MCIpa

Geoffroy.Peeters@ircam.fr, David Fenech, Xavier Rodet
IRCAM – CNRS STMS

M C I p a
a Music Content Information Player and Annotator for discovering music

Geoffroy.Peeters@ircam.fr, David Fenech, Xavier Rodet
IRCAM – CNRS STMS

Introduction

- Many researches on
  - query over large databases
    - by specific music characteristics (melody, genre, mood, tags, chords, …)
    - by-similarity
- Few works address the problem of using content-information
  - to guide the user during its listening of a track
  - to allow the user have a better understanding of the music content of a track
- Many researches rely on training data or validation data
  - Tools that allow annotating music audio files in terms of specific music characteristics are still missing
- This work:
  - propose a tool for music content visualization and music content annotation

Related works

Existing media players

- iTunes
- Windows Media Player
- RealPlayer
- WinAmp
- …

peeters@ircam.fr

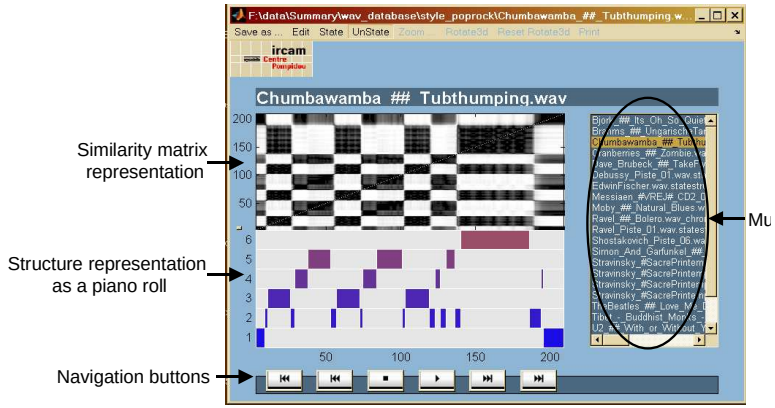
Starting point

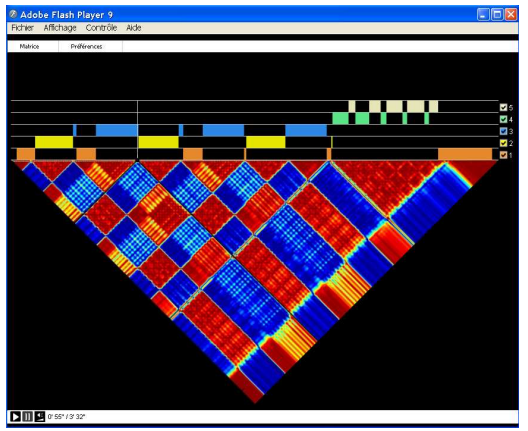
- Peeters 2002 Music Structure
  - Matlab Interface Prototype
  - [Peeters ISMIR2002, Springer2005]

- Ludovich Gaillard
  - Flash version

- Samuel Goldsmidth
  - Extension of the flash interface
    - Hierarchical structure representation
    - Semantic HIFI remote-controller
    - [Boutard, Goldsmidth, Peeters LSAS2007]

- Semantic HIFI user-testing
  - Users found the interface “interesting, useful and innovating”
  - Some weak point of the interface:
    - No possibility to assign a label to each block of the structure
    - No possibility to exchange annotations among user
    - No possibility to assign a color to each block





Related works

Existing media players

- iTunes
- Windows Media Player
- RealPlayer
- WinAmp
- ...

Existing audio annotation tools

- AS Annotation — Ircam
- Sonic Visualizer — QMUL
- CLAM annotator / MUSOCA — IUA-UPF
- Wavesurfer — KTH
- Praat — IPS
- Acousmographe — GRM
- Transcriber — DGA
- Audacity
- ...

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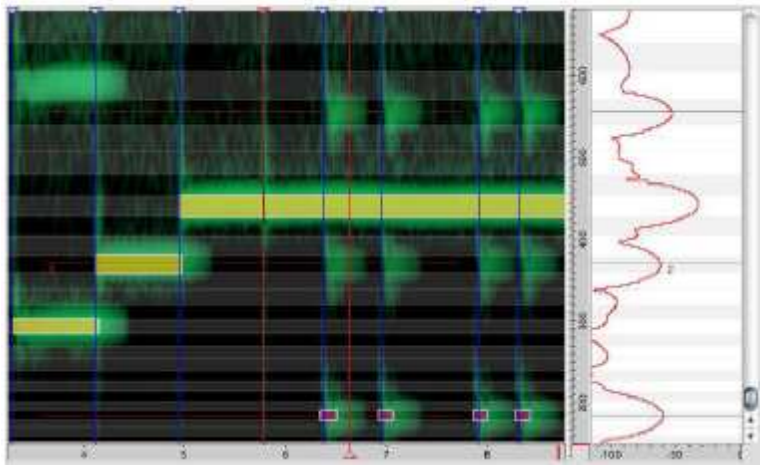
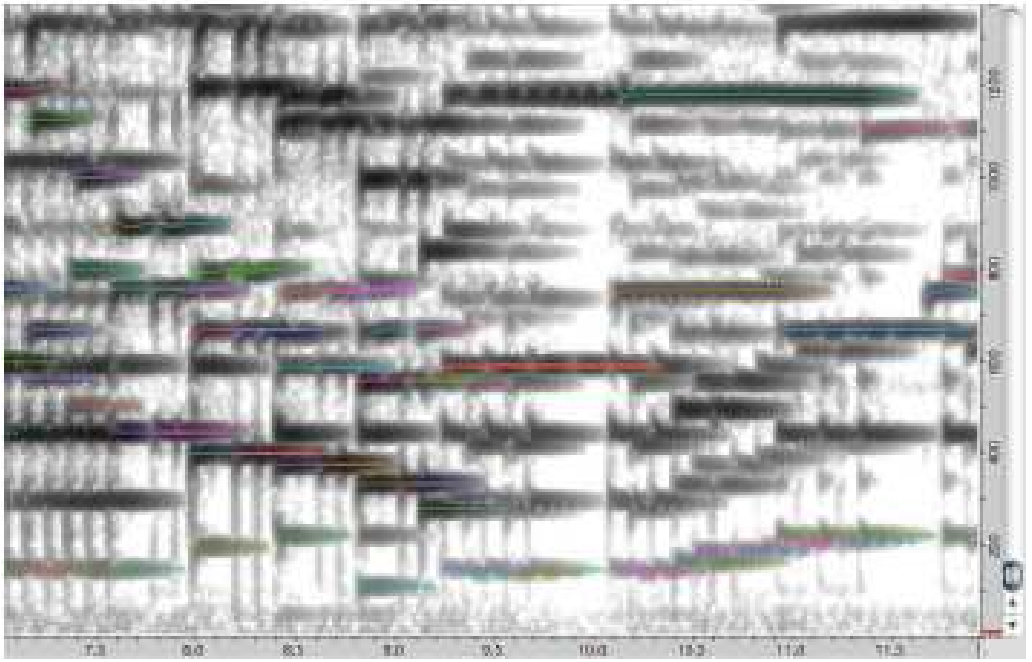
Related works

