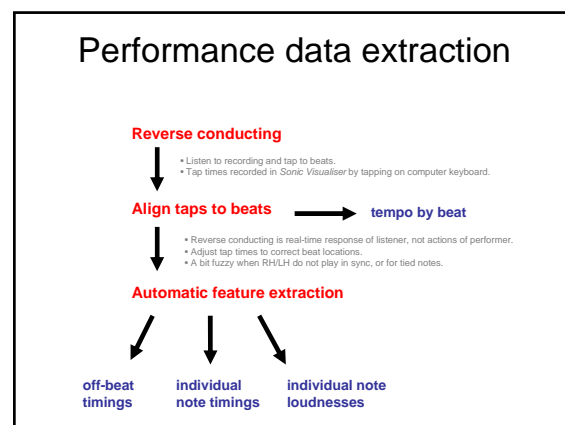
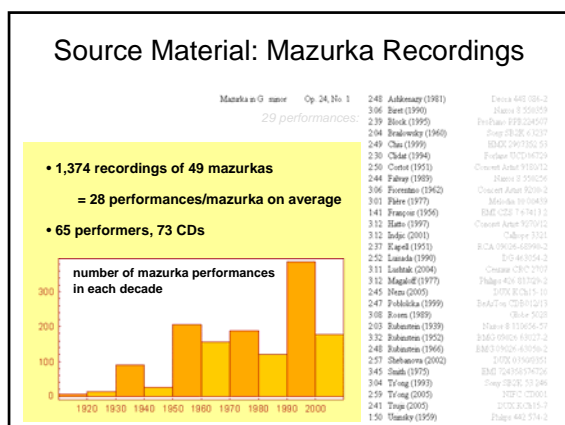
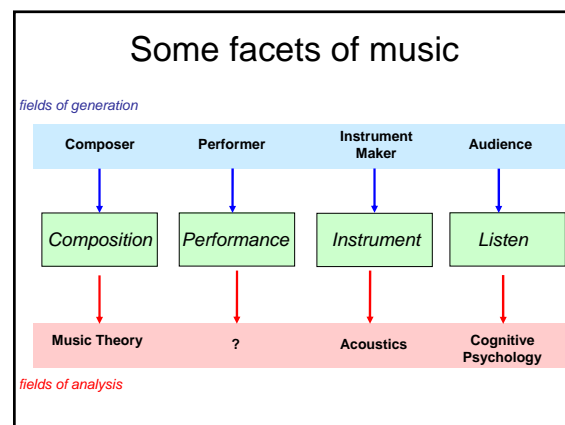


The Mazurka Project Overview

Craig Stuart Sapp
Centre for the History and Analysis of Recorded Music
Royal Holloway, University of London

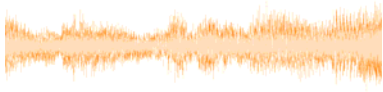


CHARM Advisory Board Meeting
Institute for Historical Research,
School of Advanced Study,
UL Senate House, London
12 Dec 2006

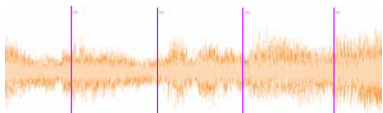


Reverse conducting

- Mazurka project using an audio editor called Sonic Visualiser (SV): <http://sonicvisualiser.org>

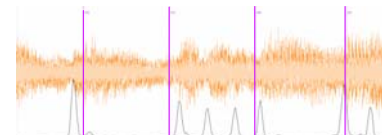


- In SV, you can mark points in time while the audio is playing:



Beat alignment

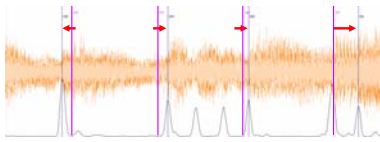
- Taps from reverse conducting are not exactly aligned with the performance. *primarily due to constant changes in tempo*
- How to adjust to actual note attacks?
- Can be difficult to do by eye in audio editor.
- Very time-consuming to do by ear.
- Solution: audio markup plugins in SV to help locate note attacks:



such as: <http://sv.mazurka.org.uk/MzAttack>
and <http://sv.mazurka.org.uk/PowerCurve>

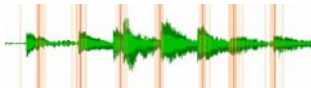
Beat alignment (2)

