

Registration of Two Music Videos

In the context of a project on the importance of internal consistency in the appraisal of musical performance, we have to combine the audio track recorded from one musician with the video track recorded from a second musician, with both playing the same piece. This requires time-warping either audio or video or both with the goal of aligning landmarks between the two sequences. In order to do that, three sub-tasks need to be accomplished:

1. Corresponding landmarks in the two audio files (beats) have to be determined. We will use beat detection which is part of audio processing packages such as Audacity. However exporting the time signatures of individual beats to be used for the subsequent warping is not necessarily straightforward and requires a bit of creativity.
2. Warping video is a matter of re-sampling and there is nothing too complicated about it. The first thing to find out is whether there exists video editing software that accepts an array of discrete landmarks (such as the time signatures of the beats) to accomplish time warping. If not, we need to implement a program ourselves.
3. Audio warping is the interesting and tricky part. Simple re-sampling is not possible because changes in timing also cause changes in pitch. Algorithms exist to separate pitch from timing. We have to find and adapt implementations which suit our purposes and accept an array of discrete landmarks.

The final product of this project would be a piece of software that takes as input two movies A and B, then warps A onto B and then exchanges sound tracks and video stream between the two movies. We will then apply this tool to create hybrid movies on the basis of a data base of violinists all playing the same piece.

The project would be ideally suited for students who bring some experience in audio post-processing or digital music production.

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