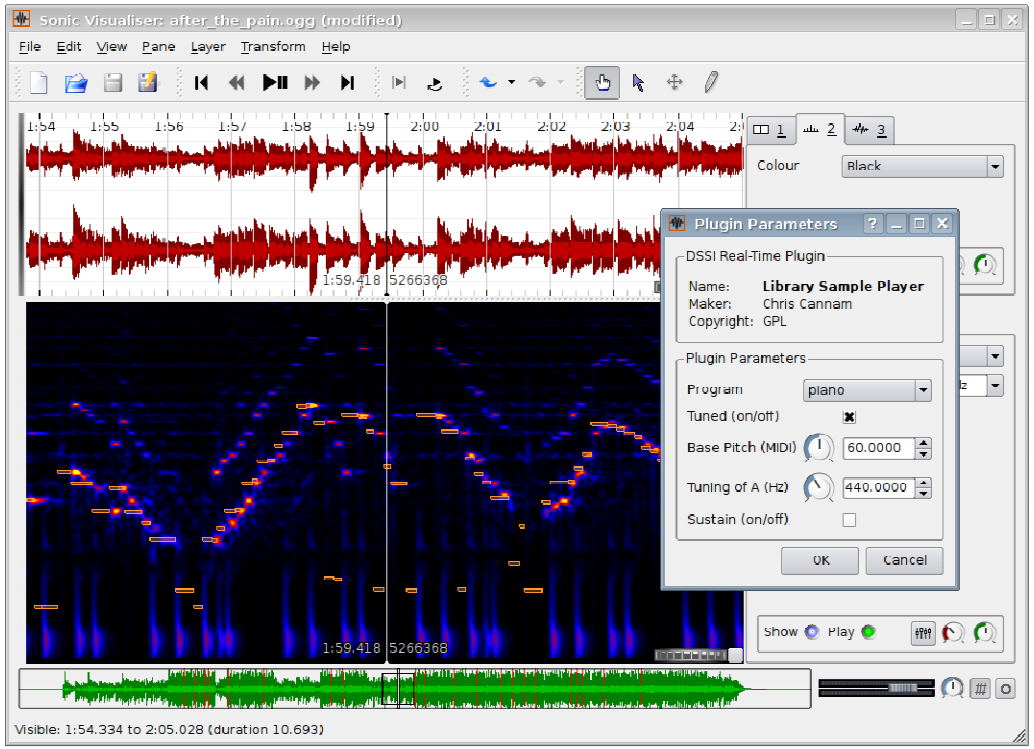
- AS (Audiosculpt) Annotation
  - IRCAM
  - MacOSX
    - http://recherche.ircam.fr/equipes/analyse-synthese/ASAnnotation/
  - Annotation over the visualization of the spectrogram (note-gram) using markers (midi-notes), integrated algorithms





Related works

- Sonic Visualizer
  - Queen Mary University of London
  - Linux/ MacOSX / Windows/ Open Source
    - http://www.sonicvisualiser.org/index.html
  - Annotation over the waveform/ spectrogram, analysis plugins (Vamp)/ Effect plugin (LADSPA/DSSI), visual masks



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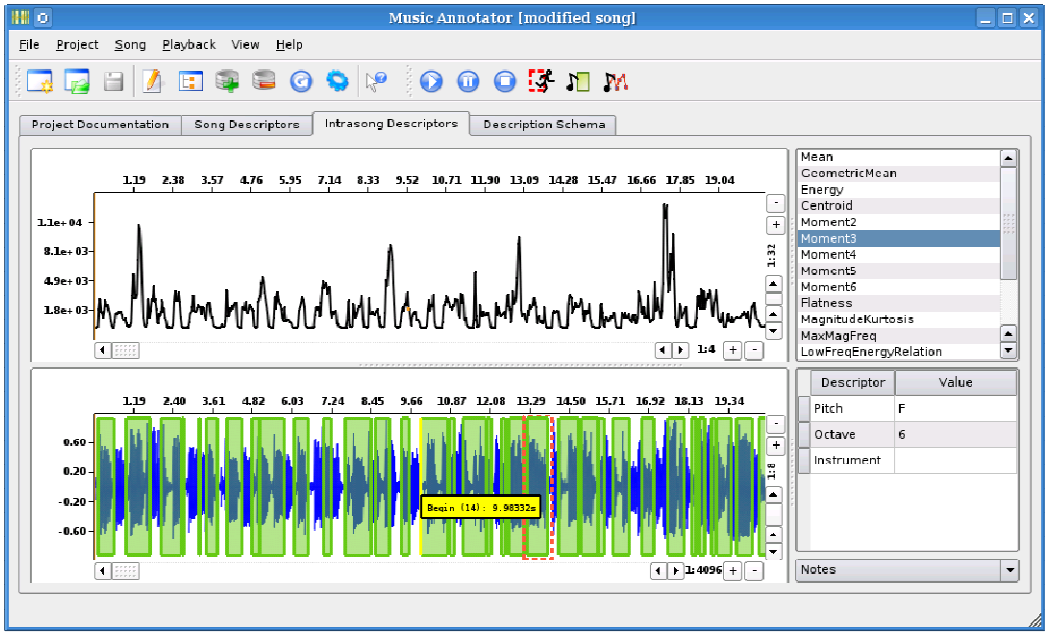
Related works

- CLAM annotator / MUSOCA
  - IUA-UPF
  - Linux/ MacOSX/ Windows/ OpenSource
    - http://clam.iua.upf.edu/
  - Framework for developing graphical interfaces and signal analysis algorithms;
  - Online system for collaborative global annotation



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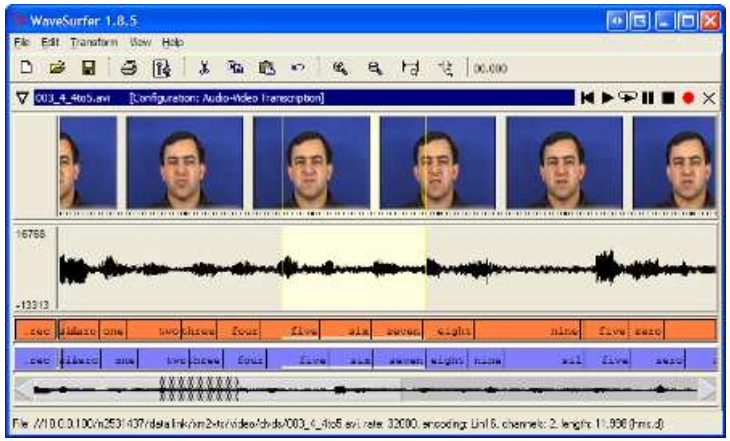
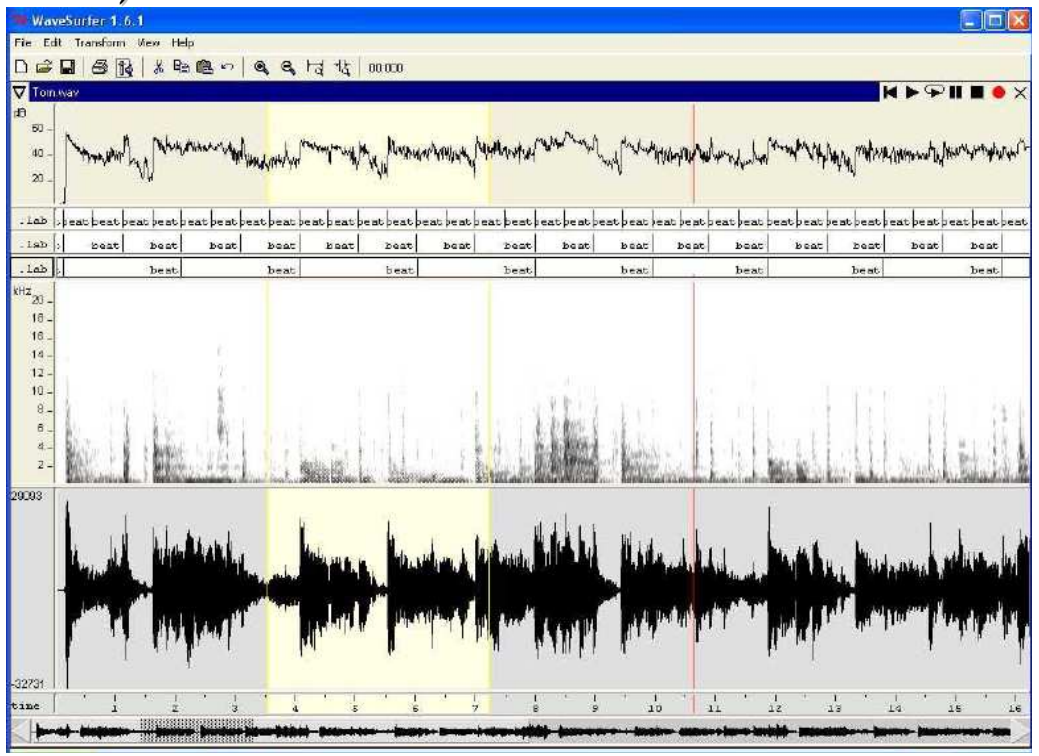
Related works

