COMPARING TEXTURE IN PIANO SCORES

Louis Couturier[1] Louis Bigo[2] Florence Levé[1, 3]

[1] MIS, Université de Picardie Jules Verne, Amiens, France
[2] Université de Bordeaux, SCRIME [3] CRIStAL, Université de Lille

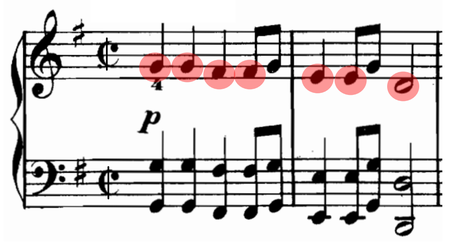
Contact: louis.couturier@u-picardie.fr

" Compositional texture refers to the organization of notes, voices and layers in a musical score " [1]

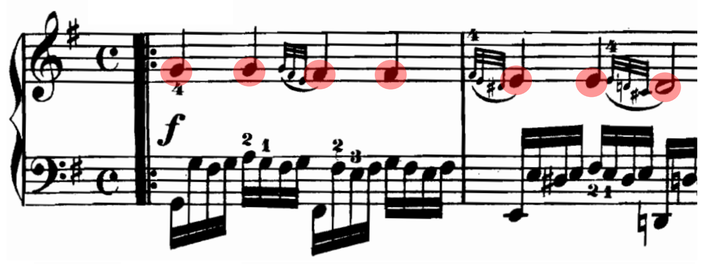
Monophonic texture
1 layer, 3 voices
Octave motions

`M3o`

a. Thema



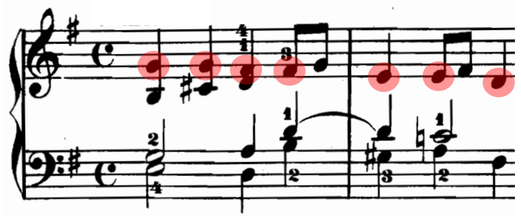
b. Variation II.



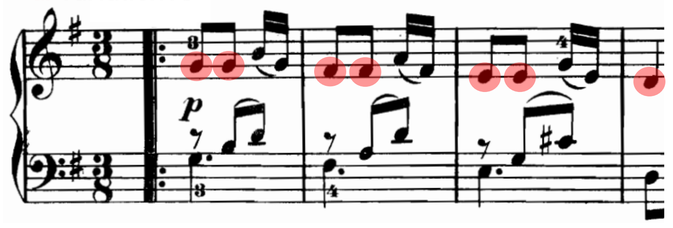
Melody and static accompaniment
2 voices, 2 layers
Upper layer with repeated notes,
Lower layer with oscillations

`2o[M1r/S1b]`

c. Variation VII.



d. Variation X.



Homophonic texture
Global homorhythmy,
a melody still stands out

`4h[M1/MH3(M1/M1/M1)]`

Melody and accompaniment
2 layers, but global vertical density of 3.
Lower layer is made of two threads,
with a sustained note

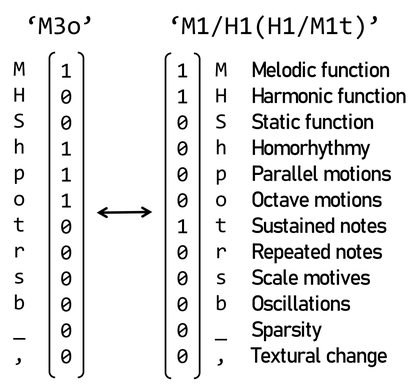
`M1/H1(H1/M1t)`

Extracts from *Ten Variations in G on 'Unsere dummer Pöbel meint'*, K455, W. A. Mozart

