

Music Wizard

from melody to music sheet

Graduate



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Problem: In today's world, music is omnipresent. Music is playing constantly in stores, in most cars and many homes. There is so much to choose from, and thanks to services like Spotify and YouTube, all of it is always available. Even identifying a song is easy with an app like Shazam. But if you want to play a melody you heard before on your home piano, the search for the corresponding music sheet begins. Many songs have already been replayed by someone, but whether and how well the notes have been put down on paper varies greatly. In addition, the search often remains unsuccessful when it comes to less known pieces. This work addresses the problem of reconstructing notes from an audio signal by Automatic Music Transcription (AMT) based on time-frequency analysis.

Approach: A melody can be read in as a time signal in the form of an mp3 or wav file (Fig. 1). Using the short-time Fourier transform, this signal is then transformed into frequency space and displayed as spectrogram, showing the temporal sequence of the contained frequencies in discretized form. The fundamentals of the melody are determined using filters in frequency space. Noise and spurious signals are then cleaned using morphological methods (Fig. 2). The notes of the melody are reconstructed based on the frequency and duration of the remaining signals and transferred to a music sheet (Fig. 3).

Result: This approach was implemented in Python using the librosa library and allowed the recovery of the musical scores of solo instrument pieces. The quality of the computed score is strongly influenced by the type of musical instrument, specifically by its overtone spectrum which is responsible for the timbre and its tone transitions. Although the algorithm is not equally suitable for all

instruments, it provides a solid basis for the reproduction of a melody.

Figure 1: Time signal of the melody
Own presentation

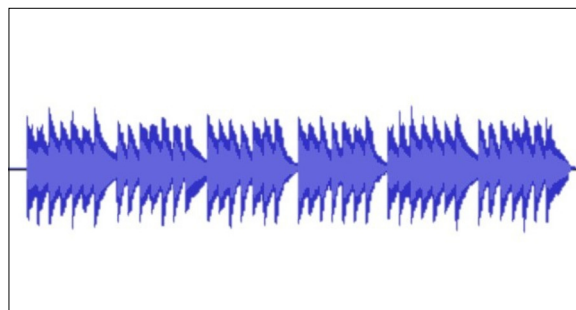


Figure 2: Notes automatically generated from the time signal
Own presentation

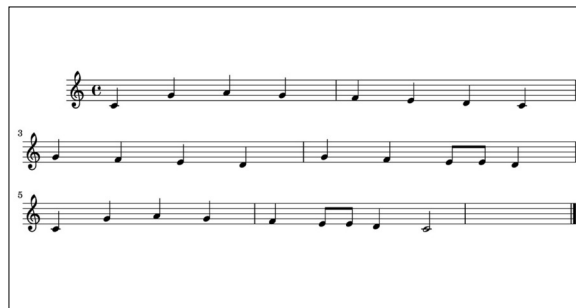
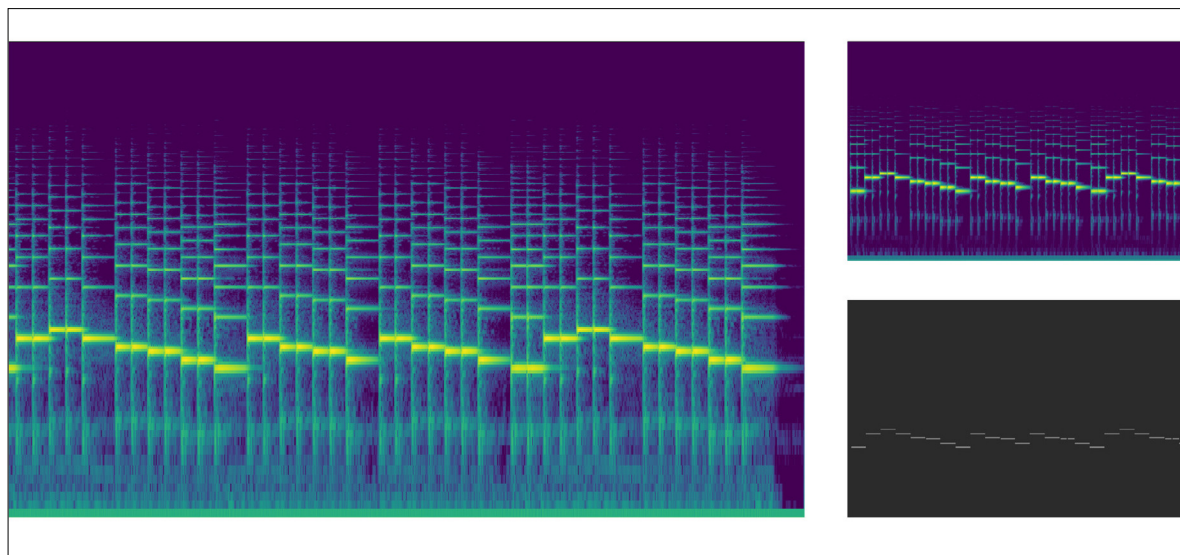


Figure 3: Intermediate steps of melody recognition based on the spectrogram
Own presentation



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Subject Area

Computer Science