

Man – Machine synchronization

with Antescofo



Jean-Louis Giavitto

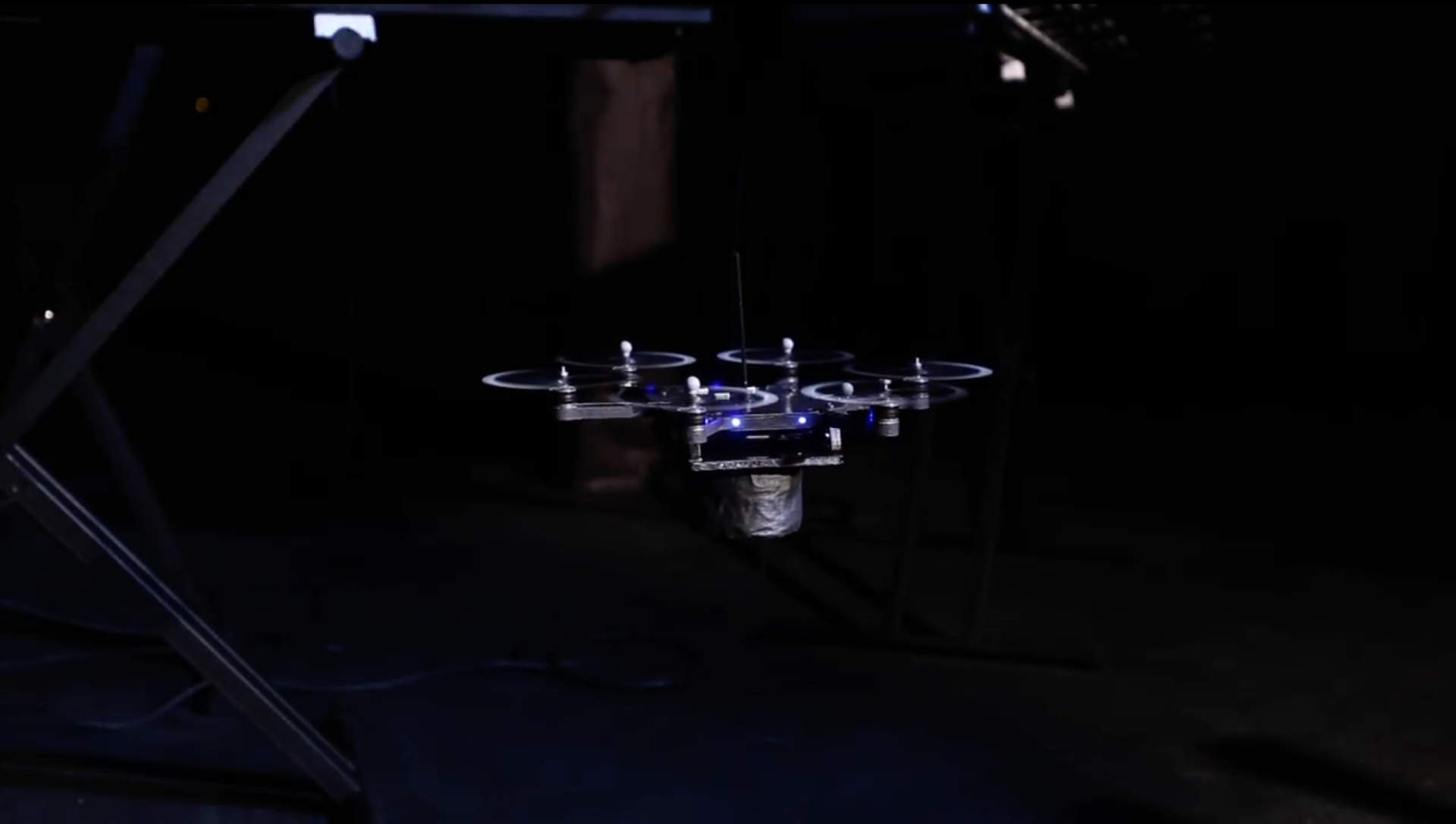


Is a computer able to...

- play chess
- check a mathematical proof
- find a path from A to B in a city
- ...
- recognize a smiling face
- walk on two legs
- ...
- *play music together with human performers—*



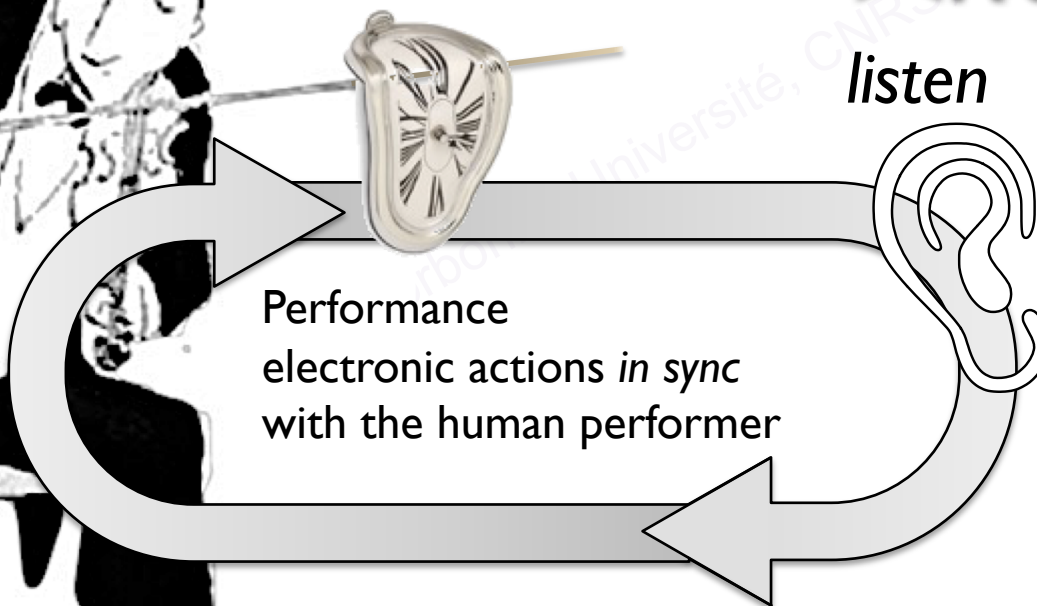
Vivre Le temps à plusieurs : se synchroniser



Mixed Music



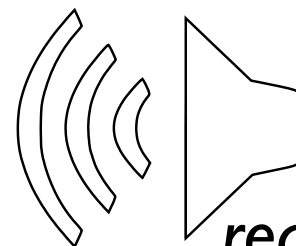
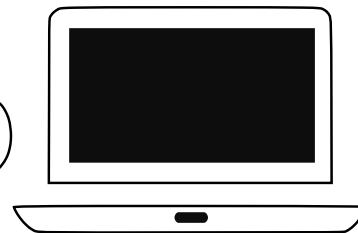
Antescofo



Performance
electronic actions *in sync*
with the human performer

listen

recognize



react
(on? in? time)

A good idea in Score Following (Arshia Cont, 2008)

a score following system

machine listening

real-time programming
language

audio-to-score
alignment

pitch detection +
tempo estimation

synchronous
programming
(event)

timed system
(duration)