- Wavesurfer
  - KTH
  - Linux/ MacOSX/ Windows/ OpenSource
    - http://www.speech.kth.se/wavesurfer/
  - Annotation over waveform/ spectrogram/ pitch/ energy, some plug-ins available for analysis (Video/ Beat/ …), browsing by content (marker lists)





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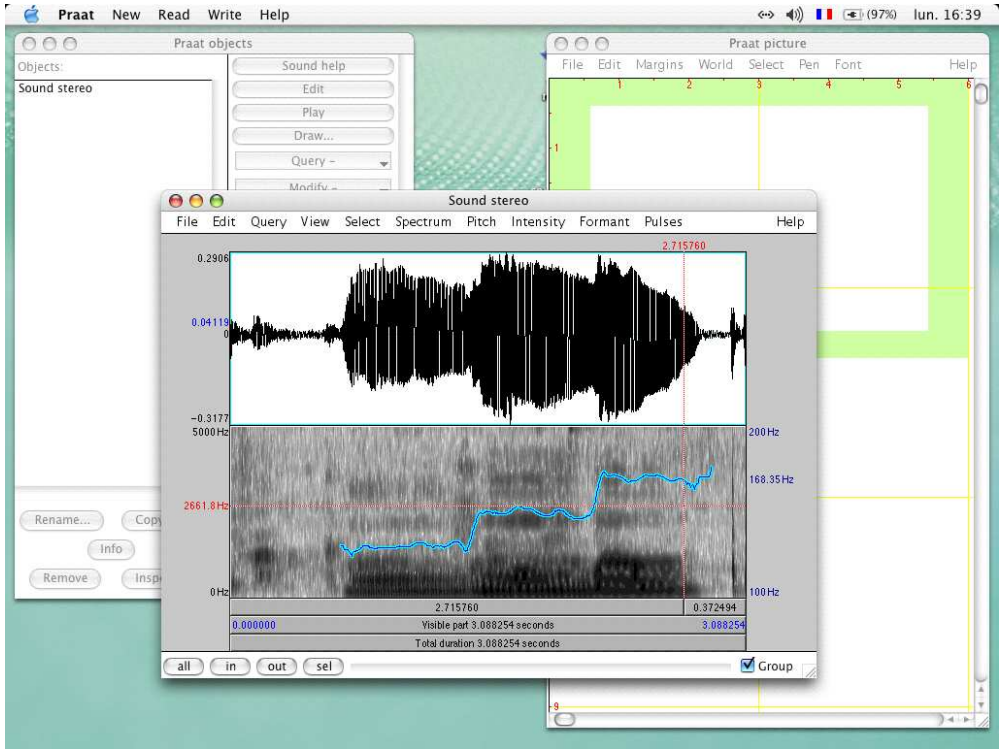
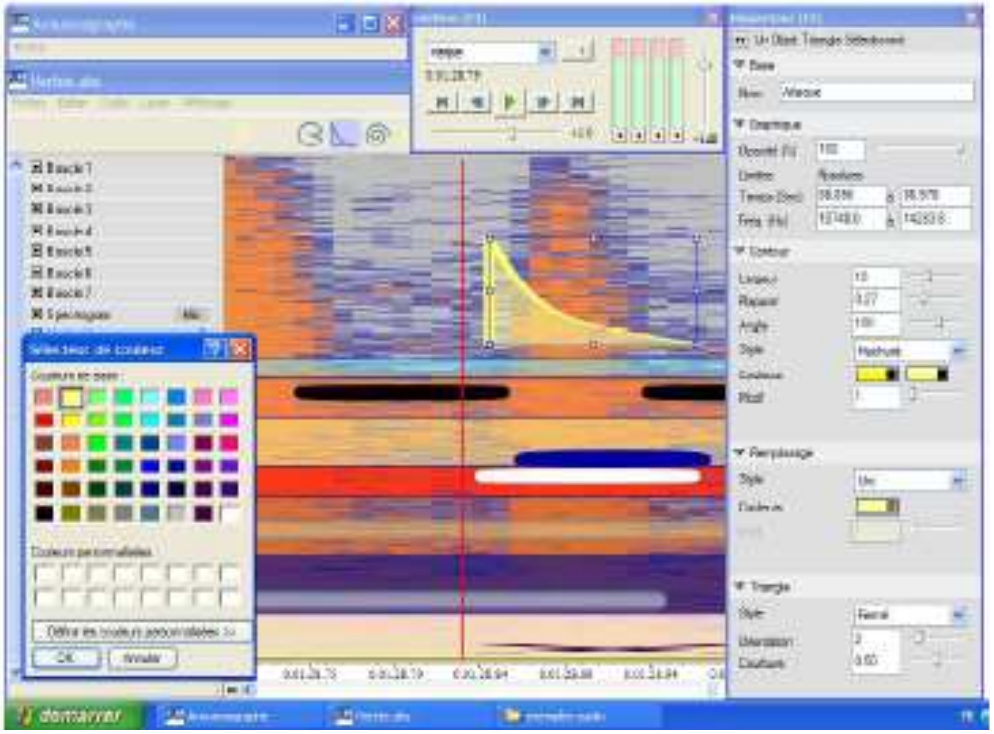
Related works

- Praat
  - IPS (Institut Phonétique d'Amsterdam)
  - Linux/ MacOSX/ Windows/ OpenSource
    - http://www.fon.hum.uva.nl/praat/
  - Many signal analysis algorithms but mostly dedicated to speech



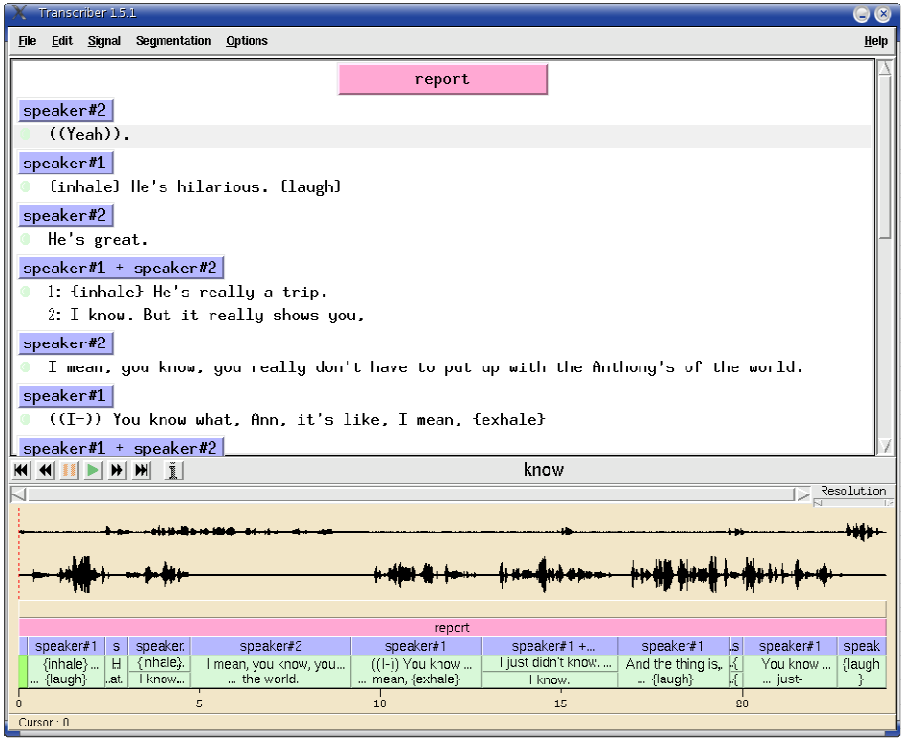
Related works

- Acousmographe
  - GRM
  - Windows XP
  - http://www.ina.fr/entreprise/activites/recherches-musicales/acousmographe.html
  - Annotation using a wide-range of graphical tools(shape, color, masks)



Related works

- Transcriber
  - DGA
  - Linux/ MacOSX/ Linux/ Open Source
    - http://trans.sourceforge.net/en/presentation.php
  - Mostly dedicated to the speech-to-text annotation, browsing by markers



