Improvasher: a real-time mashup system for live musical input

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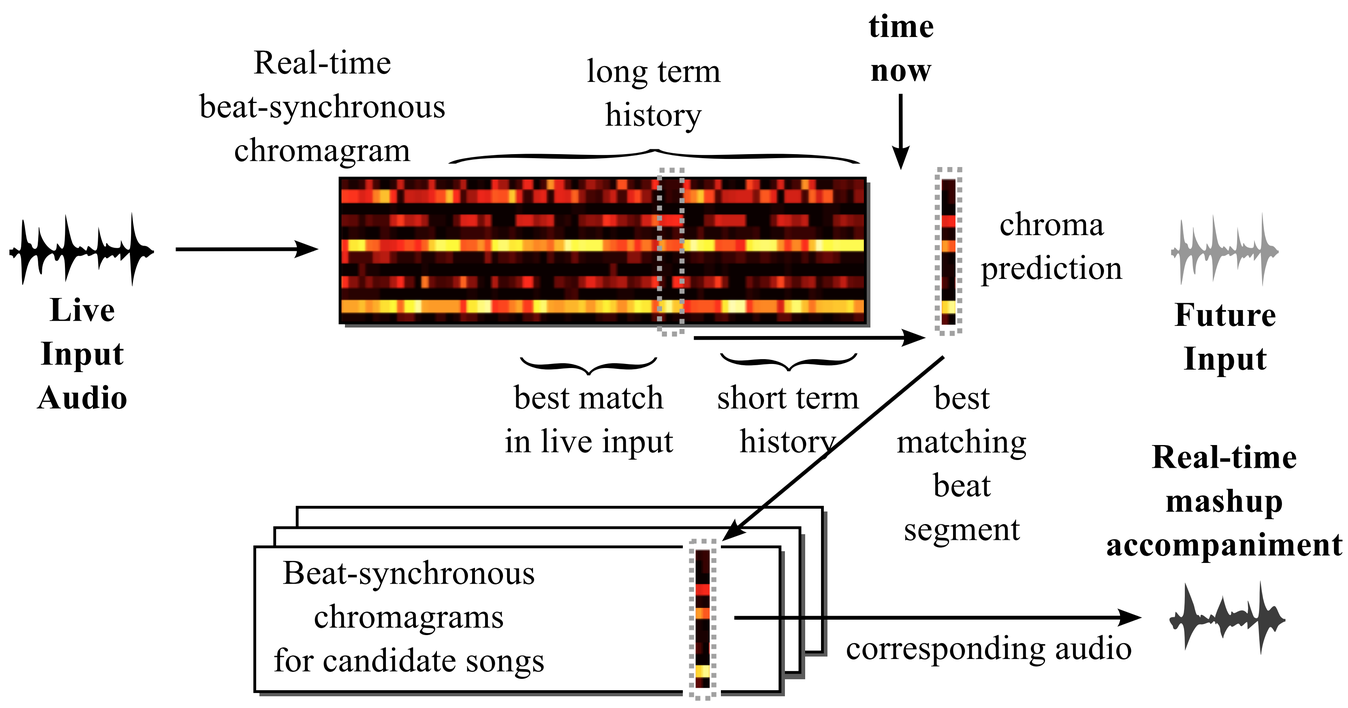
http://smc.inescporto.pt/technologies/improvasher