- With visual aid of markup, correction becomes easy to do by eye:



Example:

- = tapped times
- = aligned to beats



Automatic feature extraction

- Tapped beats linked score:



1912	4r	4ee
=1	=1	=1
2558	4r	8ff
3021	-	16ee
3175	4A 4d 4f	4dd
3778	4A 4d 4f	4ff
=2	=2	=2

- Estimate times of notes in recording

note onset	rotated duration	pitch (MIDI)	metric level	measure	absbeat	hand
1912	646	76	1	0	0	2
2558	463	77	0	1	1	2
3021	154	76	-1	1	1.75	2
3175	603	57	0	1	2	1
3175	603	62	0	1	2	1
3175	603	65	0	1	2	1
3175	603	74	0	1	2	2
3778	652	57	1	1	3	1
3778	652	62	1	1	3	1
3778	652	65	1	1	3	1
3778	652	77	1	1	3	2

- Automatic alignment and extraction of note onsets and loudnesses with program being developed by Andrew Earis.

MIDI Performance Reconstructions

"straight" performance



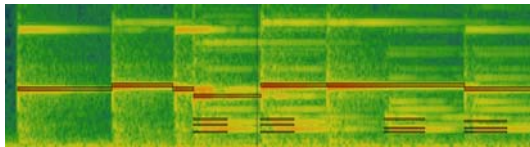
matching performers tempo beat-by-beat:



tempo = avg. of performance

(pause at beginning)

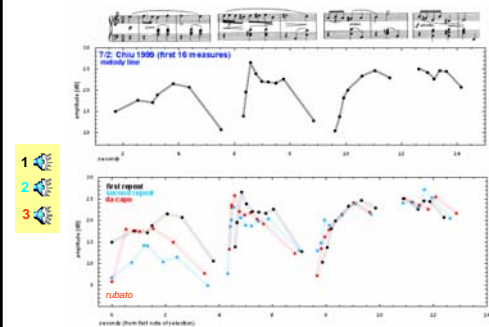
MIDI file imported as a note layer in Sonic Visualiser:



- Superimposed on spectrogram
- Easy to distinguish pitch/harmonies
- Legato; LH/RH time offsets

original recording

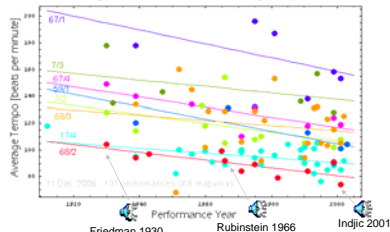
Dynamics & Phrasing



Average tempo over time

- Performances of mazurkas slowing down over time:

Average Tempo v Performance Year by Composition

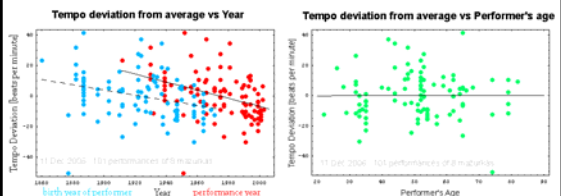


- Slowing down at about 3 BPM/decade

Laurence Picken, 1967: "Central Asian tunes in the Gagaku tradition" in *Festschrift für Walter Wiora*, Kassel: Bärenreiter, 545-51.

Average Tempo over time (2)

- The slow-down in performance tempos is unrelated to the age of the performer



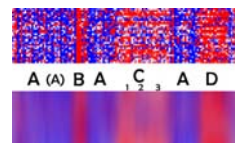
Tempo graphs



Mazurka Meter

- Stereotypical mazurka rhythm:
 - First beat short
 - Second beat long

Mazurka in A minor
Op. 17, No. 4

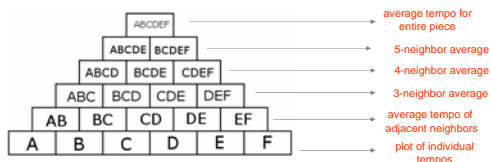


■ measure with longer second beat
■ measure with longer first beat

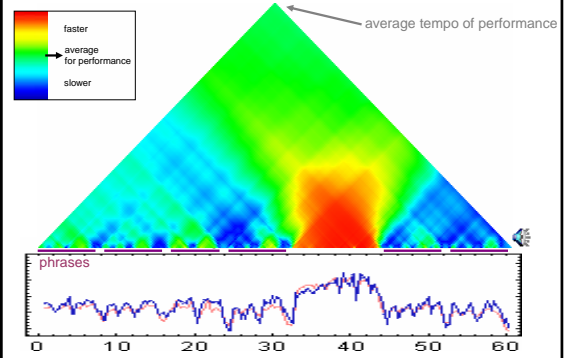
• blurred image to show overall structure