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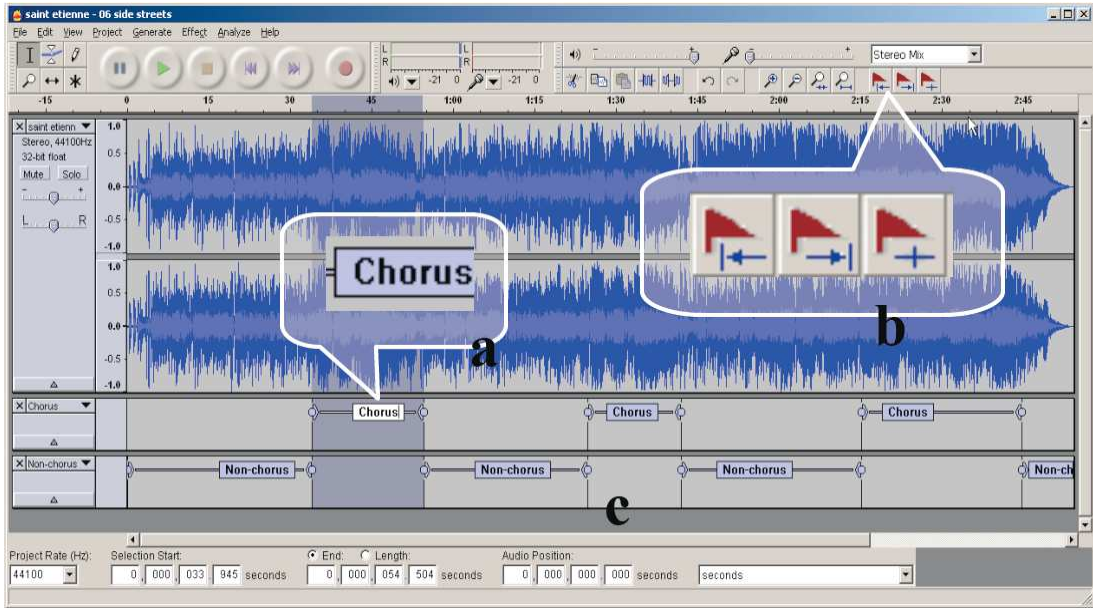
Related works

- Audacity
  - Linux/ MacOSX/ Windows/ OpenSource
    - http://audacity.sourceforge.net/
  - Good audio and midi synchronization but no specific tools for annotation



Analysis of related works

- Currently no tools dedicated specifically to the annotation of music in terms of music content (structure, chords, …)
  - Most of the tool are made for the annotation of generic audio (or speech) over a signal representation (signal, spectrogram)

- Our point of view: annotation of music content is facilitated by visualization of music content
  - Ground visualization of our tool: a similarity matrix

- Good functionalities in existing software
  - Visual masking and transparency system
  - Use of specific color and shape for each type of annotations
  - Separation between the graphical interface and the content-extraction tools
  - Possibly to quickly browse the file by annotation

MCIpa requirements

Generic requirements

- The tool must be easy to use, understand and install
- The same tool is used for both annotation and visualization
- Automatic extraction is not part of the tool, use your favorite one, or take an existing annotation
  - communication using a set of xml files
- The tool must be cross-platform
- The interface should read and play directly the most used music formats, mp3 files

Interface requirements

- Interface must be intuitive.
  - Main paradigm= click and listen to what you have clicked on"
- Action must be quick and quickly reachable
  - Keyboard shortcuts are used extensively in order to do that
- It should be easy for the user to navigate in the representation and to change the type of representation being displayed

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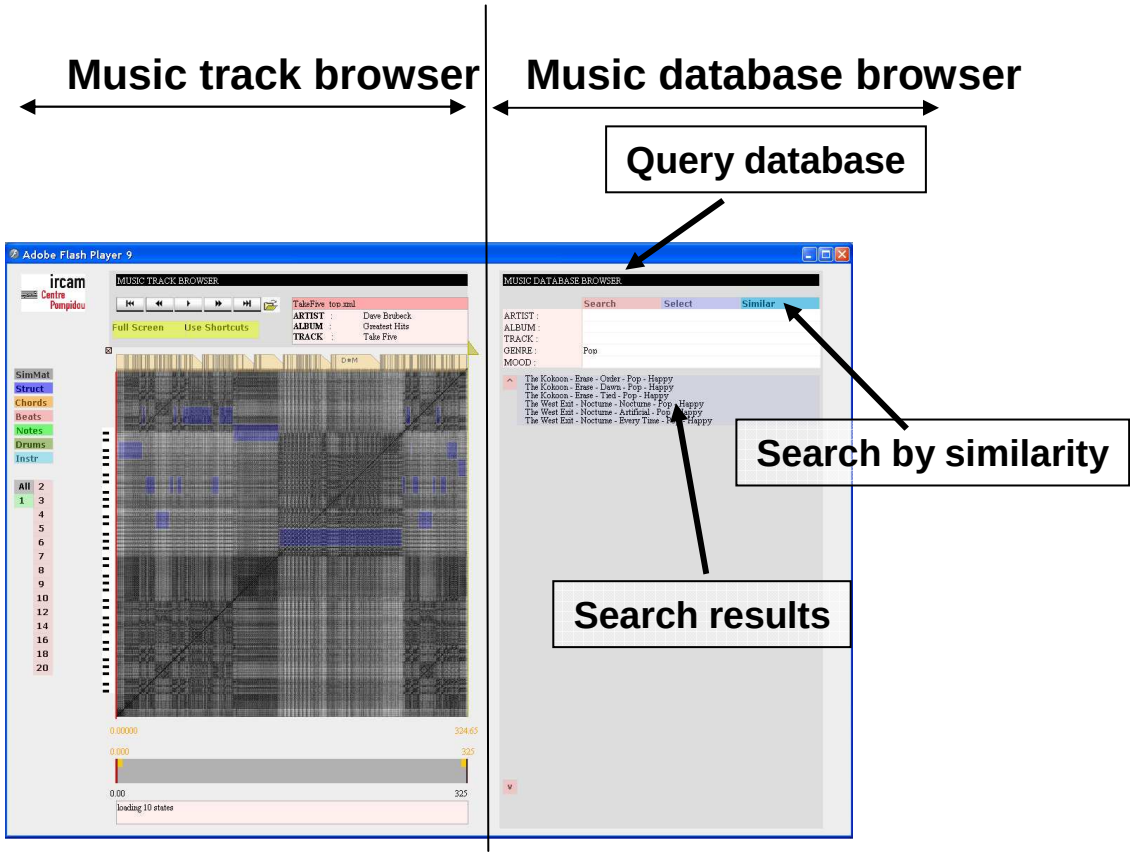
MCIpa: two parts

- Music database browser:
  - Search in a database by
    - Artist
    - Title
    - Music genre
    - Music mood
    - Similarity

- Music track browser
  - Represents graphically the content of a given track
  - Allows navigation inside the track



