Meeting Notes

THEORY407, Fall 2022

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2022-09-23

Humdrum Ch.1 It seems like a tool used for analyzing music similar to music21. With multiple funtionalities, Humdrum can be used for counting specific notes, showing certain voice in a piece, and sometime even some specfic analysis on harmonic/tonal funtions. It is more like a library of tools on my idea of searching how similar two pieces are. We can conduct research with the same approch, but with different methods. Starting with these simple metrics:

- **Note Sequence**: How many notes are the same, how many are different?
  - Might be useful for comparing two pieces in the same work, such as *Gymnopedie*. But will yield a very low score if the key changed.
- **Note Sequence with Key**: How many notes are the same, given pieces in different key but represented in a $\mathbb{Z}_7$ format.
  - Can address some very basic isssues such as exact transposition, but not effective if the phrase changes.
  - Can use the technique mentioned in the proposal to solve the above problem. But what if the phrase was changed a lot?

We then shall do the analysis with more and more complex methods such as counting leading tones, and chords using current avaliable tools. In this way I believe we can come up with various ways to compare two pieces, but not being too impractical to do. The ultimate goal is also simple: output a "similarity score" for two pieces.

Will Read:

- Temperley, *A Bayesian Approach to Key Finding*
- Lerdahl, *Tonal Pitch Space* **Chapters ***
- Tymoczko, *Geometry of Musical Chords* **Chapters ***

2022-11-04

Test on modal music The Krumhansl-Schmuckler was tested on Bartok's *14 Bagatelles Op.47 No.1*. The algorithm regonized the right hand part as in E major/C# minor, but ignored the entire left hand in C Locrian/G Lydian. This is expected, since the algorithm only outputs one key given all notes in the piece and it seems like notes in the left hand sums up to a less duration than the right hand. So the KS algorithm put more weights in right hand than the left.
Link to a playable score:`https://musescore.com/user/4887176/scores/6403822`

Potential Solution We might do twice for the treble and bass clef seperately(limited to piano), and then see if the two keys are the same. If they are, then we can say the piece is in one key.

Question How do we determine whether we should talk about keys seperately?

Set-Class Similarity and Fourier Transform by Tymoczko Fourier transform assign two-dimensional vector whose components are:

$$V_{p,n} = (\cos(2\pi pn/12), \sin(2\pi pn/12))$$

Where for integer n from 0 to 6 and p in $\{0...11\}$ is the pitches in a chord. Each fourier component is the sum of all such component:

$$n\text{th Fourier Component} = \sum_{p \in v} V_{p,n}$$

- Voice leading and set-class similarity. Steps to find the minimal Euclidean voice leading between two n-note multiset-classes A and B:
  - Choose a representative (prime form?) of A calculate the sum of its pitch classes.

- Find the n (12/n semitones for each) transpositions of B with the same sum.
- For each of the transposition, calculate the L_2 norm of A and the vector. Do the same for inversions.
- Take the minimum of these $2n^2$ numbers and output the result.

- Fourier Magnitude
  - In a set class space constructed by pitches of some perfectly even n-note chord, $n \in \{1...6\}$. Note the n-note chord means the chord even seperate the 12 tone equal temperament pitches.
  - The nth Fourier component of a chord will decrease as pitches move away from the subset of pitches in n notes chord.