Do visual features matter?

Studies in phylogenetic analysis of mensural music

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Abstract

The model of semantic domains in music notation is not only well known in the field of music encoding but is used as a common ground in reasoning about the representation of notated music. By modelling these domains in separate attribute classes, MEI provides a powerful feature offering the possibility to depict complexities of different kinds of music notation, e.g. mensural notation. Especially the lack of stable relationship between symbols and their interpretation is easily observed when encoding mensural music, but stemmatic analysis is typically led by the concept of significance commonly embodied in focussing on substantial variants, variants in pitch and duration. However, in the case of mensural music sources, with their richness of visual variance, where the particular context affects the process of reading and deciphering as well as developments in the notational system and varying concepts in mensural theory, that distinction reaches its limits:

> ”The extent to which these can be considered ‘non-substantive’ is questionable: the positioning of line breaks, for instance, will have an effect on an editor’s interpretation of the duration of manuscript accidentals, or stem direction may actually have an effect on rhythm in certain notational styles (as in some brands of 14th-century notation).”[1]

This paper reports on the task of developing concepts for a computational analysis of the transmission of mensural music based on concepts of phylogenetic analysis. Starting with encodings of the sources of Josquin’s *Missa D’ung aultre amer* and *Tu solus qui facis mirabilia*, it raises the question, how picking properties of mensural notation affects the resulting tree.

[1] Dv09, p. 143.

Other endeavours in utilising global sequence alignment for notated music[2] focus on either retrieval scenarios or minimizing differences of notation, mode and/or tempo. Analysing patterns of transmission comes with a different scope. Instead of querying the most similar in a heterogeneous group, the main task is to cluster a group of rather similar objects according to their differences. Therefore, it is necessary to find substitution models which are optimized for distinguishing those fine levels of differences.

The main challenge in developing such models is the lack of reference. Since two stemmata of the same piece from different authors could disagree blatantly, they cannot serve as a sufficient benchmark.[3] Statistical theories on substitution models cannot be used either, since they are based on similarity scores.[4] But at the current state, it is impossible to satisfy their preconditions, for example deciding which level of similarity is of neutral similarity: different enough to not be similar but similar enough to not be different.

Addressing these challenges, a data-based process was developed for evaluating substitution models. Based on the method of surrogate data analysis[5], an approach was chosen, that scales the strength of separating levels of similarity/distance. After the creation of sequences based on MEI encodings, sets of parameters were defined, capturing uninterpreted classifications of notation or resolved mensura with relative durations, these sequences are shuffled to provide independent and identically distributed random sequences as a benchmark. By quantifying the deviance of the relative distance between two original sequences and between their shuffled surrogates, it is possible to estimate the similarity of the original sequences. This approach serves as the basis for an analysis of variance to detect a trend in comparing sequences, grouped by an estimated level of similarity. Observing the behaviour of a set of attributes with that test setup can lead to an informed choice of analytical parameters.

Beyond that, it can serve as a basis for further research: By comparing the resulting tree diagrams of the same piece, it is possible to detect the influence of parameters on the resulting tree and gain further insights into the transmission of mensural music.[6] And furthermore, developing more sophisticated models for the alignment of notated music won't just serve the analysis of large amounts of data, but can lead to deeper insights into micro processes of music notation as well.

[2] See van10; MS90; vGW17.
[3] Compare e.g. Jos97, p. 34; Jos03, p. 43.
[4] See Alt91.
[5] See The+92.
[6] See Pla19.

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