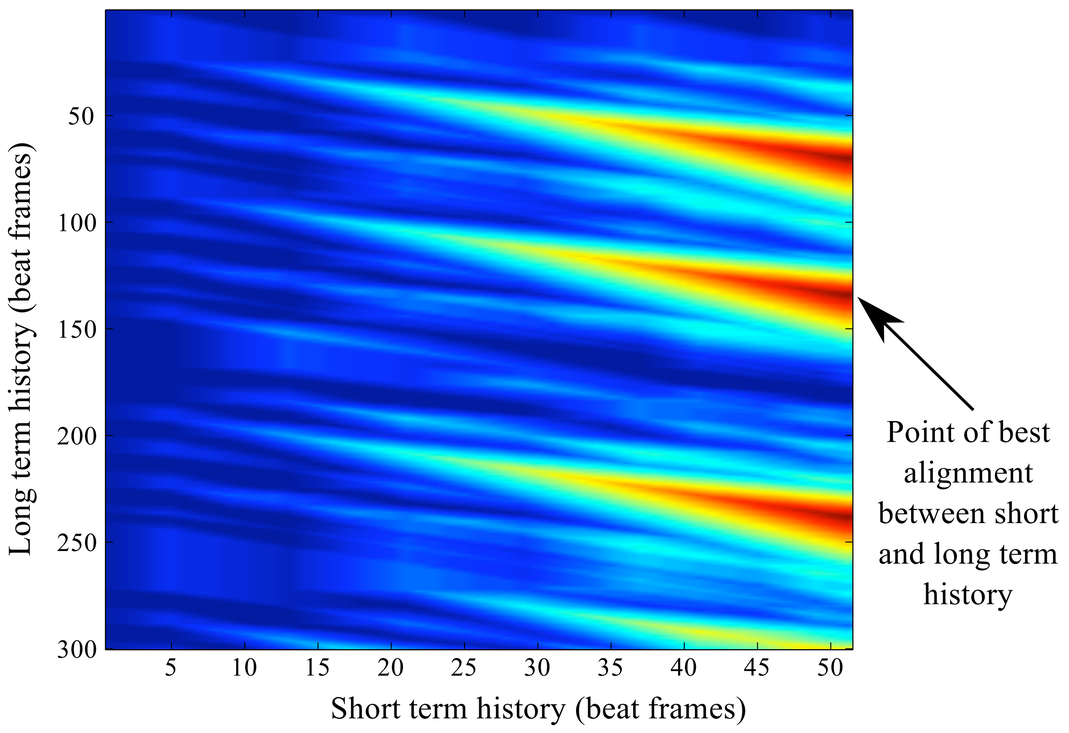
Auto-mashup accompaniment

Goal - to create an automatic accompaniment music mashup system for live musical input

Approach - to develop a hybrid system which uses an existing performance following method and combines it with a mashup engine adapted for real-time applications

Scope - an experimental prototype to explore the creative possibilities in music interaction by searching and synchronising matching musical content in real-time





Predicting and matching harmonic content

Performance follower

- Make beat-synchronous chromagram from input audio
- Use dynamic programming to search over long and short term history
- Find best match and use next beat as best prediction of future content

http://www.eecs.qmul.ac.uk/~adams/pf/

Mashup engine

- Adapt offline AutoMashUpper system (ISMIR, 2013) for real-time use
- Measure compatibility between predicted chromagram and database using cosine similarity between beat-synchronous chromagram frames
- Find the best matching beat segment across the database and retrieve the corresponding audio for synchronous playback

