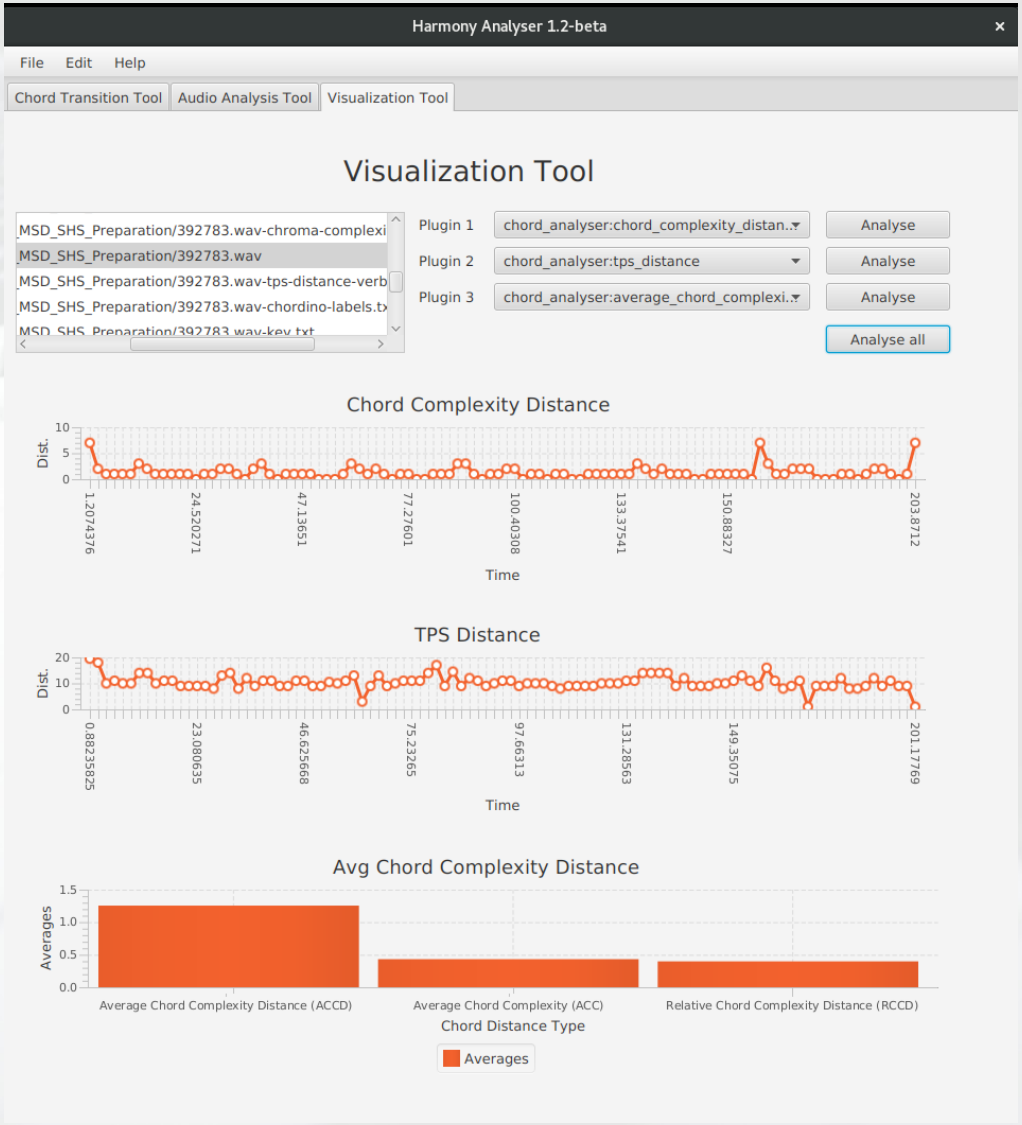