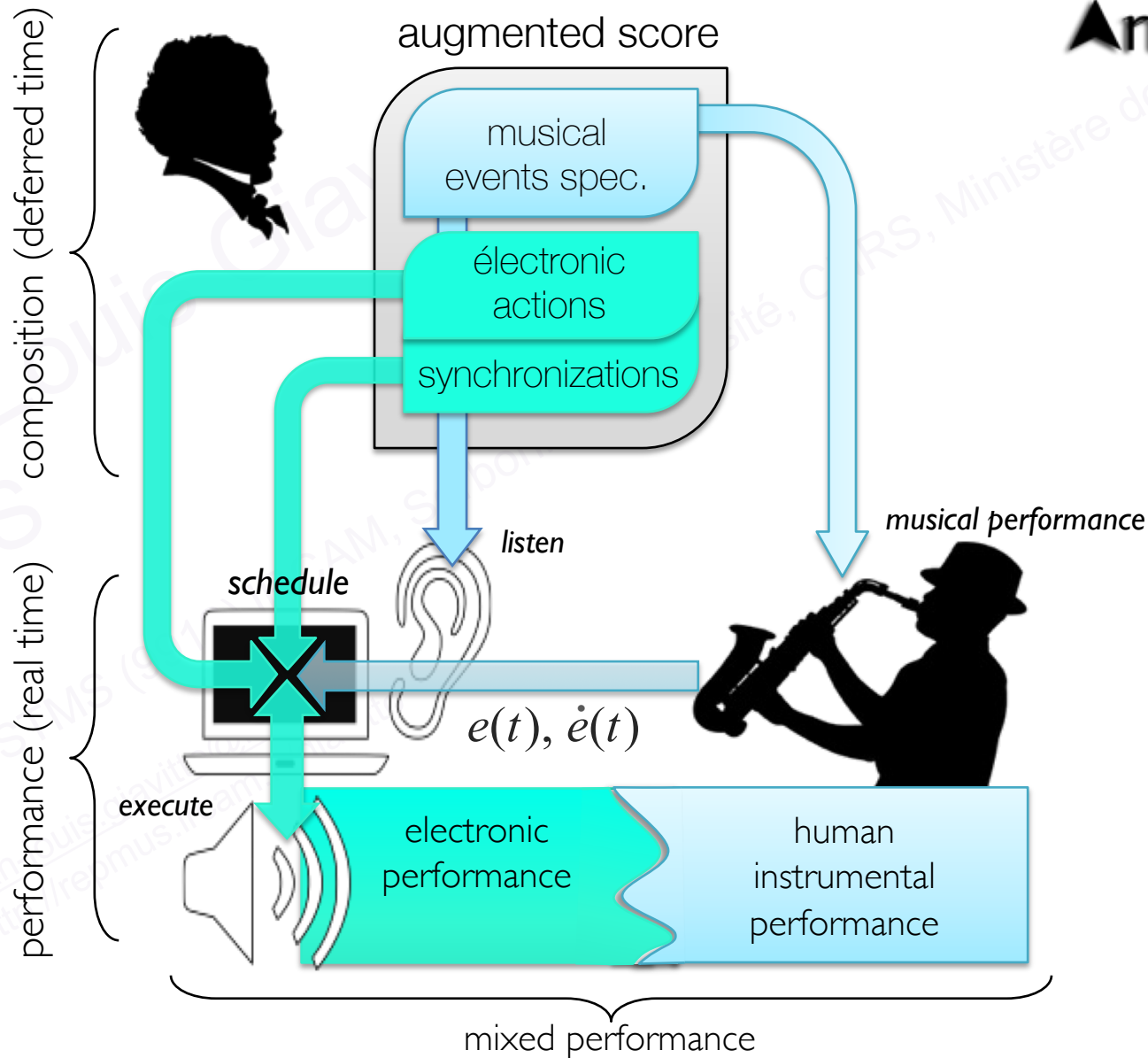
The Metronaut application

La Culture

Tesla ou l'effet d'étrangeté Julia Blondeau (2014)

alto: Christophe Desjardins, real-time electronic: Antescofo

Antescofo mixed-music's approach



Computer music as an experimental enquiry in temporal concepts — how do we organize our time together

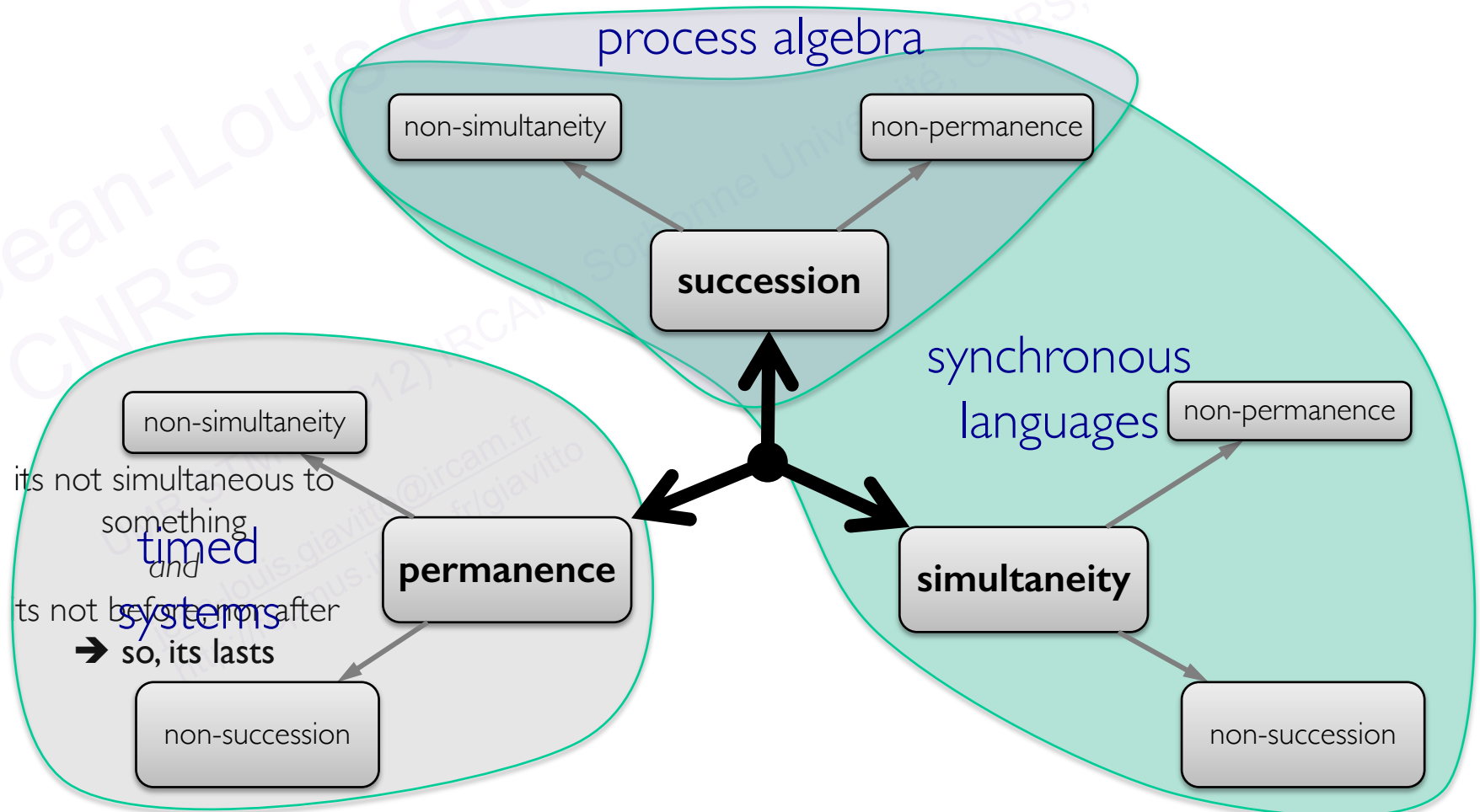
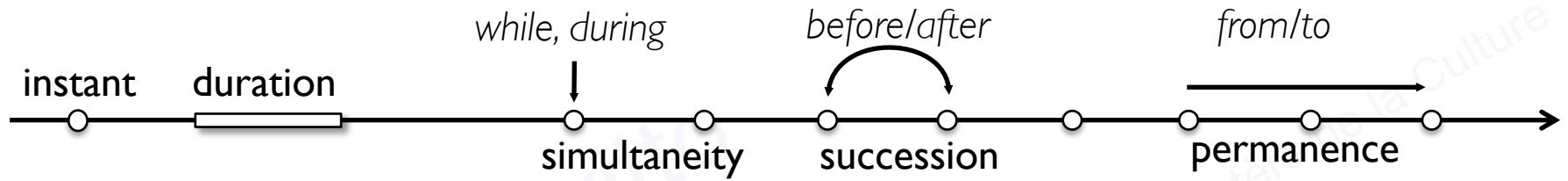
- Music makes time audible, and its form and continuity sensible (S. Langer)
- But, if music is the paradigmatic “art of time”, for which kind of time is music an art?
- *Real musical time is only a place of exchange and coincidence between an infinite number of different times.* (Gérard Grisey, *Tempus Ex Machina: A Composer’s reflections on musical time. Contemporary Music Review*, 1987)
- Test the relevance and the effectiveness of temporal notions in musical applications

Expressing Time in Antescofo



SHORPY

Instant and Duration: Simultaneity, Succession & Permanence



Can we deal with *instants* only?

