Uses of Humdrum

Overview
Traditional categories of music analysis

- Traditional means of analysis
  - Harmony
  - Counterpoint
  - Melody
  - Rhythm

Feature sets
Traditional categories of music analysis

- Traditional means of analysis
  - Harmony
  - Counterpoint
  - Melody
  - Rhythm

Feature sets

**Humdrum** = Toolset
**kern** = encoding format
Manual processes in music analysis

Riemann analysis

Schenkarian analysis

Root analysis

Ex. 6

Agnon, Conventional Harmonic Wisdom

Blair Johnson, MTO (2012)
Perspectives on music analysis: 1-2

- **Traditional** *(theoretical, historical)* means of analysis
  - Harmony
  - Counterpoint
  - Melody
  - Rhythm

- **Statistical** *(systematic)* approaches

  Feature sets: results reported in tables, charts, graphs
  *Disembodied information about music*

- **Audio-based** analysis
More approaches to analysis

- Procedures imported from other disciplines
  - Often *procedural* or *structural*
  - Borrowed from
    - Linguistics
    - Mathematics
    - Computer science
    - Engineering
- **Cognitive** and perceptual studies
- **Performance-based** analysis
- **Data visualization**
Generation of new works

- Flip side of analysis (work of David Cope)
- Emphasis on form/genre
- Emphasis on style/authorship
- Idiomatic writing for specific instrument
Other legitimate projects

- **Data translation**, enrichment
- **Linking symbolic data** with MIDI, audio, structured data
- **Style evaluation**
  - generation as proof of general concept
  - **Attribution** studies (e.g. Josquin Research Project)
- **Deep-learning/convolutional-network** (AI) analysis
- Generative approaches to new music
Algorithmic generation: 12-bar blues

Francesco Giomi, c. 1988

Is repertory highly patterned?
Phrase families (centonization)

- Panos Mavromatis (2006)
  - N.B. Lerdahl-Jackendoff touch

Linguistic orientation

Figure 3. A Phrase family in Echos 1, illustrating formulaic variation. Brackets above the staff mark the family’s opening and closing formulas.
Hierarchical systems: Lerdahl-Jackendoff

Generative theories of musical grammar (1984)
Linear systems (species counterpoint)

Several systems

Pedagogical orientation
Imitative systems (18th-century counterpoint)

Music-theory applications

Timothy Smith, NAU
Sample Projects, Random Order
Generative chorale variations

- Dominik Hörnel (2005): Pachelbel
  - Keyboard elaboration generated from chorale melody

Chorale elaboration
Rhythm, Meter, Tempo (performance)


Comparative performance analysis

Figure 4. Expression trajectories over the last bars (mm 24–38) of the Mozart piano sonata K 279, second movement, first section, as played by Daniel Barenboim (left) and András Schiff (right). y-axis: tempo in beats per minute; y-axis: dynamics (“loudest”) in decibel. The darkest point represents the current instant (third beat of m.26), while instants further in the past appear lighter.
Computer Scientist Publishes Manifesto for Expressive Algorithmic Music

A new five-year research project aims to understand how humans compute music.


https://www.youtube.com/watch?v=EJn_88Ru7w4
Geospatial mapping of musical features

- Bret Aarden (1998), from EsAC data

Minor mode

Triple meter
Tabla drumming


Non-Western repertories
Haydn-Mozart Quartet Quiz
(machine learning/information theory)

The Haydn/Mozart String Quartet Quiz

Can you tell the difference between the musical styles of Haydn and Mozart?

This website tests how well you can distinguish between the string quartets of these two composers. You will listen to randomly selected movements composed by either Mozart or Haydn. Then, you will choose the composer you think wrote the music you have just heard.

Digital scores for the quartet quiz have been provided by the Center for Computer Assisted Research in the Humanities at Stanford University. Click the start button below to answer some questions about your musical knowledge and then start the quiz...

- View current identification statistics

Brought to you by Craig Sapp and Yi-Wen Liu, Stanford University.

Yi-Wen Liu,
C. Sapp (2002-04)
-entropy study (EE)
[qq.themefinder.org]
Themefinder (melodic search)

- Huron, Kornstädt, Sapp, et al. (1996)

themefinder.org

Similarity studies
Computer methodologies in music search

- Music geohash
- Counterpoint/surfacing crawling
- Musical structure discovery via deep-learning algorithms (2016)
- Currently runs ETLeap (data extraction, transformation, loading)
Melodic search in big data

- Sapp, Liu, Selfridge-Field (ISMIR, 2004)

- Sapp, Shanahan: Rhythmic search in 1m+ incipits [RISM musical incipit database]
Studies comparing analytical tools

- Claire Arthur
  MEI Proceedings (2015)

- Johanna Devaney, Hugh Gauvin (Springer Verlag, 2016)

- Compares, Humdrum, MEI

- Advocates extensions to Humdrum and MEI
Stanford-related studies

LSJUMB (Stanford Band) repertory study

- [https://youtu.be/16Fvy3qXeaM?t=56](https://youtu.be/16Fvy3qXeaM?t=56)
Outside users: Neuromusicology

- Carol Krumhansl: Tonal, harmonic understanding
  - Their physiological correlates
- Petr Janata: specific-key perception
  - Neural correlates
Neuromusicology: movement/gesture

- Petri Toiviainen
  - Spatial-temporal music cognition
  - Perceived similarity and spontaneous dancing

- Ari Patel
  - Avian perception of rhythm
  - Snowball, the dancing cockatoo