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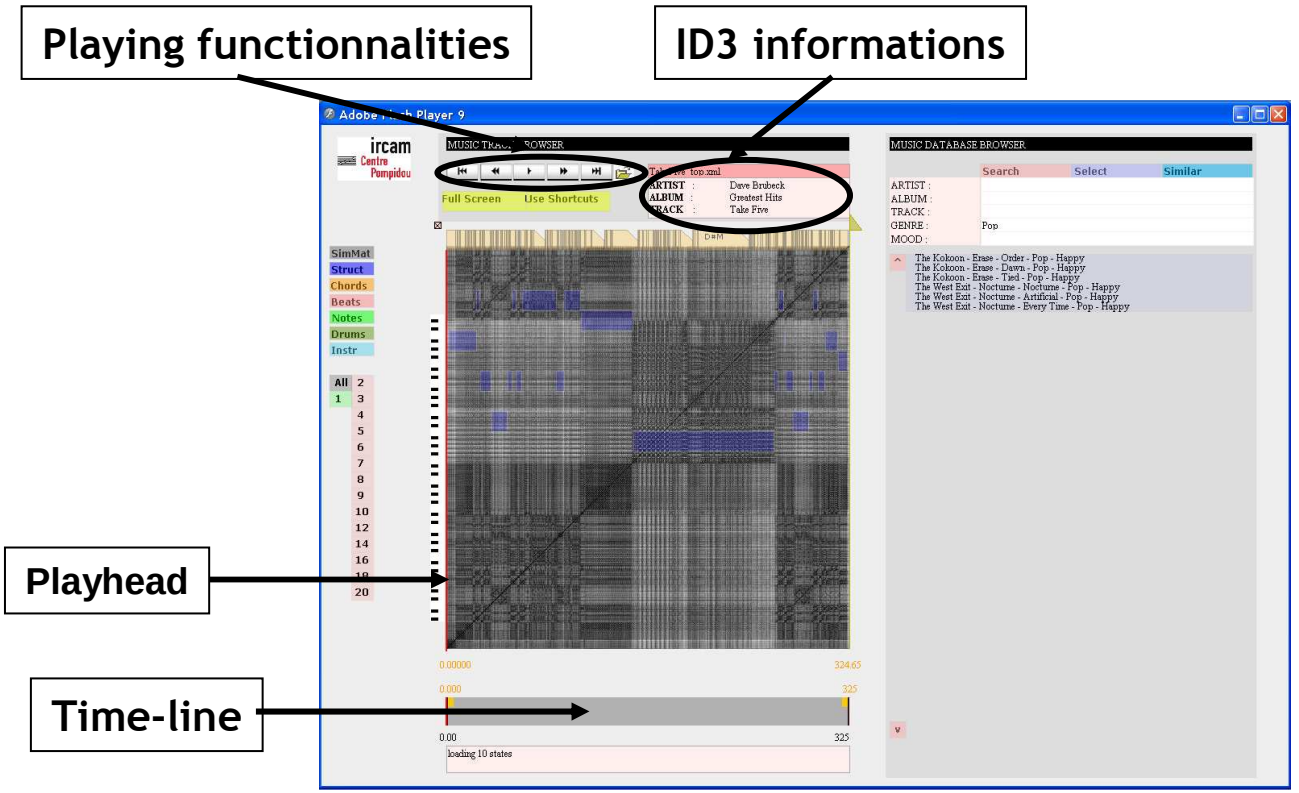
Music track browser

- Loading, playing functionalities
- Editorial metadata (ID3)
- Time-line, zoom-in/out, auto-scroll, playhead markers



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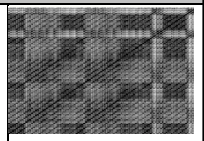
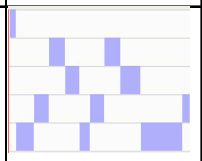
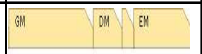
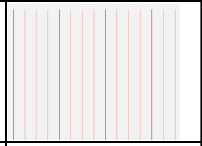
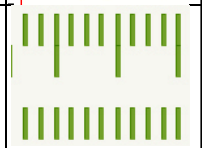
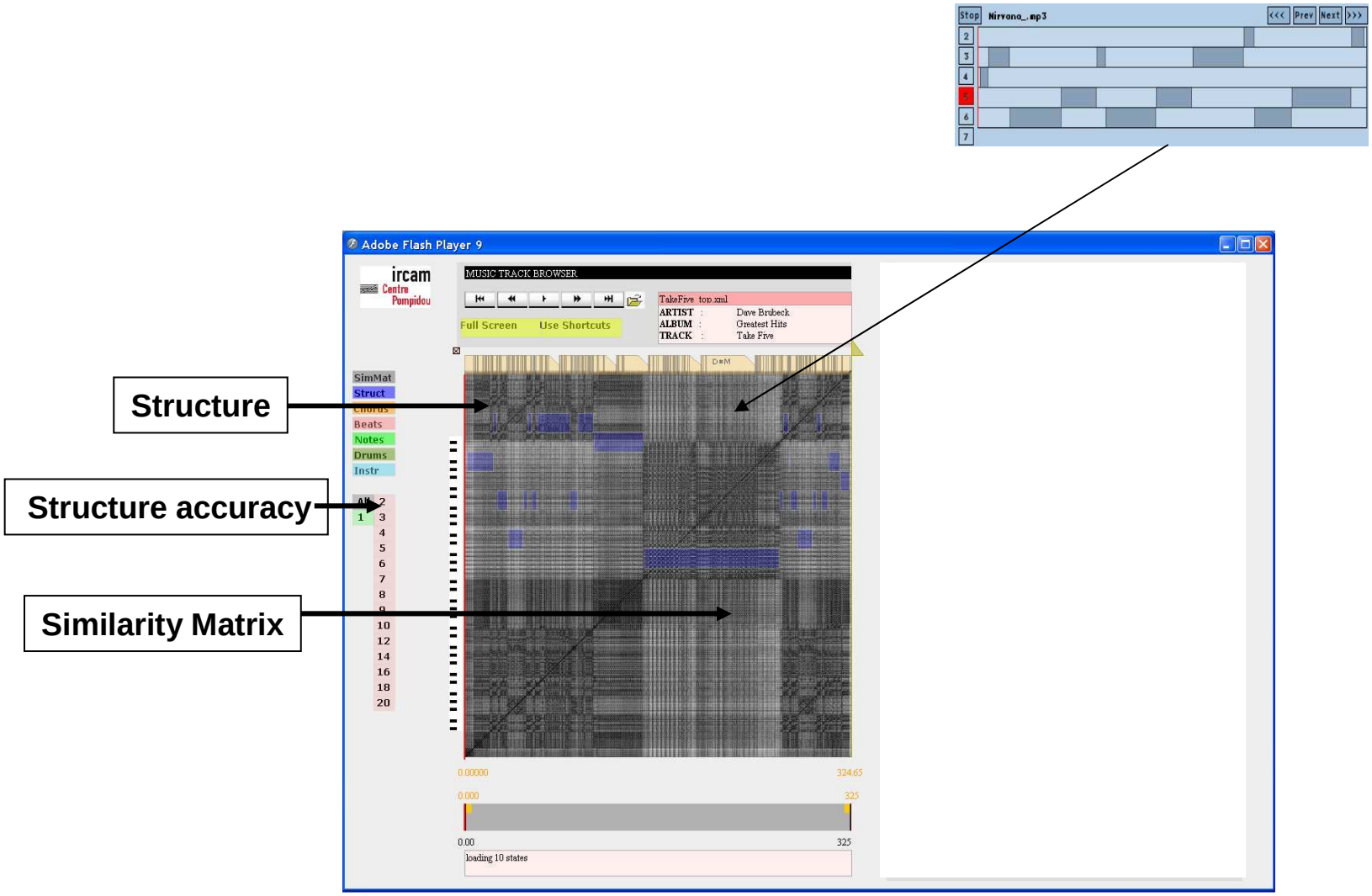
Music track browser

Representation of the content

- Music Content Information (MCI) objects
  - Describes a specific music content
  - Has a distinct visual representation
  - Has a distinct feedback (audio, play-head position)
  - Has a distinct xml representation
  - Has an existing automatic extraction tool (initialize annotation)

MCI	Graphical representation		User Interaction / Interface feedback
Similarity Matrix	As a 2D image on background		click anywhere inside the image starts playing at the given position
Music Structure	As a part-roll (each type of part is represented on a specific line)		- choose the number of parts used for the subdivision - click inside a part starts playing at the part beginning - forward-backward by parts
Chord progression	As a set of TABs with chord labels		click inside a chord 1) starts playing at the chord beginning 2) plays the corresponding chord prototype
Downbeat/ beat positions	As a set of vertical lines (thick lines for downbeats, thin lines for beats)		Audio click when the play-head crosses a beat marker
Multi-pitch	As a piano-roll (each note-stream is represented by a specific color)		- choose the displayed note channels - click inside a note plays the corresponding note prototype
Sound-events	As a sound-event-roll (each type of sound-event is represented on a specific line)		not yet

