The Perception of Music

By H. C. Longuet-Higgins, FRS

“The problem considered in this lecture is that of describing the conceptual structures by which we represent Western classical music, and the processes by which these structures are created.”

Introduction

“Given that a listener can distinguish time intervals differing by a few hundredths of a second, and can tell the difference between two notes separated by a keyboard semitone, how does he use this information in discerning the rhythmic and tonal structure of a piece of music?”

Definitions

- Performance
- Piece of Music
- Rhythmic Relationships
- Competent Performer
- Listener
- Conceptual Structure

Problem

- How to match
  - Composer’s Intentions
  - Performer’s Performance
  - Listener’s Conceptual Understanding

- Look at
  - Rhythm
  - Tonality
Rhythm

Worm vs. Tree

Worm's Eye View
- Look at sequence of notes from one note to the next.
  - Rhythm depends on the overall beat structure.

Binary Tree
- Look at the whole piece.
  - Identify rhythm based on relations to the beat.

Rules to Rhythm
- Keep track of the beat.
- A metrical unit at a given level of the tree may be a note or a rest.
  - Metrical unit may be divided into $n$ units ($n = 2, 3$)
- Apply a tolerance to account for...
  - Change in tempo
  - Tied notes and syncopation
  - Ornamentation (trills)

Tonality
Why Octaves?
- The octave can be tuned to the satisfaction of any other musician
  - Also possible with 5th and 3rd
- Western music is created using these three intervals
  - Octave minus fifth = Fourth
  - Fourth plus third = Sixth

Harmonic Space
- Key defined as the neighborhood in harmonic space.

<table>
<thead>
<tr>
<th>Y = 3</th>
<th>D#</th>
<th>A#</th>
<th>E#</th>
<th>B#</th>
<th>F###</th>
<th>C###</th>
<th>G###</th>
<th>D###</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>B</td>
<td>F#</td>
<td>C#</td>
<td>G#</td>
<td>D#</td>
<td>A#</td>
<td>E#</td>
<td>B#</td>
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<tr>
<td>1</td>
<td>G</td>
<td>D</td>
<td>A</td>
<td>E</td>
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<tr>
<td>0</td>
<td>Eb</td>
<td>Bb</td>
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<td>A</td>
<td>E</td>
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<tr>
<td>-1</td>
<td>Cb</td>
<td>Gb</td>
<td>Db</td>
<td>Ab</td>
<td>Eb</td>
<td>Db</td>
<td>F</td>
<td>C</td>
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<tr>
<td>-2</td>
<td>Abb</td>
<td>Ebb</td>
<td>Bbb</td>
<td>Fb</td>
<td>Cb</td>
<td>Gb</td>
<td>Db</td>
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<tr>
<td>X=</td>
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<td>-2</td>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</tbody>
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Example
- Key is first note because second note is on the right side
- D# does not belong to the original key

Tonal Space
- Tonal coordinates determine keyboard position
- Intervals in tonal music appear as vectors in tonal space
- Tonal space allows us to visualize the notion of a key using harmonic space.
Example (cont.)

<table>
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<tr>
<th>Y=3</th>
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<td>Fb</td>
<td>Cb</td>
<td>Gb</td>
<td>Db</td>
</tr>
</tbody>
</table>

- Key is first note because second note is to the right of the first note
- All notes played are within the neighborhood

“Remoteness”

- Figure 13
- Sharpness is the distance from a key in intervals of fifths
  - ...Eb-Bb-F-C-G-D-A-E-B-F#-C#...
- Remoteness is the distance in sharpness from a key
  - C-G has remoteness of 1

Rules

- For notes L, M, N
  - If LM and MN are both chromatic
    - Change name of M to M’ to make LM’ and M’N diatonic
  - Same applies to when preceded by note K
  - Rule 3? (p. 319)

Diatonic/ Chromatic

- Diatonic
  - Remoteness less than 6
- Chromatic
  - Remoteness greater than 6
- Remoteness of 6?
Tonality - Summary

- Listener interprets each note as lying within the extended key as suggested by the first two notes.
- If this results in a key where the notes are jumping from the key, select a new key that reduces remoteness.

Constraints

- Can only be applied to unaccompanied melodies
- Cannot be applied to polyphonic music
- Chromatic intervals can only be applied to notes within the same phrase

The Program

2 Parts to Program

- **Tonal Analysis**
  - Ignoring octaves, each note is assigned a place in the current key. Key changed as needed.
- **Rhythmic Analysis**
  - Construction of rhythmic hierarchy is performed. Change in tempo is considered.
- Analysis is displayed in matrix format
Results

- Example 1
  - Program able to perceive the performance

- Example 2
  - Although rhythm is correct, problems with phrasing affect note spelling

Closing

- Program treats Rhythm and Tonal Analysis as independent processes
- Unable to perceive atonal or arhythmic music

This theory is a very basic start to understanding the processes of music appreciation.

Questions?