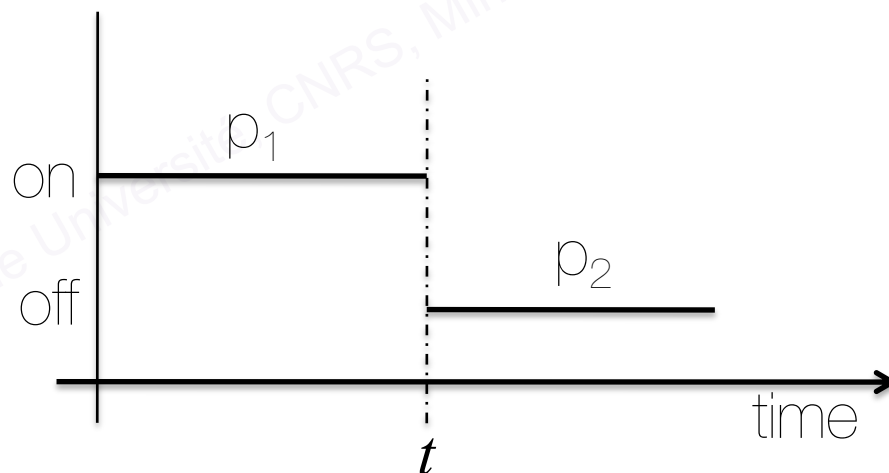
→ duration as a set of contiguous instants

- evenemential-time

versus

- the fluxion: continuous passage of time
 - going twice faster
 - finishing together
 - accelerando
 - rubato
 - tempo
 - etc...

Can duration be reduced to instant? (in temporal logic)

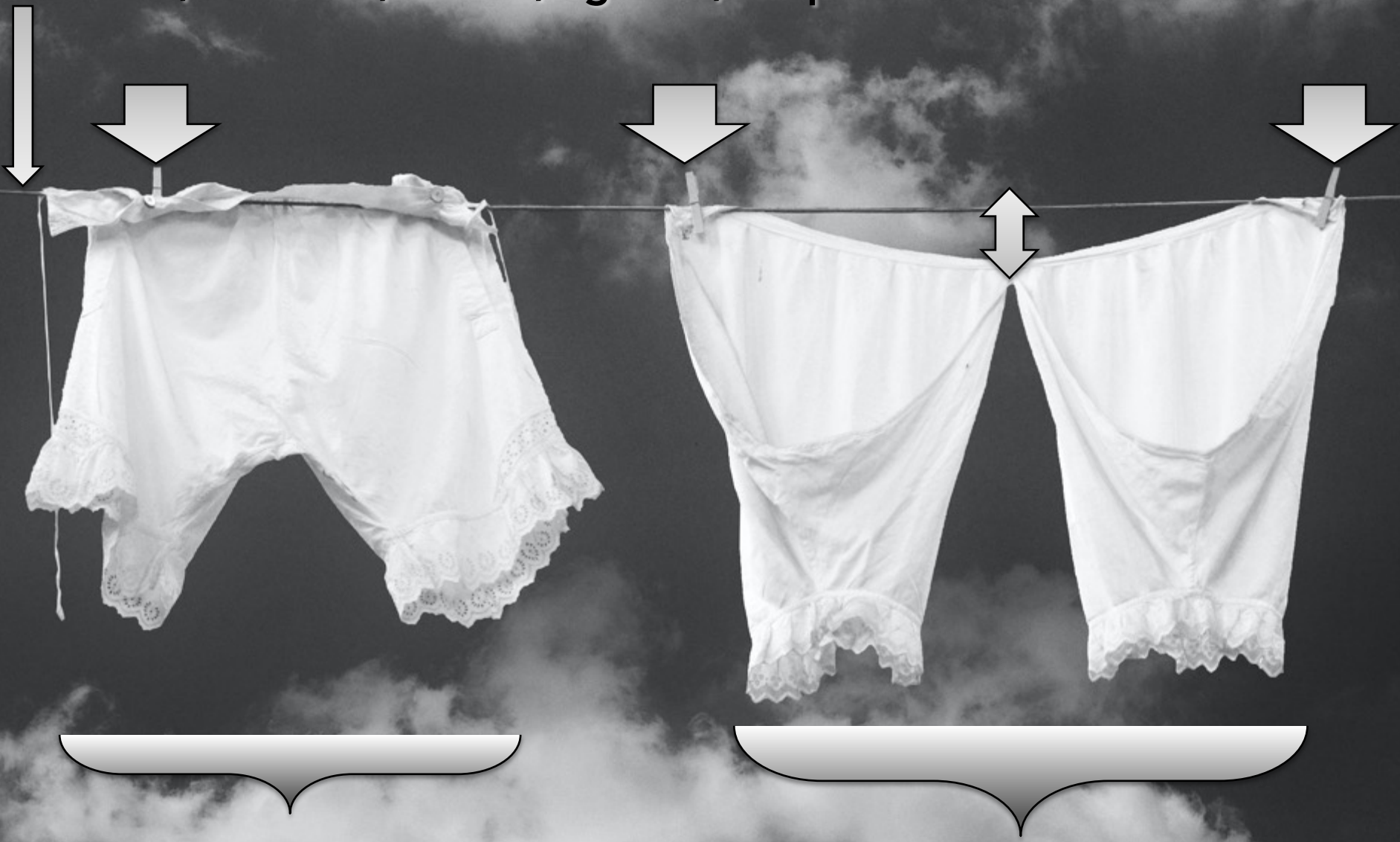


doing real analysis and topology

or

making instant and duration
primitive notions

Timeline, calendar, cuelist, agenda, script... are *clotheslines*



Instant and event in real time



past event are
imutables

an (atomic) event
takes place at
one instant

futur event
are undetermined
(but sometimes can be
anticipated)

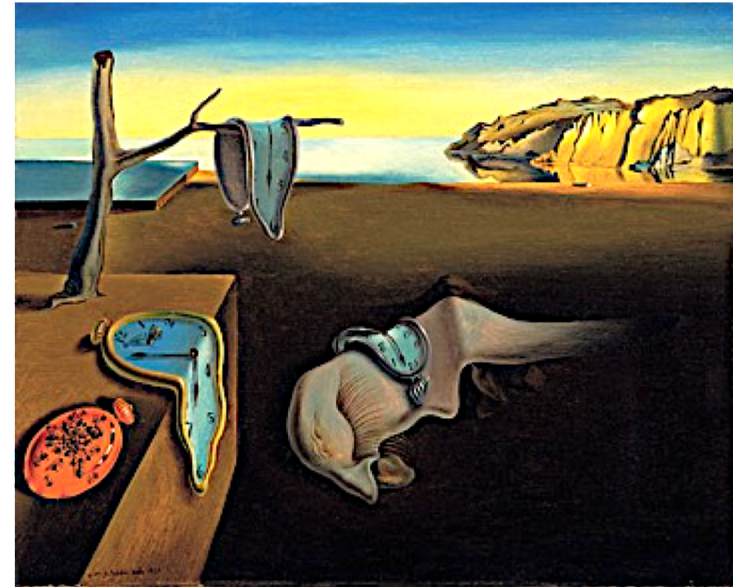
Jean-Louis Giavitto
CNRS

(2012) IRCAM, Sorbonne Université, CNRS, Ministère de la Culture
jean-louis.giavitto@ircam.fr
<http://www.jlgiavitto.com>