Music track browser



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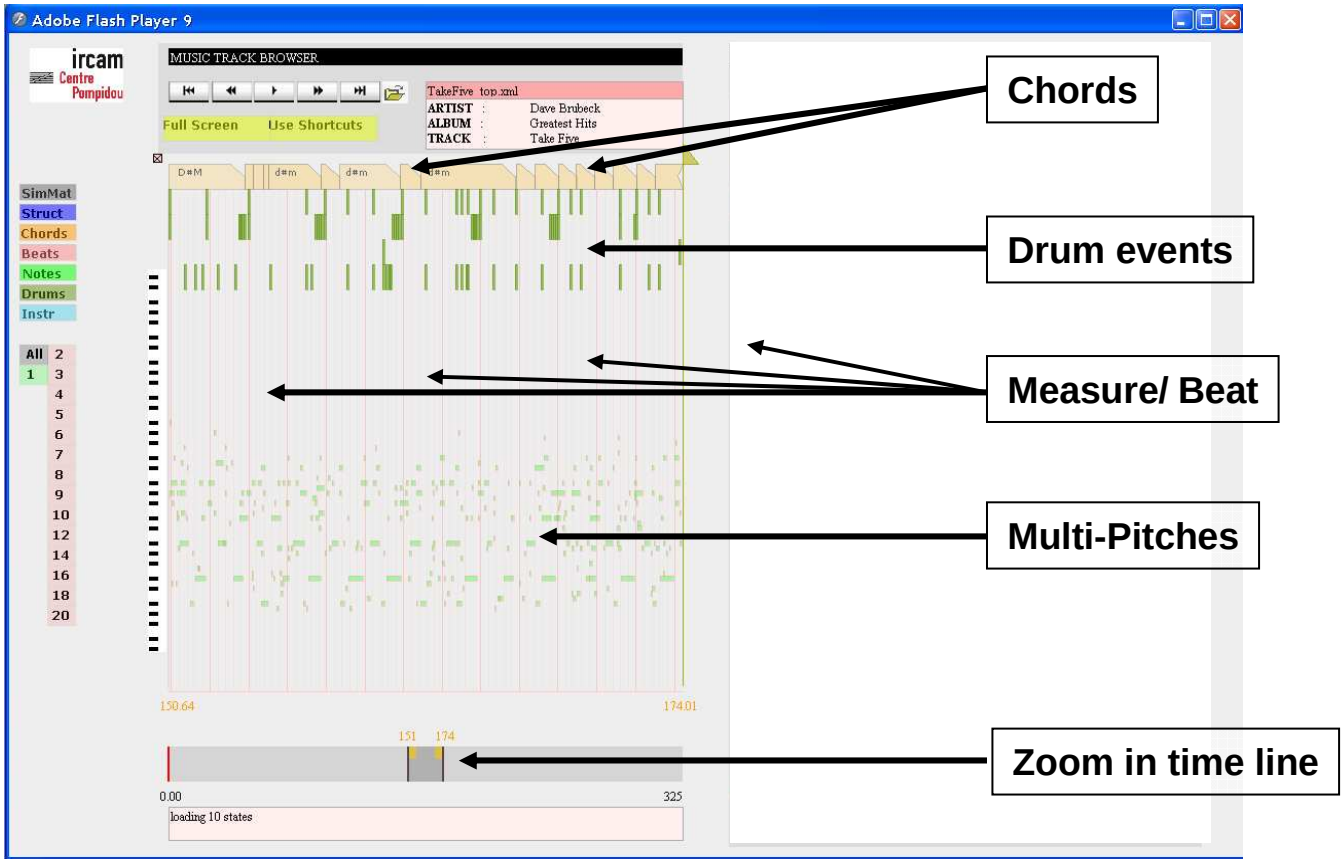
Music track browser



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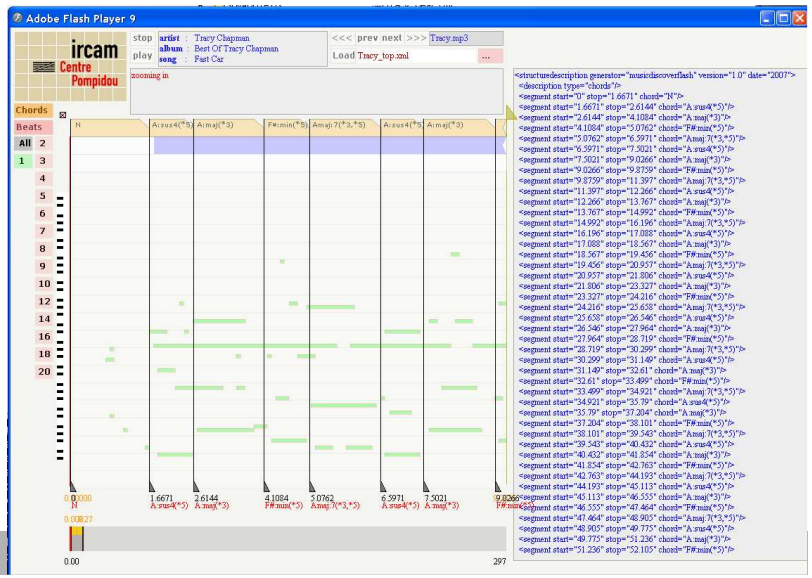
Annotation

- Enter or correct the displayed content descriptions
  - Annotation is greatly facilitated by the knowledge (visualization) of other types of content description
- Marker system, generate markers
  - on the fly
  - at the mouse position
  - at the beginning of a specific MCI
  - corresponding to a specific marker-type
- Move, Add, Delete markers, edit marker labels
- Generate the corresponding XML code
- Reload the edited description