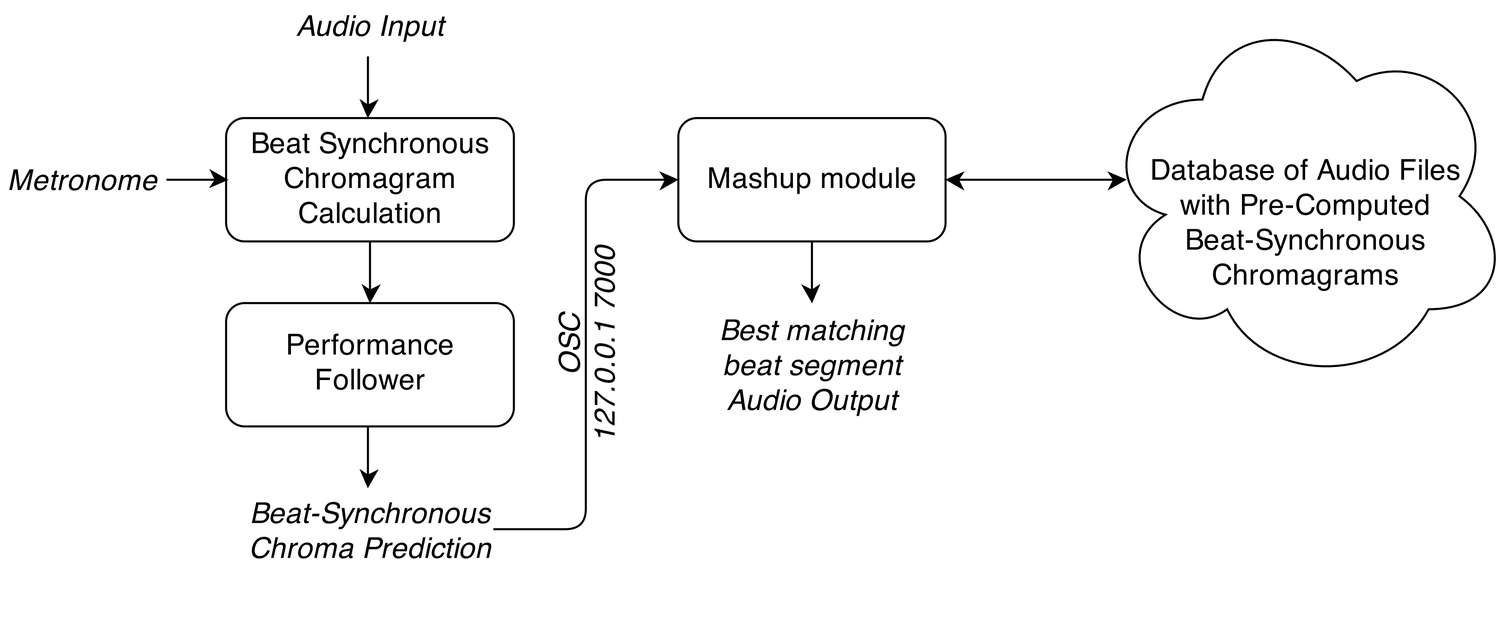
Implementation

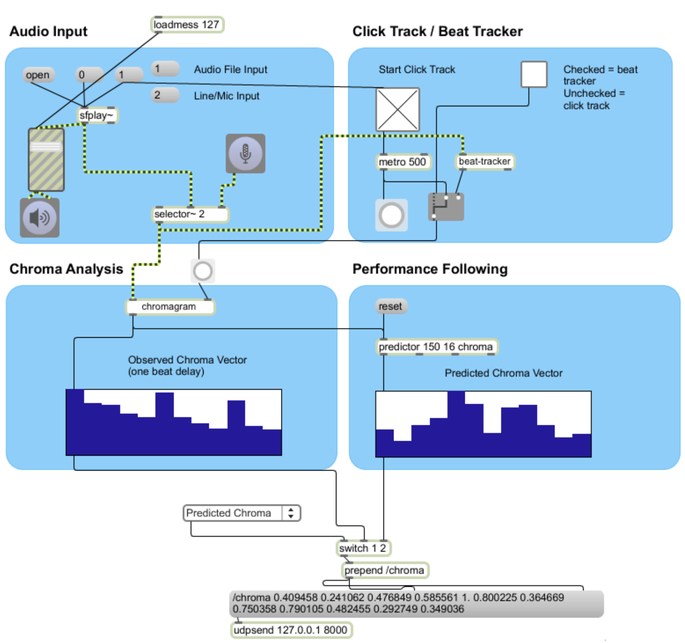
Improvasher system architecture

- Performance Follower: MAX patch
- Mashup engine: standalone C++ Juce application
- OSC connects the two modules

Database of pre-analysed songs

- Sonic Annotator with QM-VAMP plugin to extract beats and NNLS-Chroma for the chromagram
- Rubberband for time-stretching and pitch-shifting the set of candidate songs





Constraints and usage scenarios

Real-time constraints

- Fix input tempo to prevent the need for real-time beat-tracking and time-stretching
- Used pre-computed database of candidate songs to reduce computational burden
- Pre-compute pitch-shifted versions of candidate songs to expand scope of matches

Modes of operation

- Live musician input: mashup accompaniment is driven by user selected songs
- Re-use musician input: use musician's performance as mashup data to accompany songs
- DJ mode: create mashup in real-time between existing songs