SCORE-INFORMED AUDIO PARAMETRIZATION

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Extended Abstract

In this contribution, we present automated methods for parameterizing audio recordings of piano music. In our scenario, we assume that we are given a MIDI file (representing the score) and an audio recording (representing an interpretation) of a piece of music. Then our idea is to successively adapt and enrich the information provided by the MIDI file to explain the given audio recording. More precisely, our goal is to parameterize the spectrogram of the audio recording by exploiting the score information (given as MIDI), see Fig. 1(a). This approach is inspired by [3], where score information is used to support the task of source separation.

Our parameterization approach works iteratively proceeding in several steps. In the first step, we make use of parameters specified by the MIDI file (or score) to generate a piano-roll-like spectrogram, see Fig. 1(c). In the next step, we compute a temporal alignment between the MIDI file and the audio recording. This alignment is used to warp the MIDI spectrogram to temporally correspond to the audio spectrogram, see Fig. 1(d). Since the alignment accuracy is of major importance, we employ a refined synchronization method that exploits onset information and generally provides highly accurate alignments, in particular for piano music [1].

In the third step, we estimate parameters related to the tuning of the underlying piano. Here, we consider one parameter describing the overall tuning as well as a set of parameters describing pitch-dependent tuning nuances. Furthermore, we also estimate the pitch-dependent inharmonicity which is related to the stiffness of a piano string. Based on these parameters, we further refine the warped MIDI spectrogram, Fig. 1(e). In the fourth step, we estimate the amplitude progression of each note and adjust the spectrogram accordingly, see Fig. 1(f). In the last step, we try to capture specific spectral properties that correlate to the energy distribution over the partials and the frequency properties of the piano resonance body. Here, we employ a signal model similar to the one proposed in [2]. The final modified spectrogram is shown in Fig. 1(g). The procedure continues by refining these parameters in subsequent iterations of the steps described above.

First experiments show that our approach gives reasonable results even for complex piano music. To further analyze, which kind of information is captured by our parameterization, we sonified the refined MIDI spectrogram by applying an inverse Fourier transform using the phase information from the audio spectrogram. Several of these sonifications will be part of our demo. Note that percussive elements or transients, which are not yet considered in our parameterization model, are missing in the estimated MIDI spectrogram. In future work, we plan to refine our model and to conduct extensive experiments to prove the applicability of our parameterization approach.

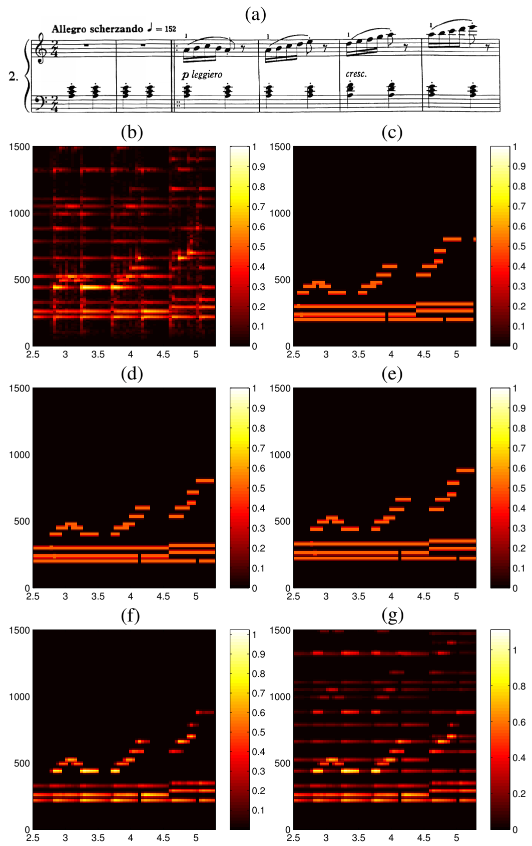

Figure 1: Illustration of the first iteration of our parameter estimation procedure using three measures of Burgmüller, Op. 100, Etude No. 2 as an example. **(a):** Score of the first six measures of the piece. **(b):** Audio spectrogram corresponding to measures three to five. **(c):** MIDI spectrogram. **(d)-(f):** Modified MIDI spectrograms corresponding to the steps of our parametrization approach.

1. REFERENCES

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