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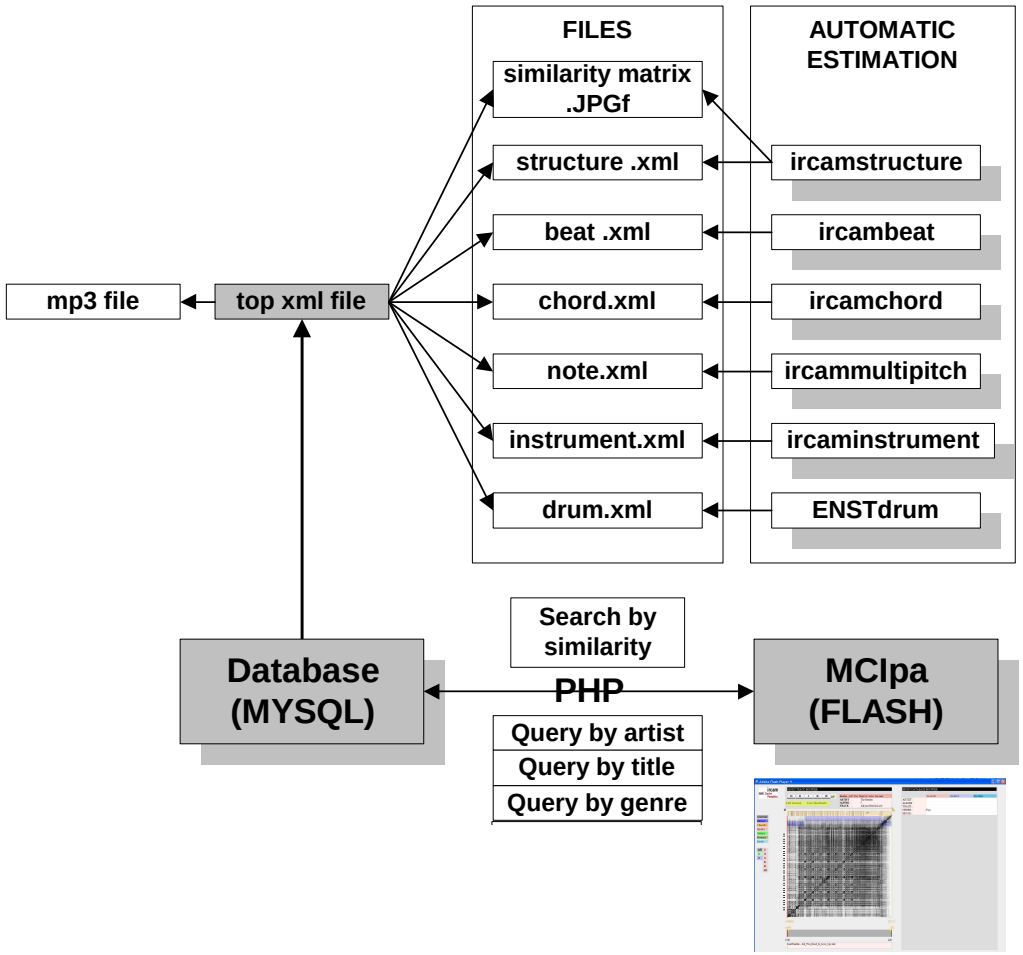
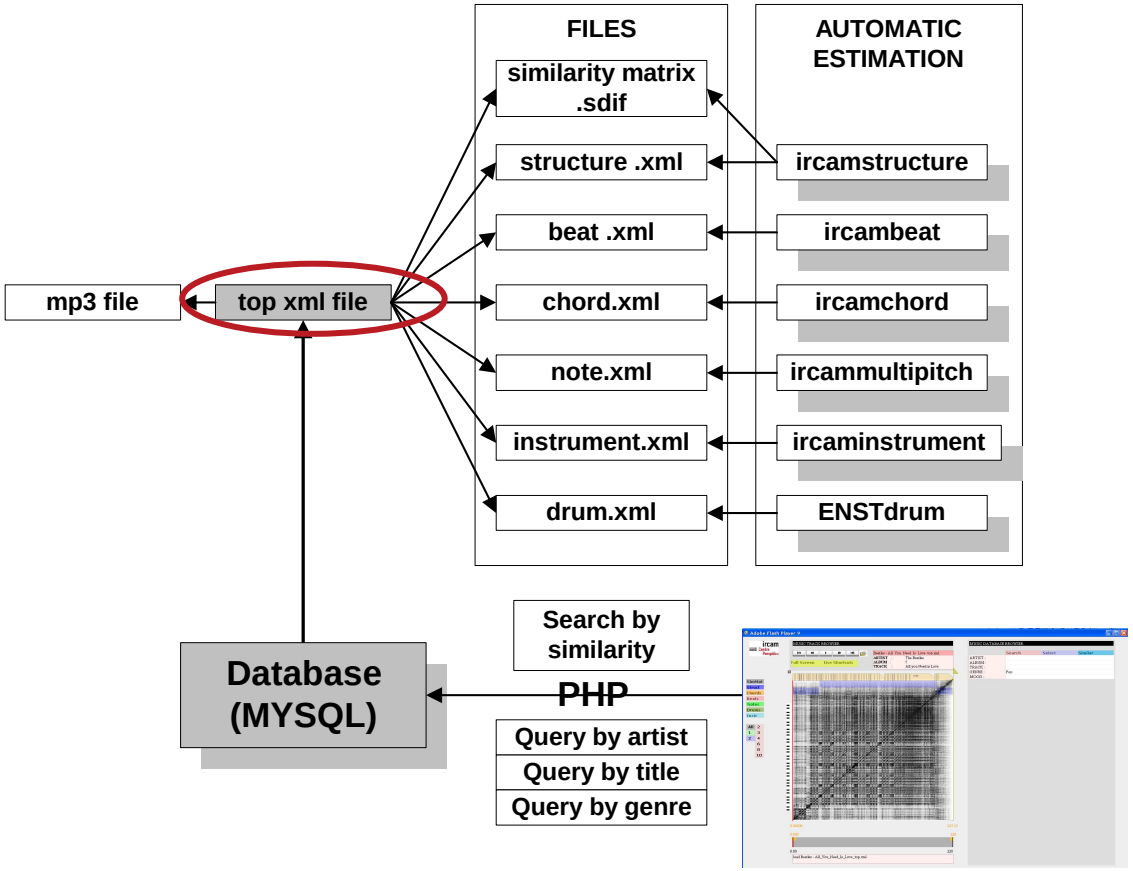
Overall architecture and file formats

- Reads directly mp3 file
- Descriptions: set of XML files
- Top XML file with pointer to
  - Mp3 file
  - Various XML description files
  - Simple and light XML format (not MPEG-7 based)



Overall architecture and file formats




```
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                    < structuredescriptionfile > Tracy_struct.xml </structuredescriptionfile >
                    < beatdescriptionfile > Tracy_beat.xml </beatdescriptionfile >
                    < chorddescriptionfile > Tracy_chord.xml </chorddescriptionfile >
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                    < drumdescriptionfile > Tracy_drum.xml </drumdescriptionfile >
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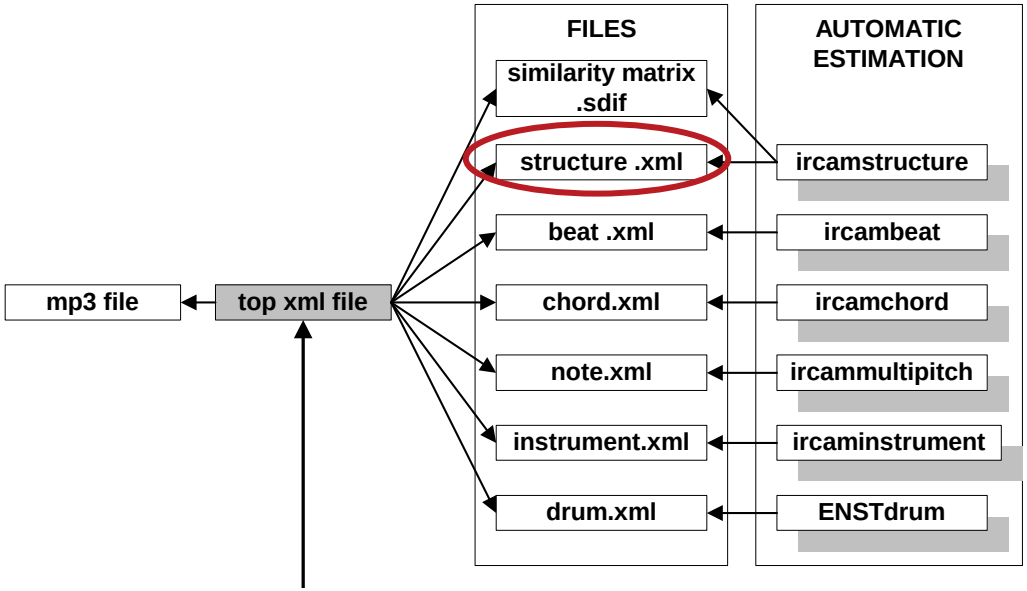
Overall architecture and file formats

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                < segment start="39.5695" stop="48.2892" label="1" id="*" />
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```


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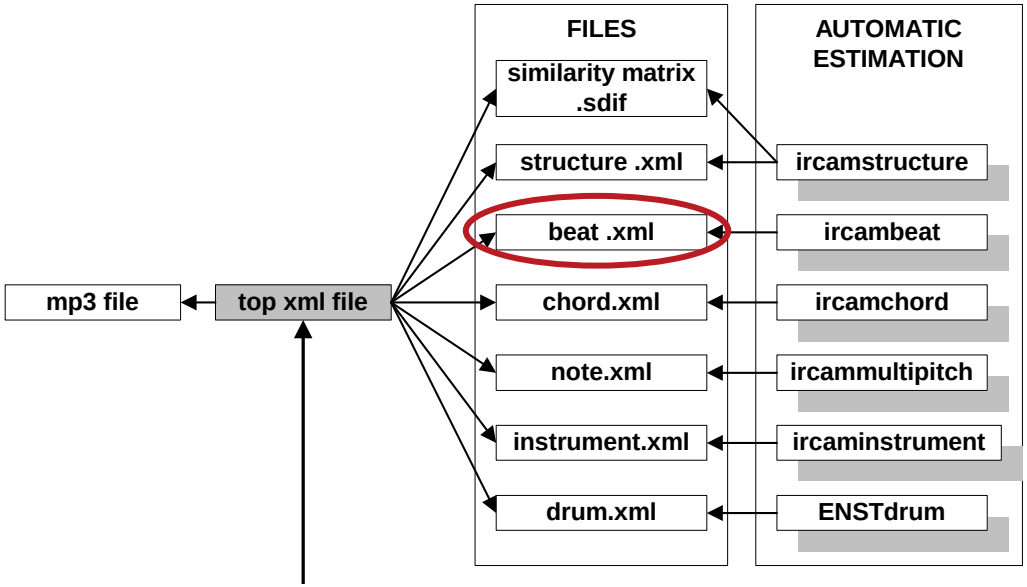
Overall architecture and file formats

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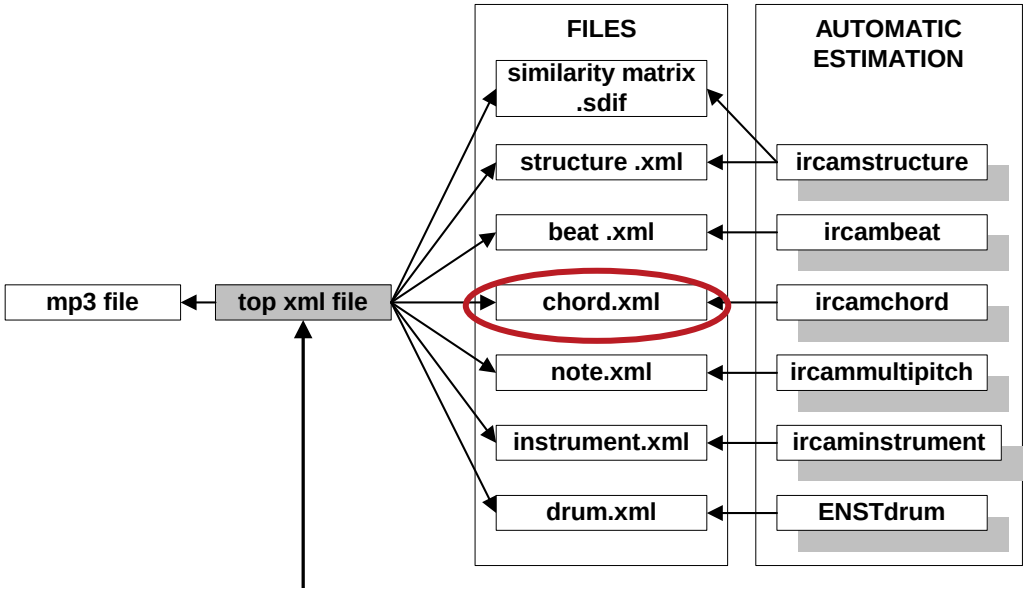
Overall architecture and file formats

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                < segment start="2.6143598" stop="4.1083732" label="Gmin" id="*" />
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< /mcipadescription>
```