Four approaches for comparing texture between two musical bars

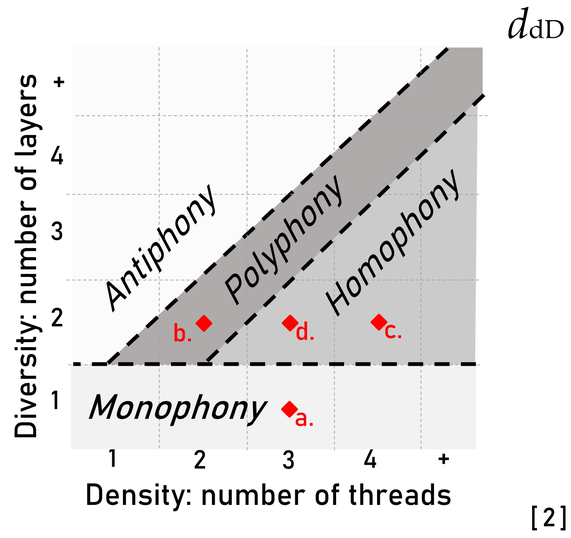
d_{texel}

Textural elements



Ref. [1, 2]

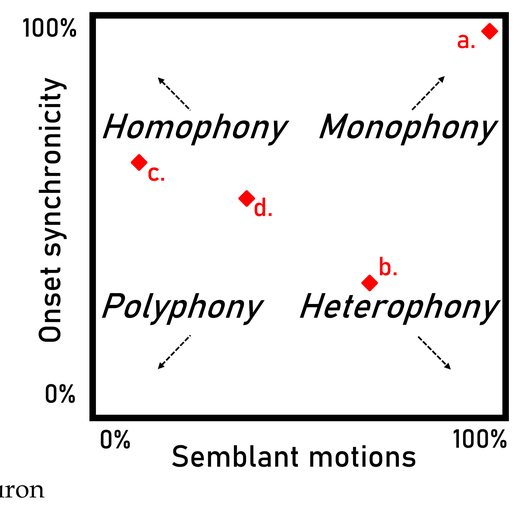
d_{ddD}



[2]

d_{huron}

[3]



[2]

Density features

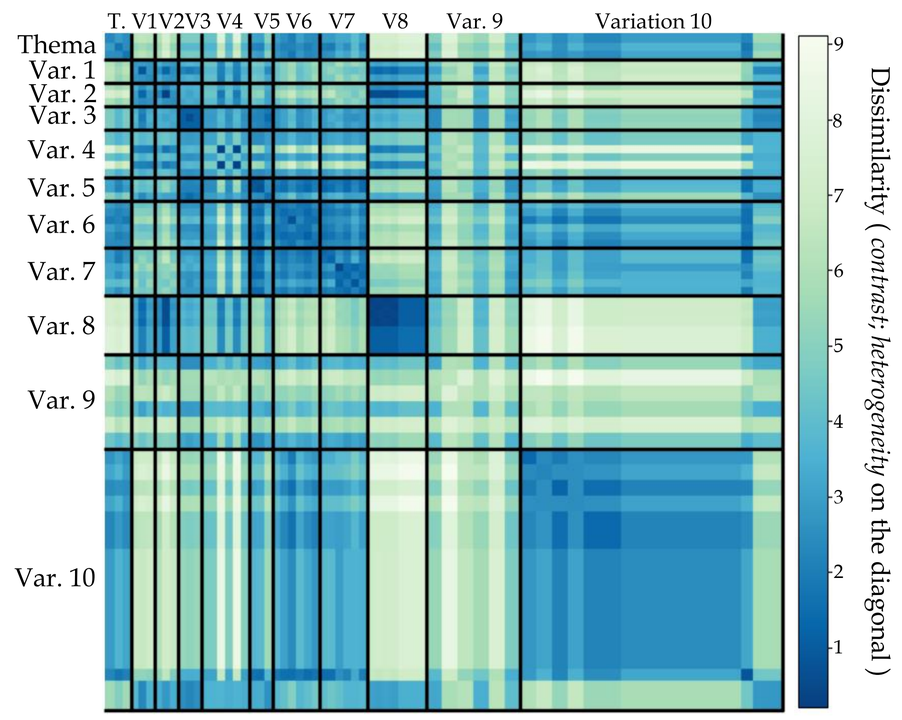
Vertical density
`Vert_avg` — Average number of simultaneous notes
`Vert_std` — Dispersion of the number of sim. notes
d_v