Timescapes

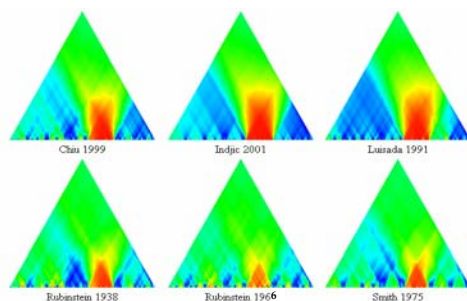
- Examine the internal tempo structure of a performance
- Plot average tempos over various time-spans in the piece
- Example of a piece with 6 beats at tempos A, B, C, D, E, and F:



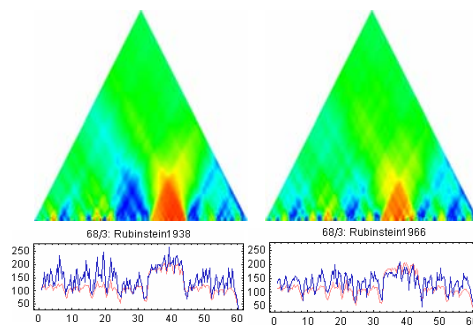
Timescapes (2)

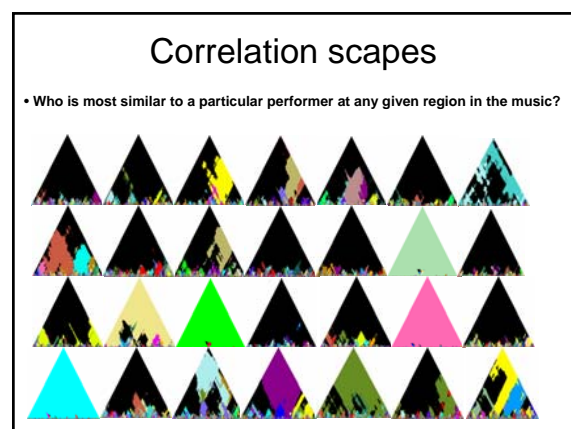
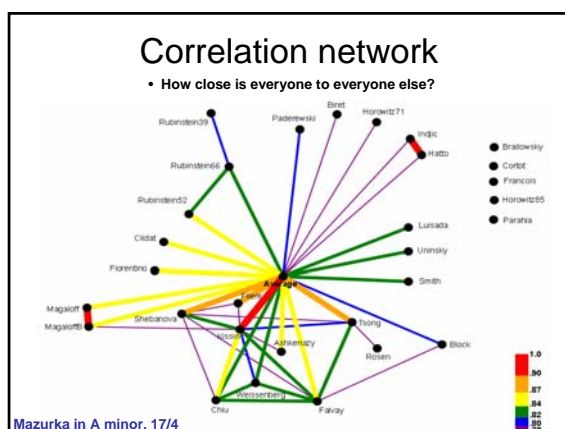
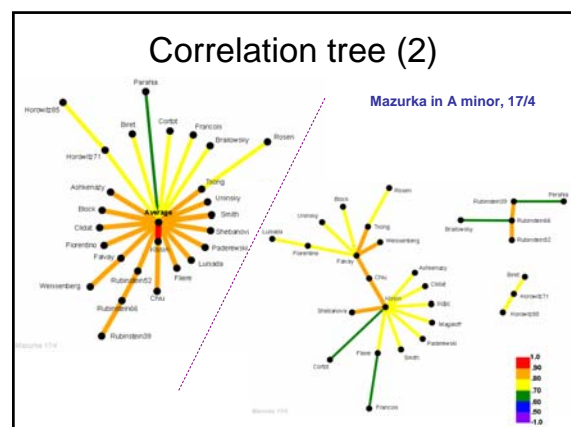
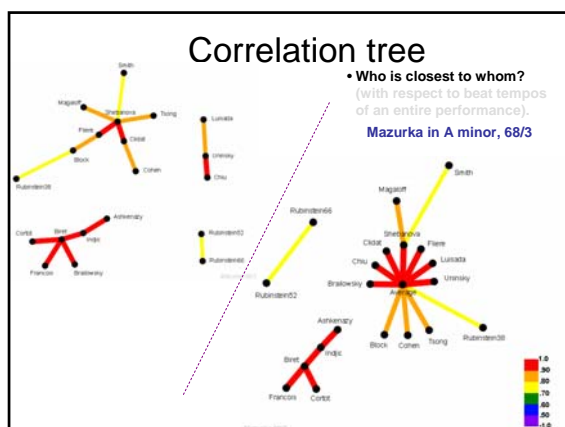
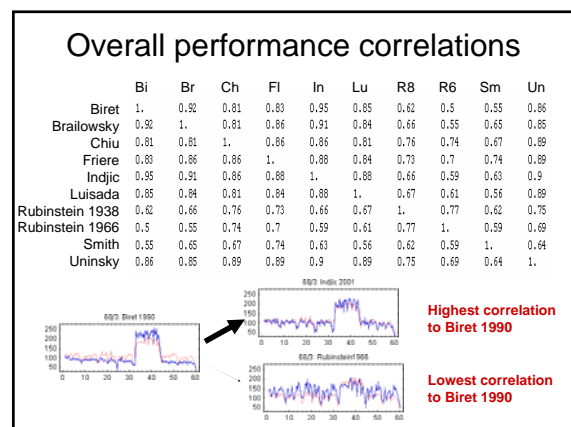
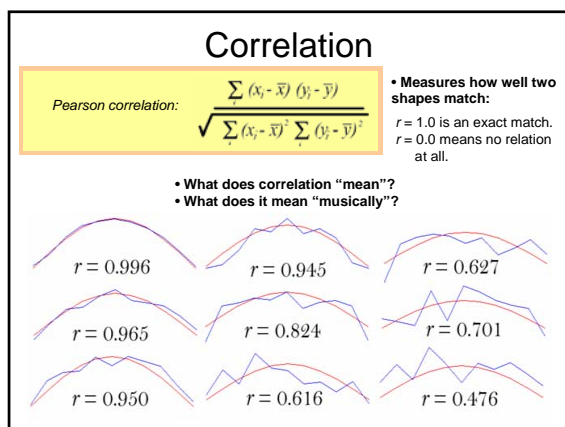