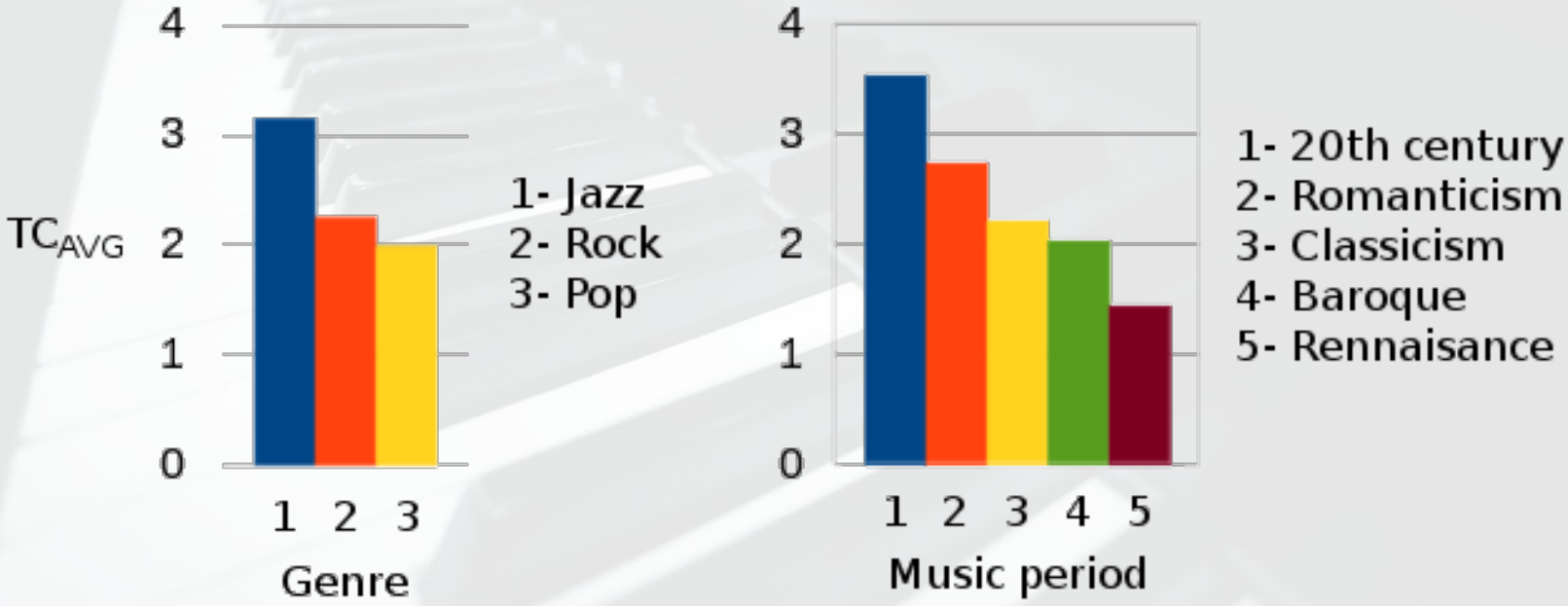


