MODELING HARMONIC SIMILARITY FOR JAZZ USING CO-OCCURRENCE VECTORS AND THE MEMBRANE AREA

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Summary

- Our premise is that harmony is the most discriminative feature of live jazz
- We present a method for embedding lead sheet chords into a latent space, and using this to compare the chord progressions of different songs

Data

Imaginary Book	Number
Progressions	2,612
Chords	134,182
Unique Symbols	1,542
Classes	61



The data is the largest known digital corpus of symbolic jazz chord progressions
The corpus contains 2,612 songs and 134,182 chords, of which there are 1,542 unique symbols
We use principles of music theory to reduce all chord types to 61 classes
The classes are comprised of the major7, dominant7, minor7, minor7b5, and diminished7 chords for each of the twelve keys, plus the no-chord symbol

Experiment

- Uses set of 80 contrafact-original song pairs
- For each contrafact, compute the membrane area with each of the other 2,611 songs in the corpus, and rank order the results from smallest area to largest
- Identify the rank of the original song
- Figure shows the histogram of the original song ranks for the 80 contrafacts
- The median rank is 18, meaning that 50% of the original songs fall within the top 0.7% in closeness (18/2,611)
- 75% of the songs are within the top 3.8% in closeness (100/2,611)



Embedding

 Co-occurrence is computed by accumulating the number of times chord class / occurs next to chord class j in the corpus of chord progressions

Computation of Co-occurrence



Similarity Metric

- Construct a path in latent space based on the the sequence of chords in a song's progression
- For any pair of songs, the membrane area between the two chord progressions is a similarity metric
- Zero area corresponds to identical chord progressions, and a large area to dissimilar ones



Investigation of Poor Rank Results

- According to our contrafact reference, the song "I Want More" is a contrafact of "All the Things You Are"
- However, the original song ranks 758th in closeness
- Visualizing the chord progressions of the two songs side-byside shows they are harmonically very different





All the Things You Are Number of Bars: 36 Time Signature: 4/4 DB Key Signature: Ab Ref. Major Scale: Ab



I Want More Number of Bars: 40 Time Signature: 4/4 DB Key Signature: Ab Ref. Major Scale: Ab



A D G D G

Conclusions

- Method can reliably identify contrafact-original song pairs
- Embedded chord class vectors show explainable music theory properties like those seen in word embeddings for natural language processing
- Future work: Use chord embeddings in initial layer for deep neural network applied to MIR tasks such as Automatic Chord Transcription







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