

Quantitative Analysis of Musical Style

CS 275B/Mus 254
Stanford University



Overview

- Purposes
 - Ordinary query
 - Stylometry (style differentiation by composer, genre)
 - Attribution studies
- Variables
 - Approach
 - Features evaluated
 - Static vs dynamic assessments

Van Kranenburg (1)

- CIM (2004)
 - MuseData corpus (Handel, Telemann, Haydn, Mozart vs Bach)
 - Operations (selected from 20):
 - Normalized time values
 - Labelled all intervals consonant or dissonant
 - Scored each bar by percentage of dissonance
 - Computed sonority entropy
 - Computed harmonic entropy
 - Computed pitch entropy
 - Computed voice density
 - Computed dissonances in suspensions and separated them

VanKranenburg (2)

- Methods of analysis
 - (k-means) Clustering (with error computation)
 - Made nearest-neighbor classifier
 - Remapped to lower dimensional space
 - Removed pieces with outliers
 - Made decision tree for each (of 7) datasets
- Findings
 - Most Bach clusters well
 - Hadyn, Mozart cluster poorly

Jürgensen and Knopke (1)

- CIM2004
- *Goal:* to attribute pieces in the Buxheim Organ Book (1450-1470)
 - 250 pieces, many with uncertain attributions
 - Almost 200 = keyboard transcriptions of vocal models (intabulations)_
 - Several genres
 - Improvisation exercises (fundamenta)
 - Sacred and secular tenor settings
 - Free keyboard improvisations
 - Texture: mainly 3 voices, with contratenor taking less active role
 - Almost all pieces have “circle” mensuration
 - Data: **kern

Jürgensen and Knopke (2)

- Features investigated
 - Basic counts (by pitch, note, range, melodic intervals)
 - Computation of “event density” (level of rhythmic activity)
 - Dissonant attacks, dissonance treatment
 - Role of contratenor in contrapuntal framework
 - Cadence types
 - Modal emphasis
- Results preliminary (Cadential Density)

Features in a user's head

- **Music Genome** patent Ser 10/678,505 (2003)
- *Claim*: method and system for **measuring the characteristics of a musical composition** and a method for digital sorting based on them
- Data: any library of digital music files (then chunked)
- Features evaluated:
 - Brightness (from spectral histogram)
 - Bandwidth (variance of spectral histogram)
 - Tempo (via beat tracker)
 - Volume
 - Low frequency (spectral)
 - Noise
 - “octave” (Cepstrum)
 - File size