Automated Digital Music Transcription

Project code: MM2-10

Cai Weiyang

Supervisor: Matthew R. McKay

Introduction

Music transcription refers to the analysis of an acoustic musical signal in order to write down the pitch, onset time, duration, and source of each sound that occurs in it. It is closely related to audio coding and music perception. In addition, applications of music transcription include

• Transcription tools for amateur musicians who wish to play along with their favorite music.
• Musicological analysis of improvised and ethnic music for which musical notations do not exist.
• Music processing, such as changing the instrumentation, arrangement, or the loudness of different parts before re-synthesizing a piece from its score.

Objectives

1. Write a Matlab program which can convert a piece of music into a musical score which can be easily understood by musicians.
2. The music scope is narrowed to monophonic music.
3. Violin is chosen as the testing instrument in this project.

I. Pitch Detection

This method is a combination of all the previous approaches.

By dot product
1. the combination of FFT and ACF: \( S(f) \)
2. The transformed Cepstrum: \( C(f) \)

The fundamental frequency can be obtained by searching the frequency which generates the maximum \( Y(f) \).

II. Beat Detection

Two conditions to become an onset point:

1. The pitch doesn’t change, but the energy changes dramatically.
2. The pitch changes.

The absolute duration is the frame index difference between two adjacent onsets.

Evaluation

The results obtained from the two cases shown above indicate that the performance of the transcription tool can be dramatically different when the tempo and expressiveness of two pieces of music vary substantially.

For Case 1, the program gives 100% accuracy due to the fast tempo and the regularity of Bach’s music.

For Case 2, although the music is extremely simple, the program cannot give the accurate result because vibrato is added to the music. No functions have been written to tackle this special case.

More than 10 cases have been tested. Overall the music transcription tool can reach 100% accuracy when the music has fast tempo and regular pattern. However, the tool is not so effective when handling very expressive and emotional music which requires further improvement.