

# Characterizing Texture for Symbolic Piano Music

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**Abstract**— Musical texture describes how sounding components are organized, individually or with each other. In this work, we propose a new syntax to characterize symbolic texture in classical piano music and thus allow its automated analysis. We annotated the score of 9 movements of W.A. Mozart’s sonatas (totalling 1164 bars), on which tested binary classification models show promising results for automatic texture retrieval.

**Index Terms**— Texture, symbolic music, piano, modeling, machine learning

## I. MUSICAL SYMBOLIC TEXTURE

Symbolic texture is a high-level feature of music which strongly relates to musical style and form. Huron [1] links the term *texture* with the density, the diversity or the overall quality of sound. In this work, we set aside the physical timbre to focus on what Hérold [2] calls the “textural factors of timbre”<sup>1</sup>. Ultimately, a textural configuration can be defined by grouping *threads* (voices or instrumental parts) into several *layers* (textural units) [3]. In 2014, Giraud et al. [4] proposed a first syntax of texture annotation for classical string quartets. We aim at broadening this definition and apply it to piano music. Improving the global understanding of musical texture can also open new perspectives in style analysis or texture control in music generation.

## II. MODELING PIANISTIC TEXTURE

The number of threads and their mutual relationships can vary during a piece of music. Piano scores do not explicitly separate musical threads, in contrast to ensemble music. This challenge needs to be addressed by proposing a more general model of texture.

Hence, we model the separation of vertical layers, their thickness (number of threads in each) and functions (melodic, harmonic and/or static support). Other attributes were added to characterize the content of certain layers (sustained or repeated notes, arpeggios etc.) or link them together (like homorhythmy or parallel motions). This model was defined syntactically and semantically, and resulted in an object-oriented implementation in *Python*.

<sup>1</sup>In the original paper: “les facteurs texturaux du timbre”.

## III. ANNOTATED DATASET

In order to evaluate this syntax through supervised machine learning tasks, we built a minimal dataset from the 9 movements of Mozart’s piano sonatas 1, 2 and 5 (K. 279/189<sup>d</sup>, 280/189<sup>e</sup>, 283/189<sup>h</sup>), for a total of 1164 annotated measures. Selected movements all share sonata form but feature various time signatures and tonalities. Scores are taken from the *Mozart Annotated Sonatas* [5], based on the *Neue Mozart-Ausgabe*. Furthermore, 62 high-level descriptors of symbolic music were implemented and computed on each measure of the corpus, adding expert knowledge in the process. For each bar, we retrieve 15 *textural elements* from the annotation. They indicate the presence of certain functions or attributes in the textural layers (melodic layer, homorhythmy, arpeggios...).

## IV. PREDICTING TEXTURAL ELEMENTS

A Logistic Regression model is trained to predict the presence of each of the 15 *textural elements* in a bar given its associated 62 computed high-level features. The model is cross-validated with a *leave-one-piece-out* strategy: the prediction on the bars in one movement is performed by a model trained on the other 8 movements in the dataset. Other models including Support-Vector Machine and Decision Trees showed no significant improvements. Although the identification of melodic layers or homorhythmy showed reasonable results – with F1-scores of respectively 96% and 85% –, scale motives or non-melodic functions remain challenging elements to predict.

## V. REFERENCES

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