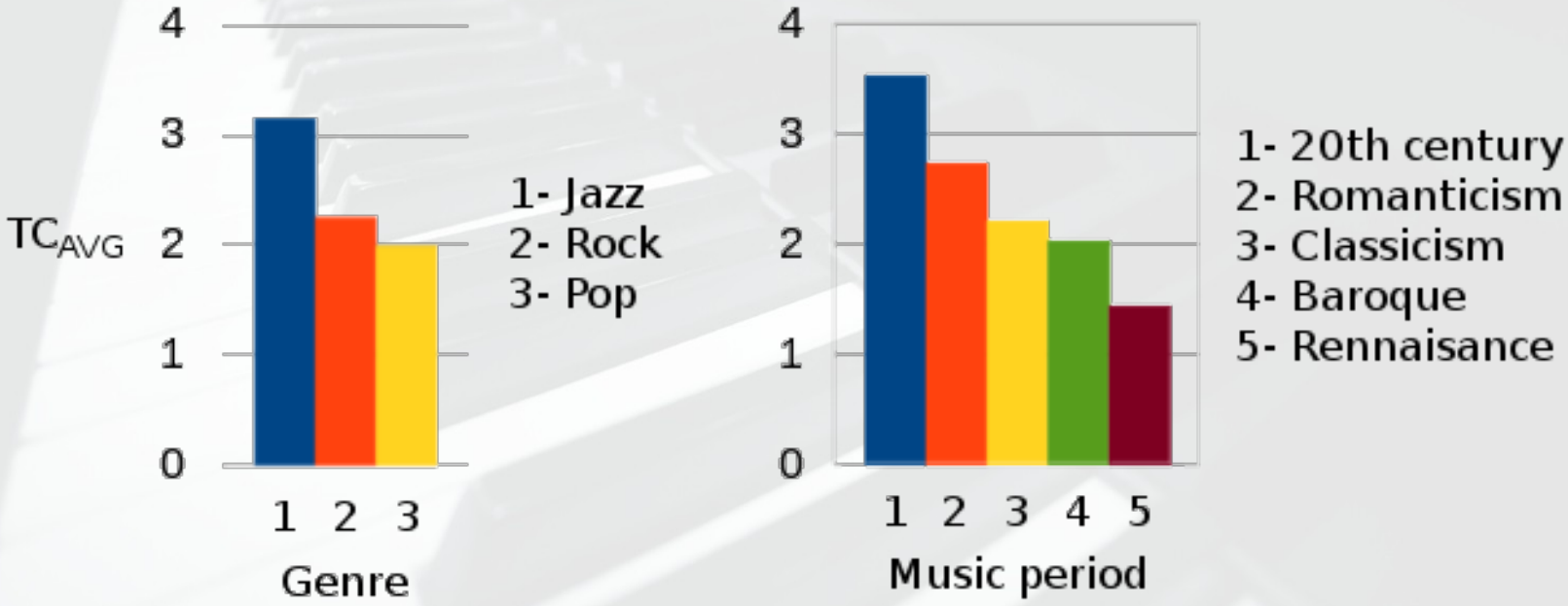
Results with our approach

- Genre detection



Results with our approach

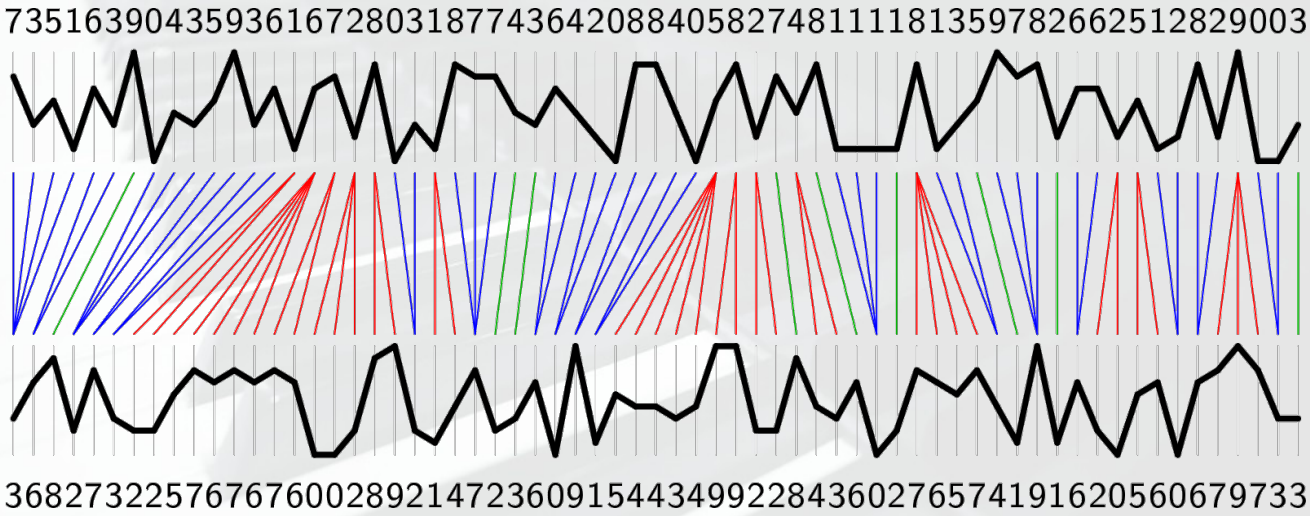
- Genre detection



- 5 % accuracy improvement on NN method when CCD was used
- Dataset of 100 songs, other features
- Improving Music Genre Detection Using Music Complexity, 2014

Results with our approach

- Cover Song Identification



Picture: courtesy of co-author Martin Rusek, IT4Innovations National Supercomputing centre, Ostrava

Evaluation of Chord and Chroma Distances and DTW method on Cover Song Identification, CISIM 2017

- Under state-of-the-art with 341 average rank out of 999 songs, state of the art: ~ 200
- (accuracy: 41.25 % vs 73.5 %)
- However, the matrix computation took: 25ms for 100 songs, vs 50s
- Proposal: Saving time for large-scale approaches

Conclusion and Future work

- Proposal to use chord distances for MIR
- New Chord Complexity Distance concept
- harmony-analyser.org = Java library and ready-made tools, Open-Source project
- Results to prove that this concept has a potential to improve recent MIR tasks
  - Genre detection
  - Cover Song Identification
- … and one step towards the applications useful for musicologists
- Future work:
  - More chord distances
  - Dynamic Time Warping + chord distances

Thank you for your attention