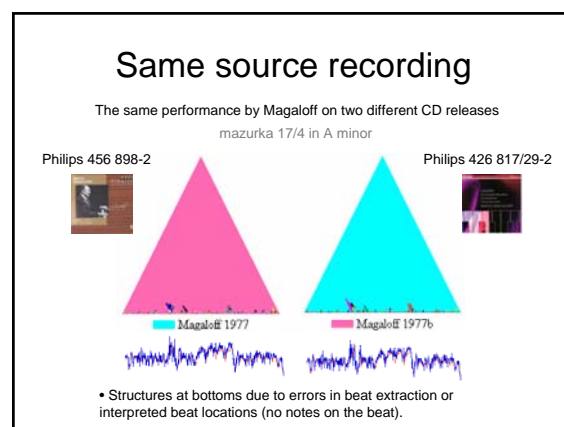
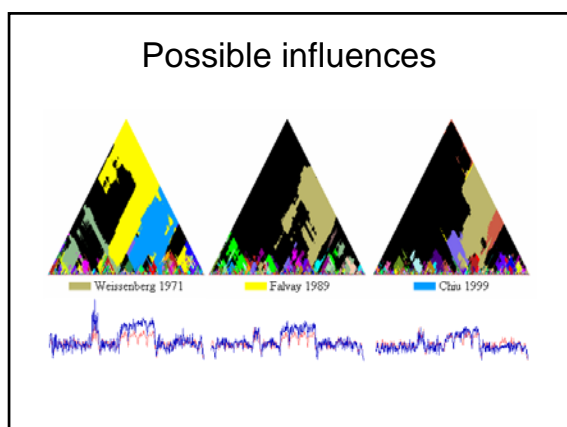
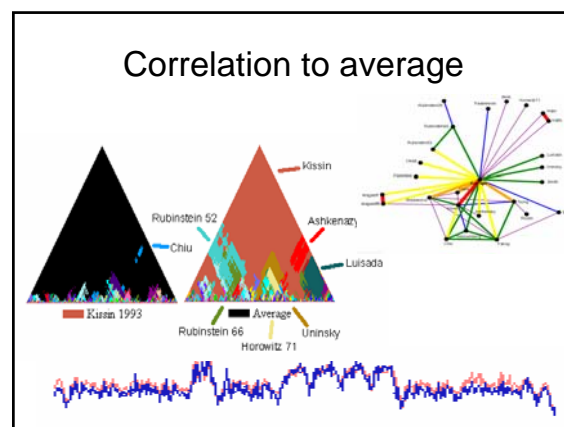
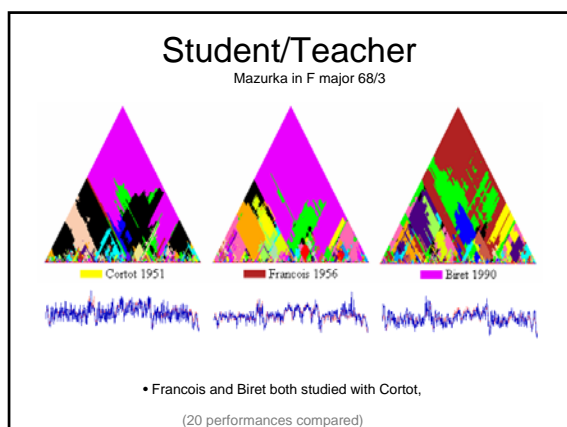
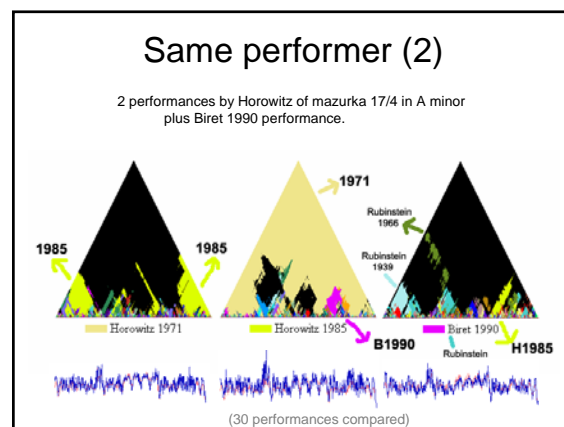
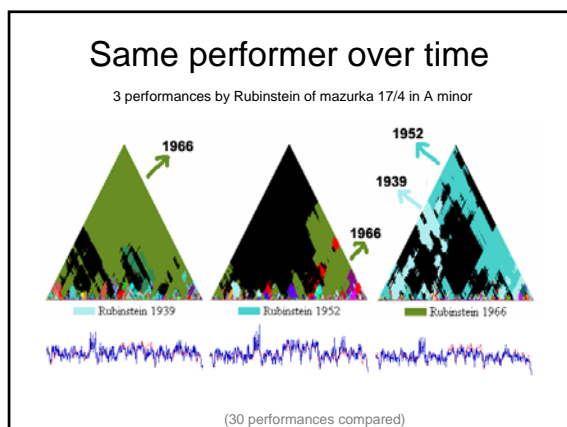
Comparison of performers



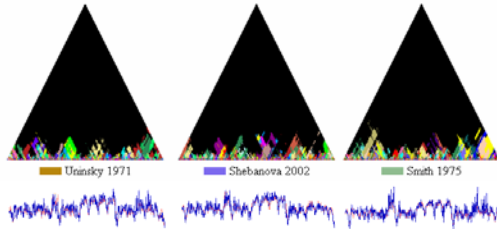
Same performer







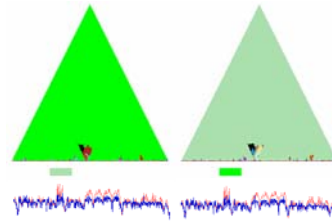
Individual interpretations



- Idiosyncratic performances which are not emulated by other performers.
(or I don't have performances that influenced them or they influence)

Purely coincidental

Two different performances from two different performers on two different record labels from two different countries.



For further information



<http://www.charm.rhul.ac.uk/>

<http://mazurka.org.uk>