Horizontal density
`Horiz_avg` — Average number of onsets per beat
`Horiz_std` — Dispersion of the n. of onsets per beat
d_h

Or **both** d_{hv}

Dimensions of texture	d_{texel}	d_{ddD}	d_{huron}	d_v	d_h	d_{hv}
Horizontal density (time dimension)	X				X	X
Vertical density (thickness)	X	X		X		X
Semblant motions, Parallelism	X		X			
Roles of layers (melody, acc. ...)	X					
Main types of texture (mono/polyphony...)		X	X			
Computed on annotated labels	X	X				
Computed on symbolic scores			X	X	X	X

Applications for structure analysis



Textural dissimilarities between phrases
in *Ten Variations in G on 'Unsere dummer Pöbel meint'* by W. A. Mozart (K. 455).
Phrases are scaled according to their size in number of bars (338 in the whole piece).

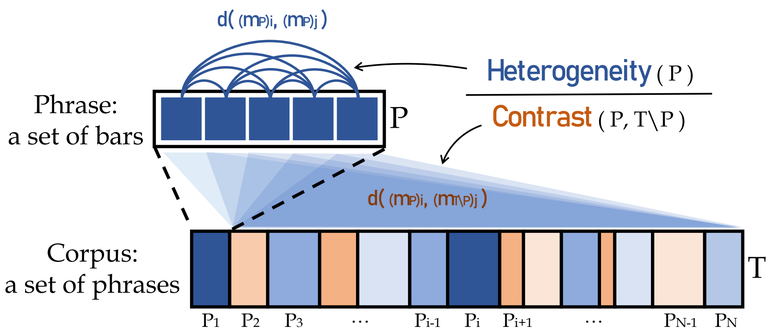
Evaluation using Thema and Variations

Using the TAVERN dataset [4] : 27 pieces (Mozart, Beethoven), 1060 phrases

Hypotheses

*Texture is more **similar** within a variation (/ a phrase)*

*Texture is more **contrasted** between two distinct variations*



Goal: minimizing *average relative heterogeneity*

$$\mathrm{aRH}_T(d) = \underset{\forall P_i \in T}{avg}\left(\frac{h_d(P_i)}{c_d(P_i, T \setminus P_i)}\right)$$

Evaluated distance — *i-th phrase in corpus T* — *Heterogeneity of the i-th phrase* — *Contrast between the i-th phrase and the rest of the corpus*

Results

d	$\mathrm{aRH}_T(d)$
d_{hv}	0.51
d_h	0.39
d_v	0.64
d_{huron}	0.72
d_{pc}	0.80

Harmonic distance for comparison:
Pitch-class distance,
between chroma vectors

Comparison within sections
Using defined distance between individual bars
Using **heterogeneity** as a measure of dispersion
cf diagonal on the figure

Comparison between sections *see figure above*
Using **constrast** as a dissimilarity measure

Comparison between whole musical pieces
Between composers, styles

Code in *Python* available at
`www.algomus.fr/code`

References
[1] L. Couturier, L. Bigo, and F. Levé, "*Annotating Symbolic Texture in Piano Music: a Formal Syntax*", SMC 2022.
[2] L. Couturier, L. Bigo, and F. Levé, "*A Dataset of Symbolic Texture annotations in Mozart Piano Sonatas*", ISMIR 2022.
[3] D. Huron, "*Characterizing Musical Texture*", ICMC 1989.
[4] J. Devaney, C. Arthur, N. Condit-Schultz, and K. Nisula, "*Theme And Variation Encodings with Roman Numerals (TAVERN): a New Data Set for Symbolic Music Analysis*", ISMIR 2015.