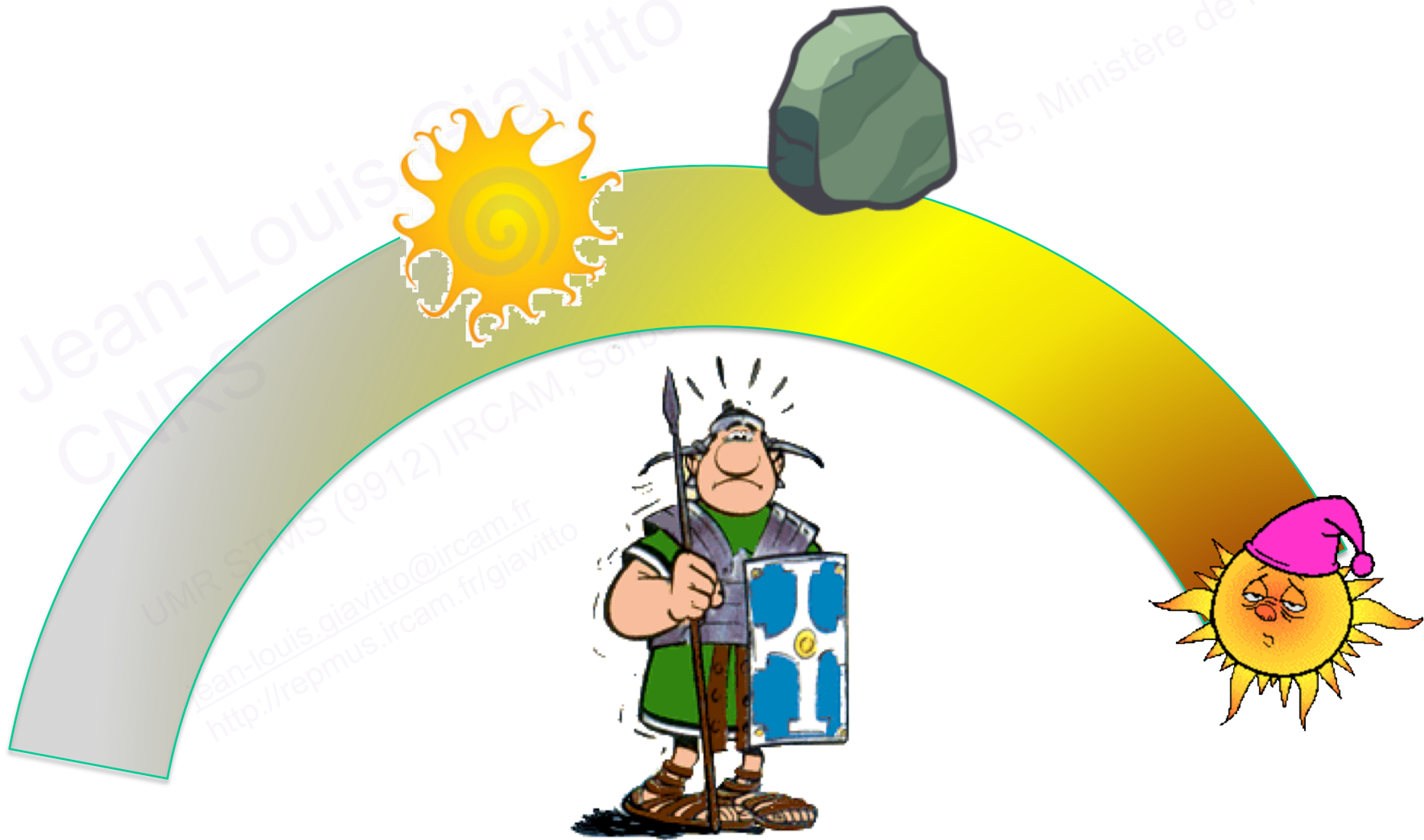
DATATION VS. TEMPORAL RELATIONSHIPS

From a global shared chronometric time to a relational distributed relative time

- chronometric, commensurable, time
 - events are localized in a preexisting coordinatized time
 - newtonian time, commensurable units
 - a shared prescription
- Multiple relational times: co-dependending relative clocks
 - events *make* times
(Bluedorn : epochal timedefined by events)
 - leibnizian time, relationnal
 - Examples :
 - score/performance relationships
 - quatuor vs. ensemble vs. orchestra



Summer hours and winter hours in Rome



cue-list dated events (chronology)

- 2 datation systems
 - page number in the script
 - act/scene/dialog
- pre-existing
- inter-convertible

SOUND EFFECTS

Act 1

| | | | |
|-----|-----------------------------|----------|-----|
| 1. | Clock ticking fade in | Digital | p3 |
| 2. | Clock chiming 12 | Digital | p3 |
| 3. | Knocking from below | Live, SL | p9 |
| 3.5 | Clock ticking boost | Digital | p9 |
| 3.7 | Clock ticking back down | Digital | p9 |
| X | Masha Bangs plate with fork | X | p25 |
| X | Top makes "amazing sound" | X | p26 |

Act 2

| | | | |
|-----|---------------------------|----------|-----|
| X | (Clock ticking continues) | X | p29 |
| 4. | Doorbell | Live, SR | p33 |
| 5. | Wind fade in | Digital | p34 |
| 6. | Wind fade up | Digital | p35 |
| 7. | Wind fade down | Digital | p35 |
| 8. | Knocking from below | Live, SL | p36 |
| X | Tuzenbach knocks on floor | X | p37 |
| 9. | Wind fade up | Digital | p41 |
| 10. | Wind fade out slowly | Digital | p42 |
| 11. | Doorbell, twice | Live, SR | p50 |
| 12. | Doorbell | Live, SR | p50 |
| 13. | Sleigh Bells | Live, SR | p51 |
| 14. | Doorbell | Live, SR | p51 |
| 15. | Doorbell | Live, SR | p52 |
| 16. | Clock ticking fade out | Digital | p53 |

Act 3

| | | | |
|-----|-----------------------------------|---------|-----|
| 17. | Church bell / fire alarm fade in | Digital | p54 |
| 18? | [cart goes by house] | Digital | p55 |
| 19? | [fire alarm?] | Digital | p58 |
| 20? | [fire alarm?] | Digital | p62 |
| 21? | [fire alarm?] | Digital | p72 |
| 22. | Church bell / fire alarm fade out | Digital | p72 |

Act 4

| | | | |
|-----|-------------------------|---------|-----|
| 23. | Birds ambience fade in | Digital | p73 |
| 24. | Gunshot | Digital | p90 |
| 25. | Birds ambience fade out | Digital | p94 |

Cue-list of events related by temporal relationships

| Q | Event | Notes |
|---------|--|--|
| Q 1 | Preshow | |
| Call On | Before House is Open | Page 3 |
| Q 5 | Preshow Announcement / Into | Notes "Together" High City Skyline ambience - ritzy high-rise apartment |
| Call On | When Ready | Page 3 |
| Q 10 | Door Close | Notes |
| Call On | Before Kate: "Hello?" | Page 9 |
| Q 15 | Phone Ring (TELECUE?) | Notes |
| Call On | "Maybe that's the need." | Page 13 |
| Q 28 | Transition Lead In | Notes |
| Call On | "I'm worried about Sylvia at the moment" | Page 19 |
| Q 30 | Into Scene 2 - Park | Notes "Together" Reprise. Ends on Central Park Ambience - Maybe something with a lead in to underscore before here |
| Call On | "Hamlet Act III" GO | Page 19 |
| Q 30.5 | End of Transition | Notes |
| Call On | Set in Place | Page 19 |
| Q 31 | Dog Barks Bed | Notes |
| Call On | "Play!" GO "Run Around" | Page 22 |
| Q 31.5 | Bowser Aggressive Barks | Notes |
| Call On | "Bowser and Sylvia" | Page 22 |
| Q 32 | Bowser Barks | Notes Short, Fun |
| Call On | "Look out Bowser, here I come." | Page 22 |

- temporal relationships
 - before/after
 - during
- beyond total order
- some events are incomparable
- how to give a date to an event? (must be done in real-time)

Datation in Antescofo

date = delay relative to an event :