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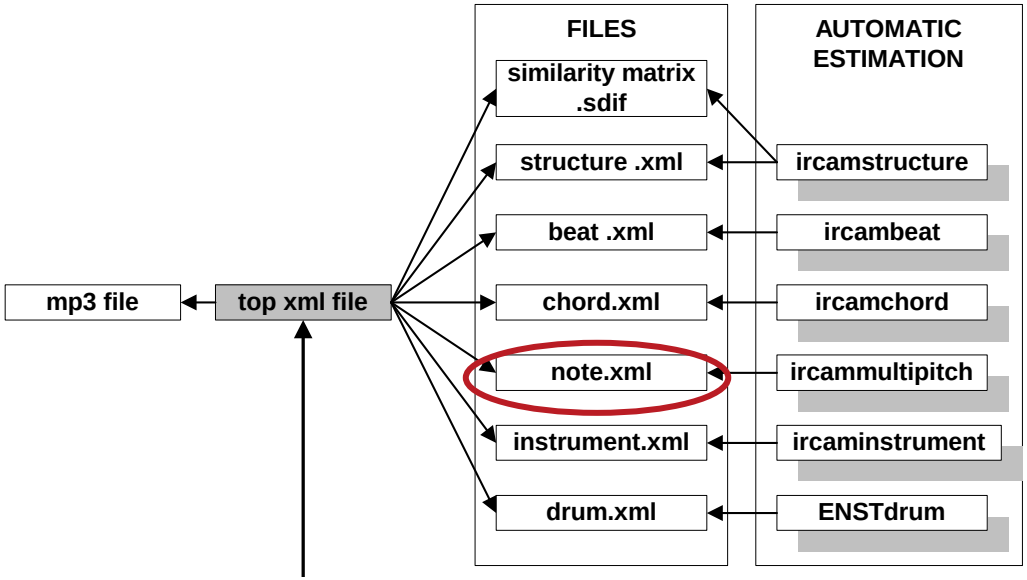
Overall architecture and file formats



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                < segment start="1.114467" stop="1.207347" label="33" track="2" velocity="90" id="*" />
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```


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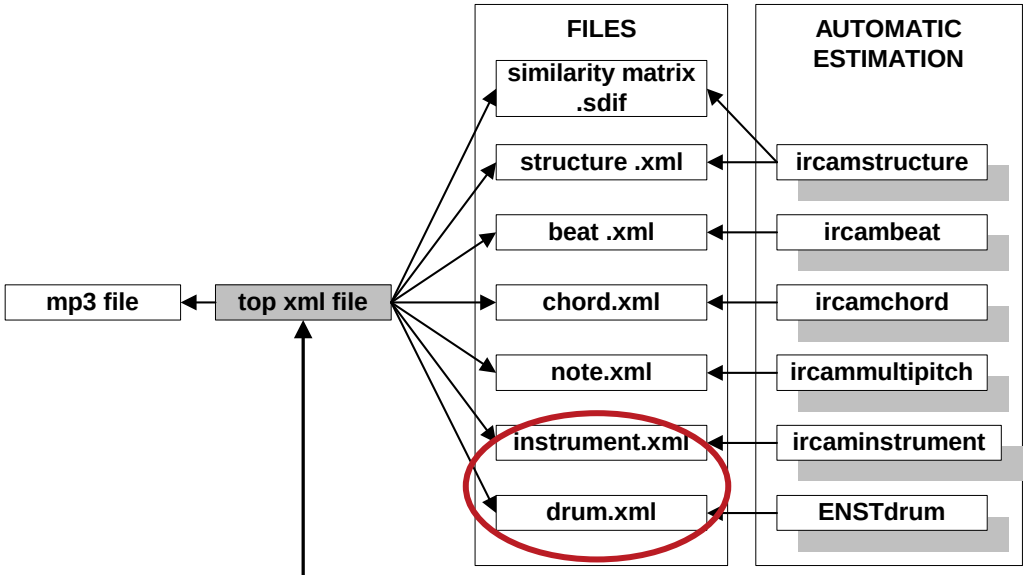
Overall architecture and file formats



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                        < segment start="1.149365" stop="2.089773" label="vc" id="*" />
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< /mcipadescription >

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                        < marker start="0.189" label="hh" id="*" />
                        < marker start="0.793" label="sd" id="*" />
                < /description>
< /mcipadescription >
```


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Development

- Graphical interface
  - Flash 9,
  - Action Script 3
  - Can be run on any platform supporting the Adobe Flash 9 plugin (Linux, Windows, Mac OS-X, portable devices, ….)
  - Standalone version for Windows and Mac OS-X

- Database management
  - PHP scripts to a MySQL database return a list of pointer to top-xml files
  - XAMPP (Apache, mySQL, PHP)

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Conclusion

- Future works
  - Paradigm used by MCIpa has been partially tested during the user-testings of the Semantic HIFI system
    - Test the paradigm for annotation purposes
      - Establish an experimental protocol: choice of a set of annotation tasks, set of music items
  - Extending the current architecture to a plug-in architecture in order to be able to display new types of MCI

- MCIpa usages
  - Visual representations can be understand by a large number of people
  - Standard media player,
  - musical education,
  - comparative musicology (cnfr Ircam mediatheque),
  - musician practicing tool (playing over Aebersold records),
  - research purposes (quick visualization of results)
  - annotation

- Available at
  - http://recherche.ircam.fr/equipes/analyse-synthese/peeters/mcipa/