A Statistical View on the Expressive Timing of Piano Rolled Chords

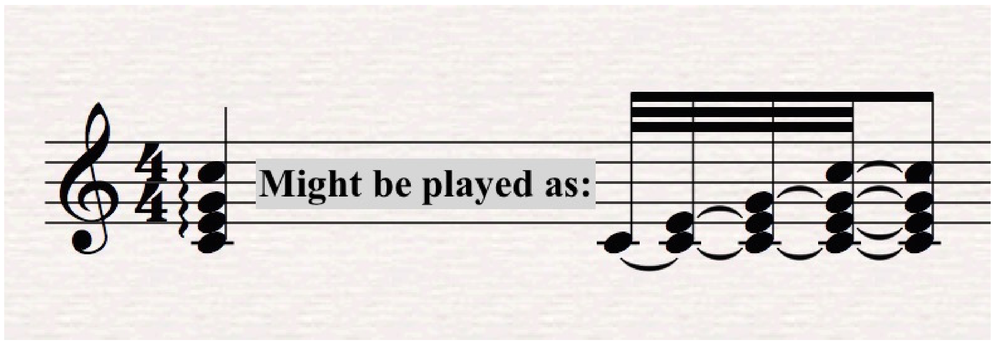
Mutian Fu, Guangyu Xia, Roger Dannenberg, Larry Wasserman

Carnegie Mellon Univeristy

Problems

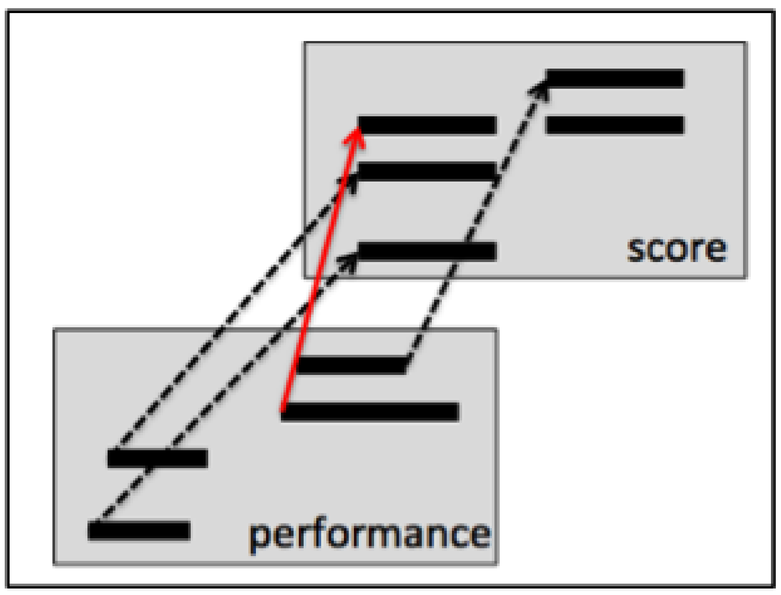
· What is the equivalent onset of a rolled chord?

· Are different chords interpreted in the same way?



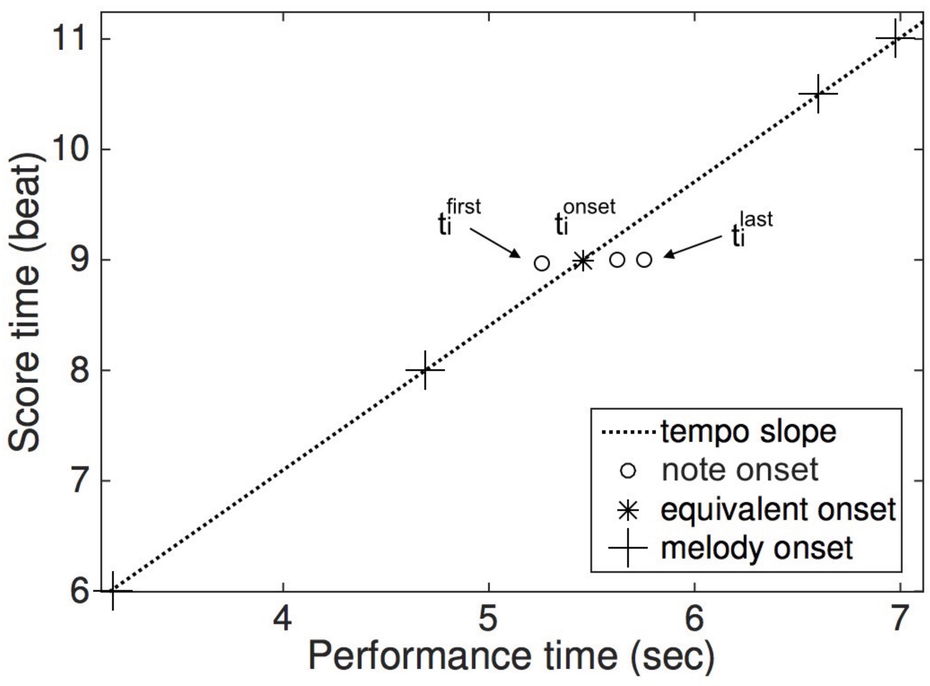
Data Preprocessing

We align the polyphonic piano performance to the score by forward alignment and backward correction.



Equivalent Onset

Equivalent onset refers to the place where we substitute a rolled chord by a single onset.



Ratio Model

Ratio model assumes that equivalent onset is decided by the first and last onset of a rolled chord. Formally,

$$t_i^{onset}(r) = (1-r)\cdot t_i^{first} + r \cdot t_i^{last}.$$

Constant Offset Model

Constant offset model assumes that the equivalent onset is decided by he first onset plus some constant offset value. Formally,

$$t_i^{onset}(s) = t_i^{first} + s.$$

Onset Span

We use Analysis of Variance to test the distribution of onset span among different chords and different performances. Because some performances are performed by the same musicians, we use repeated-measurement one-way ANOVA to eliminate the dependent factors.

Results

Equivalent Onset

Ratio model outperforms the other models for all pieces of music.

Onset Span

Different chords are interpreted in different ways. Musicians interpreted chords in the same way.

Future work

Although ratio model outperforms the other models, r value of different pieces varies from 0 to 1. In future work we should either look for a way to predict the ratio for a given piece of music, or more likely, that we should look for an even better model by combining objective and subjective evaluations.