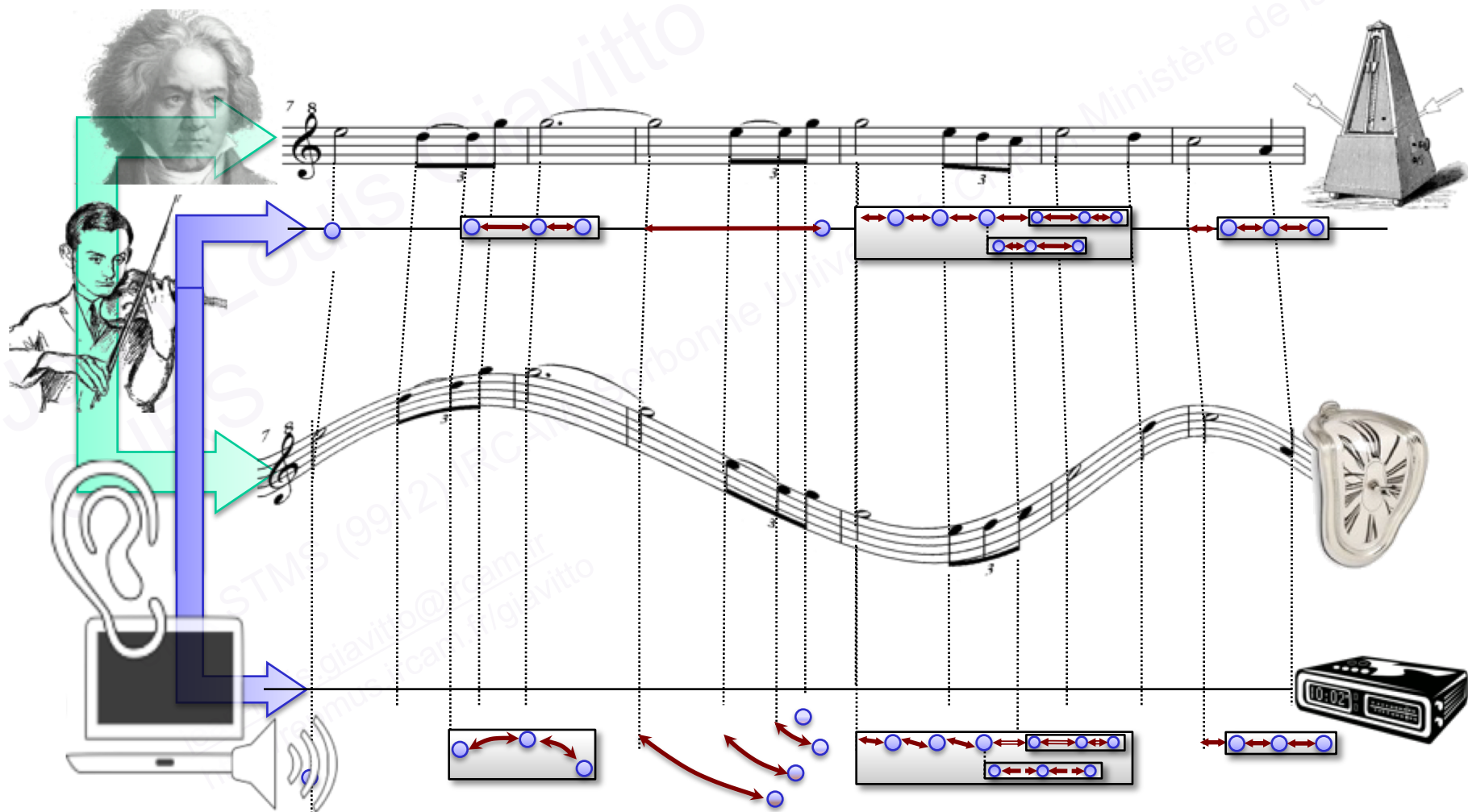
- events are
 - *musical events*
specified in the score and detected by the listening machine
 - *logical events*
defined by a predicate on program's variables
 - *introspective events*
« some process has died », « some curve reach this point » ...
 - *environmental events*
 - Max/PD messages
 - OSC messages
- delay are
 - *relative* to a tempo
 - tempo is *dynamic*
 - tempo is *inferred from events*

Interpretation :
reconciling abstract
score and concrete
performance

TIMELINE



The Multiples Times of Temporal Scenarios



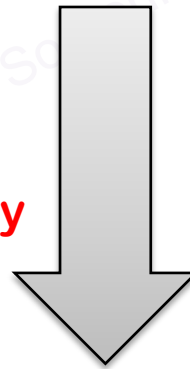
performance = progression on a timeline
with respect to the progression on another one



reference timeline



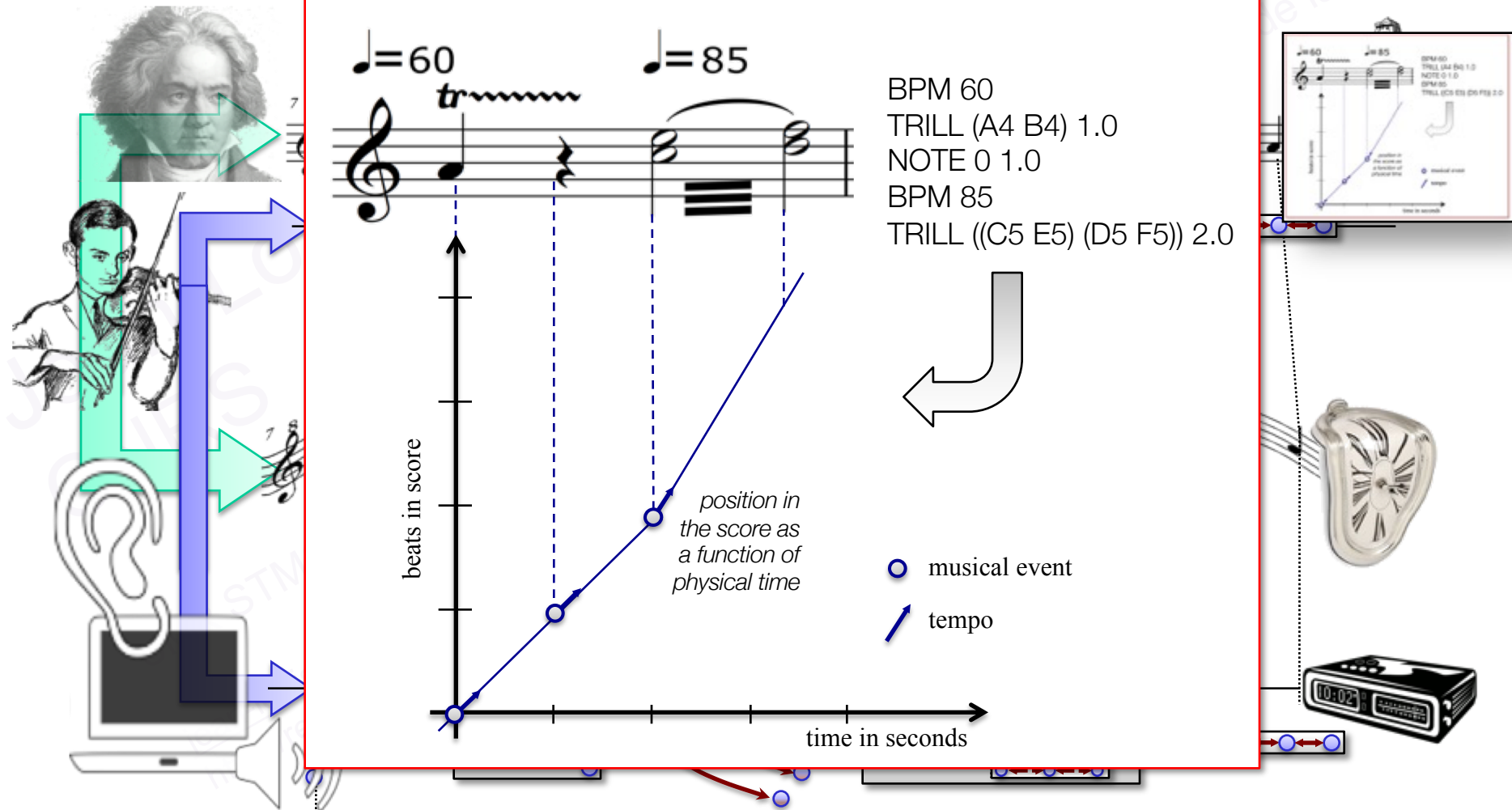
temporal scope
=
reference +
synchronization strategy



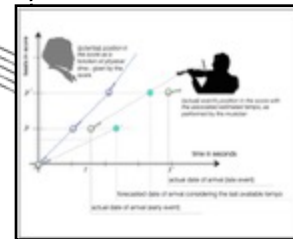
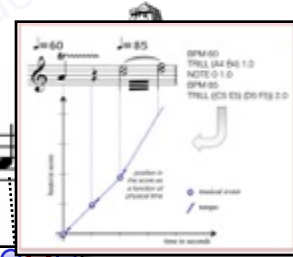
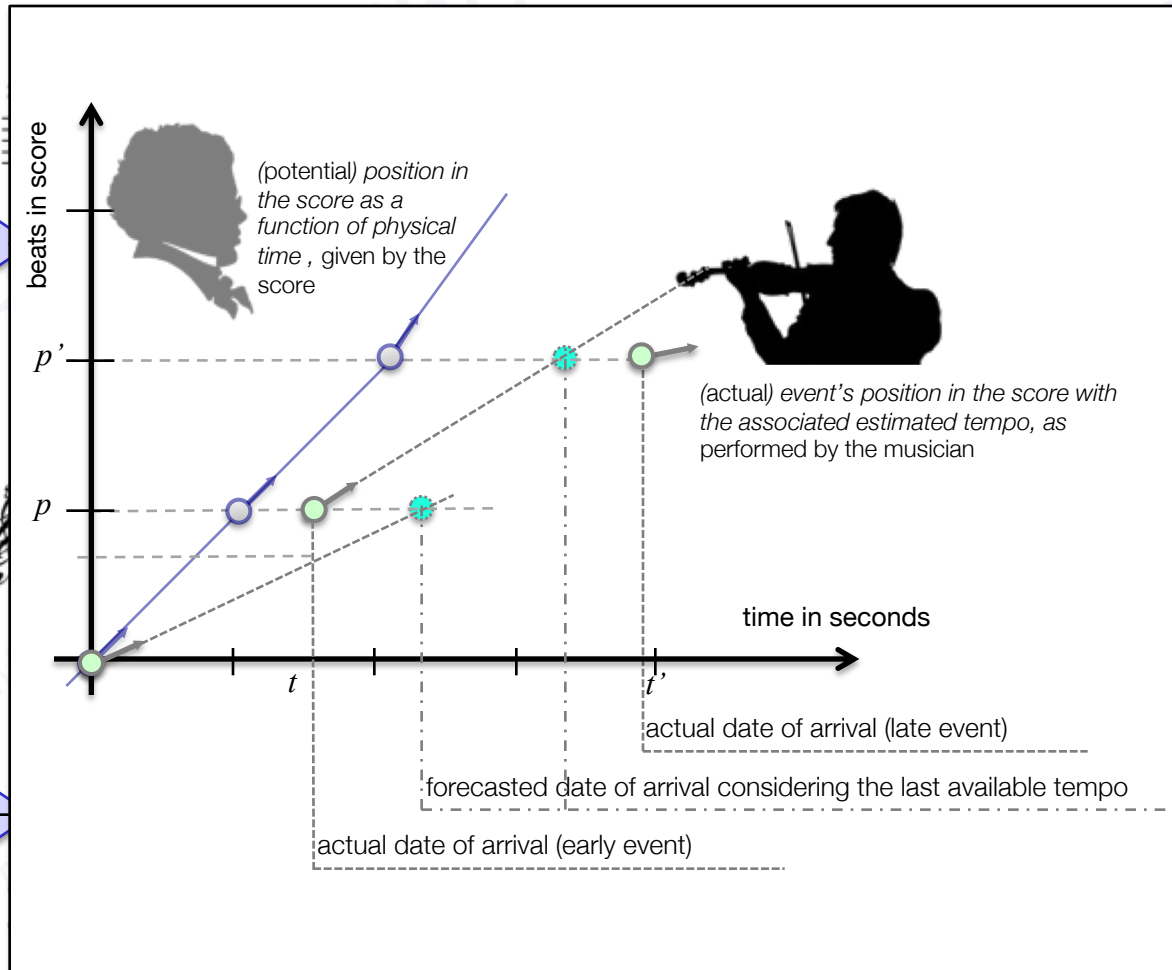
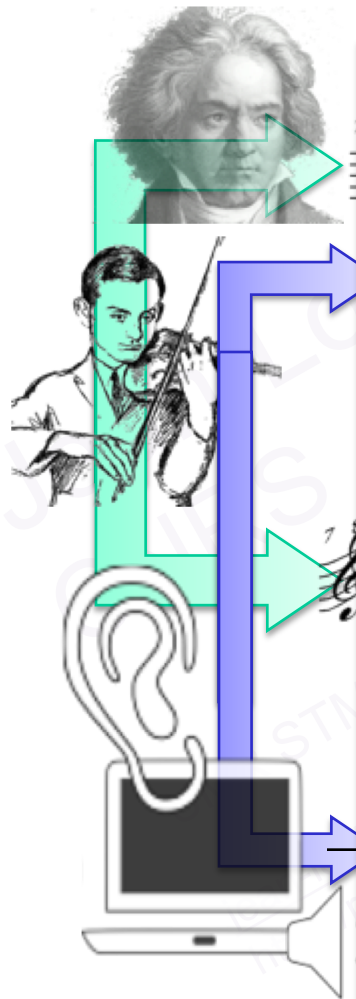
synchronized timeline



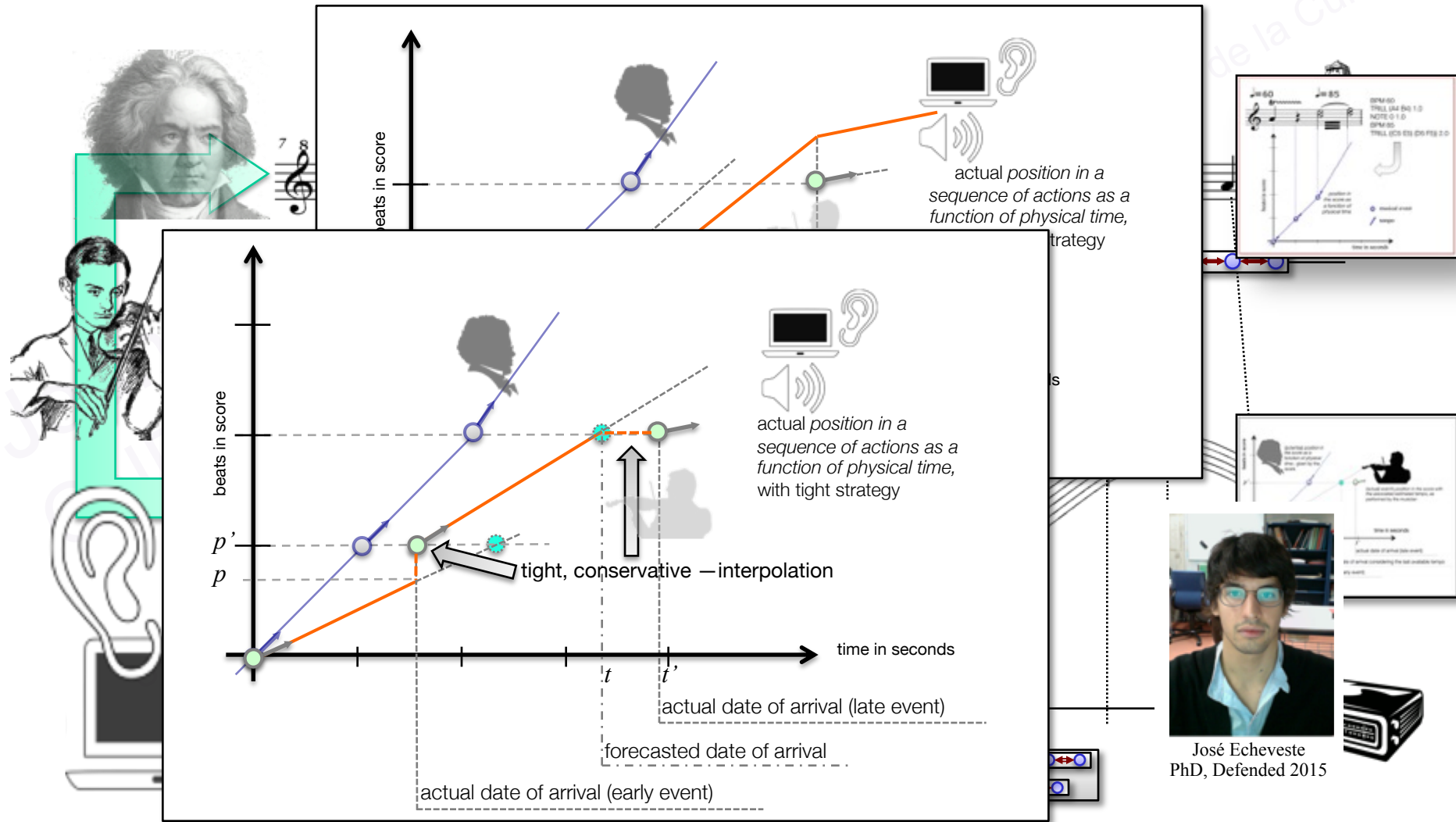
Time-time diagrams



Time-time diagrams



Time-time diagrams



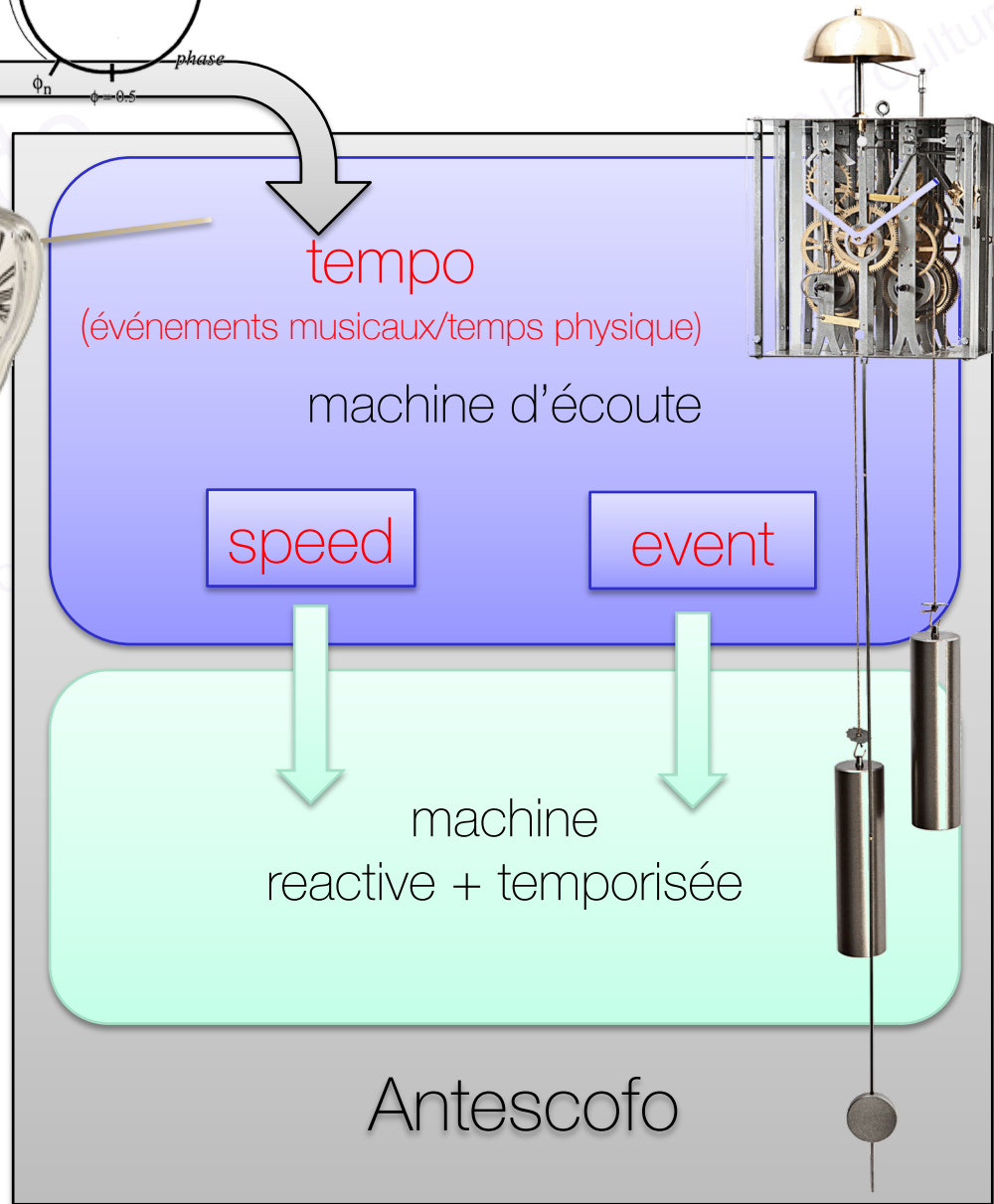
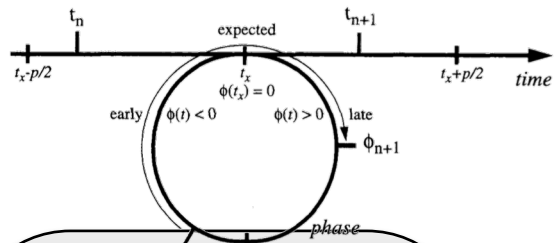
Temps strié et temps lisse (P. Boulez)

Bernard Hermann, *Psycho* (1960)

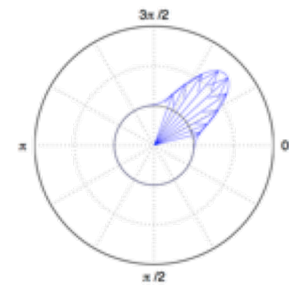
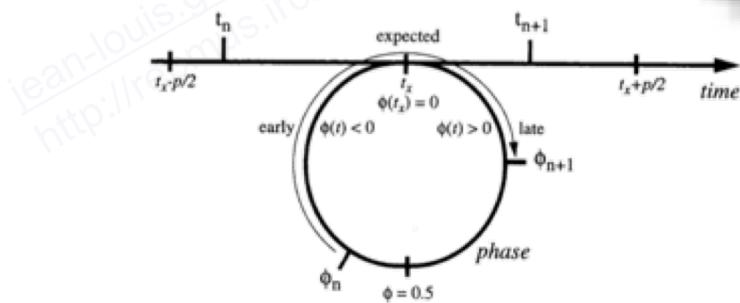
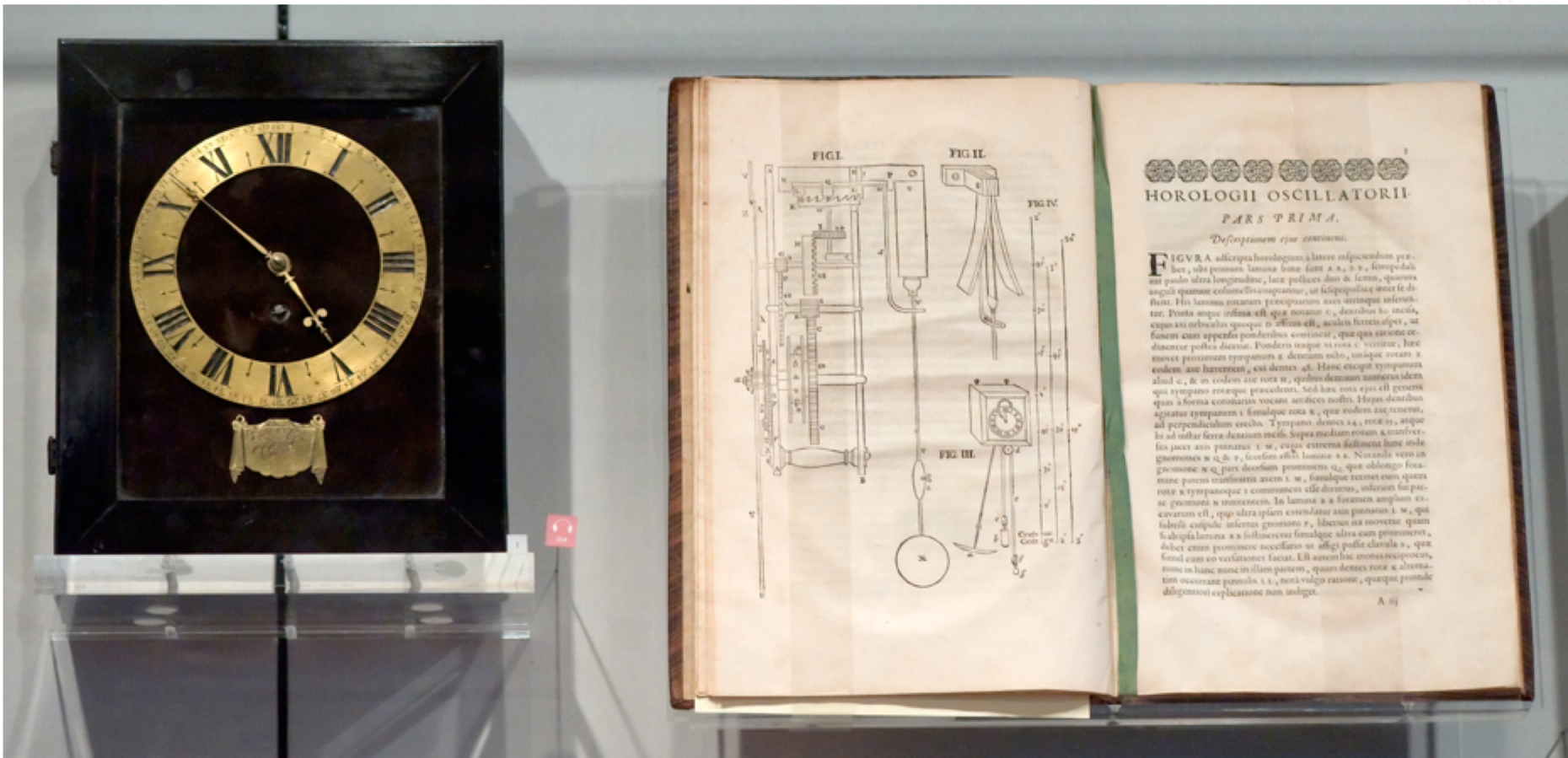


György Ligeti *Lontano* (1967)



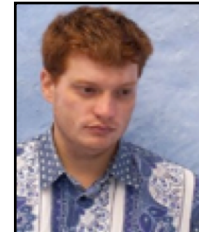


Inférence du tempo et sympathie des horloges



Christopher Trapani

real-time rhythmic canon à la Nancarrow



start

Clarinet in B♭

start'

[playback]

Cl.

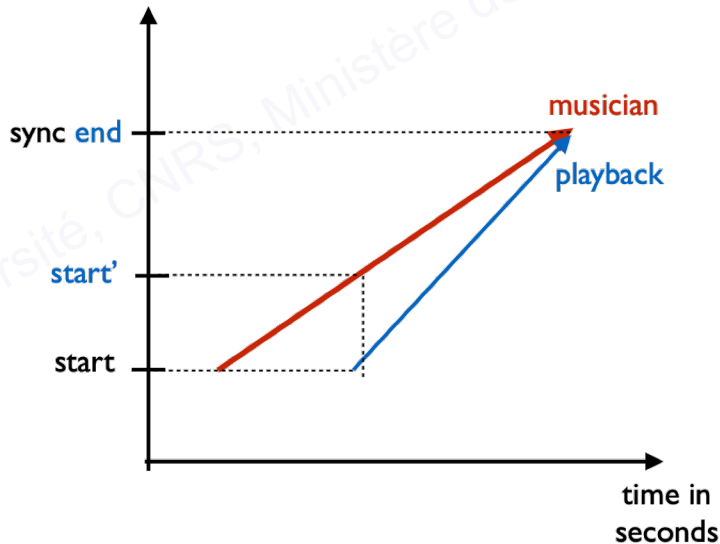
Cl.

sync

end

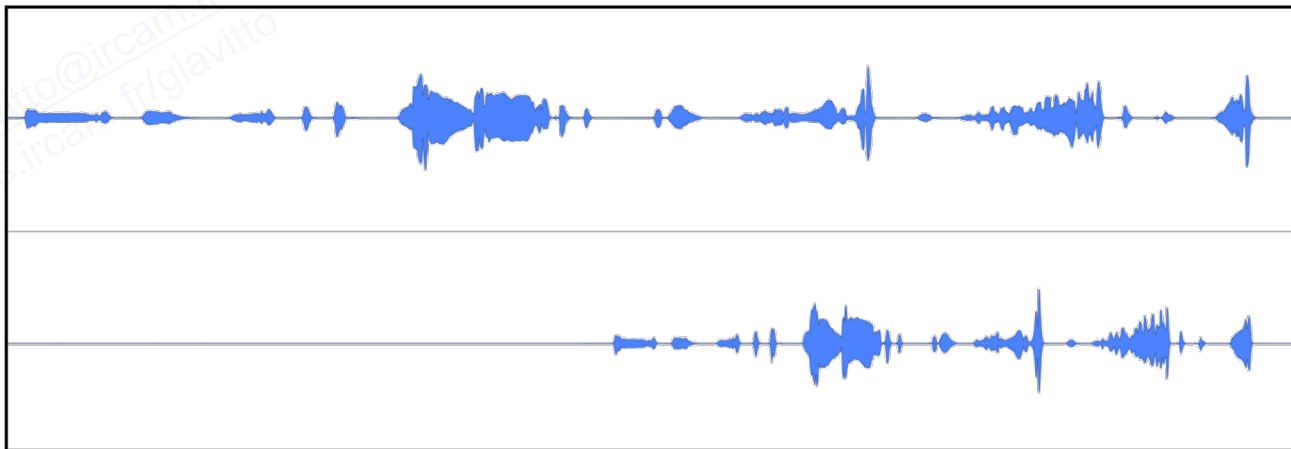
Cl.

position in beats
in the score



musician

playback



Christopher Trapani

real-time rhythmic canon à la Nancarrow

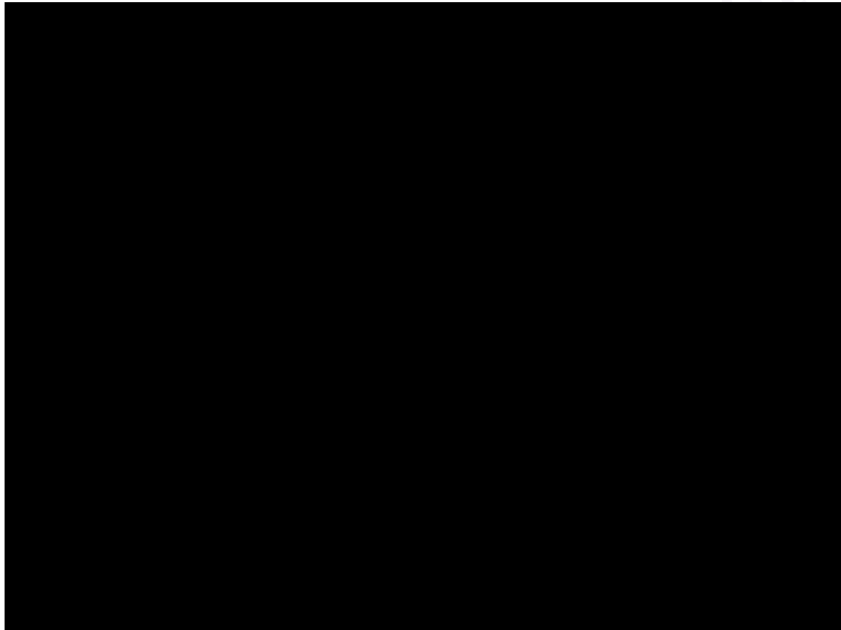
SCORE in C

Sketch — ~~7 Nov~~ 2012

3 DEC

CHRISTOPHER TRAPANI

[X] markers to be placed by Antescofo
 [X] possible convergence points



ca. ♩ = 108

Clarinet in B \flat

1B

1 -> A 3/5

gliss. 'pizz.'

f > mp > p

pp

mf-p

Cl.

A 2

1B -> A point d'entrée défini

B 3

sub. sfz f ppp

p

mf

pp

sfz f

n < p

Cl.

C 4

3 -> D 7/11

8

6

7

mf

ppp

Cl.

D 5

2 -> B point d'entrée défini

1B -> A point d'entrée défini

12

3

3

3

sfz mf pp

n

pp

p

5

Cl.

E 6

16

tongue -slap

3

6

6

5

3

3

sub. mf

p > pp

mf

pp

gliss.

Cl.

7

19

3

7

5

p

pp

mp

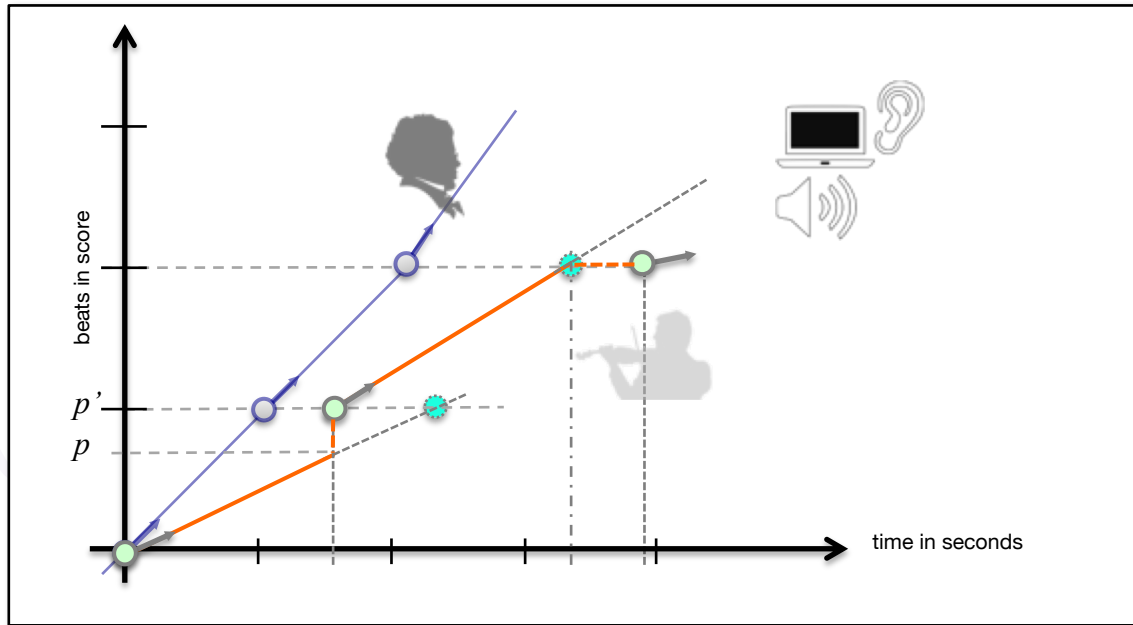
p

pp

p

pp

n



FUNGIBLE TIMES OR INCOMPARABLE TIMES ?

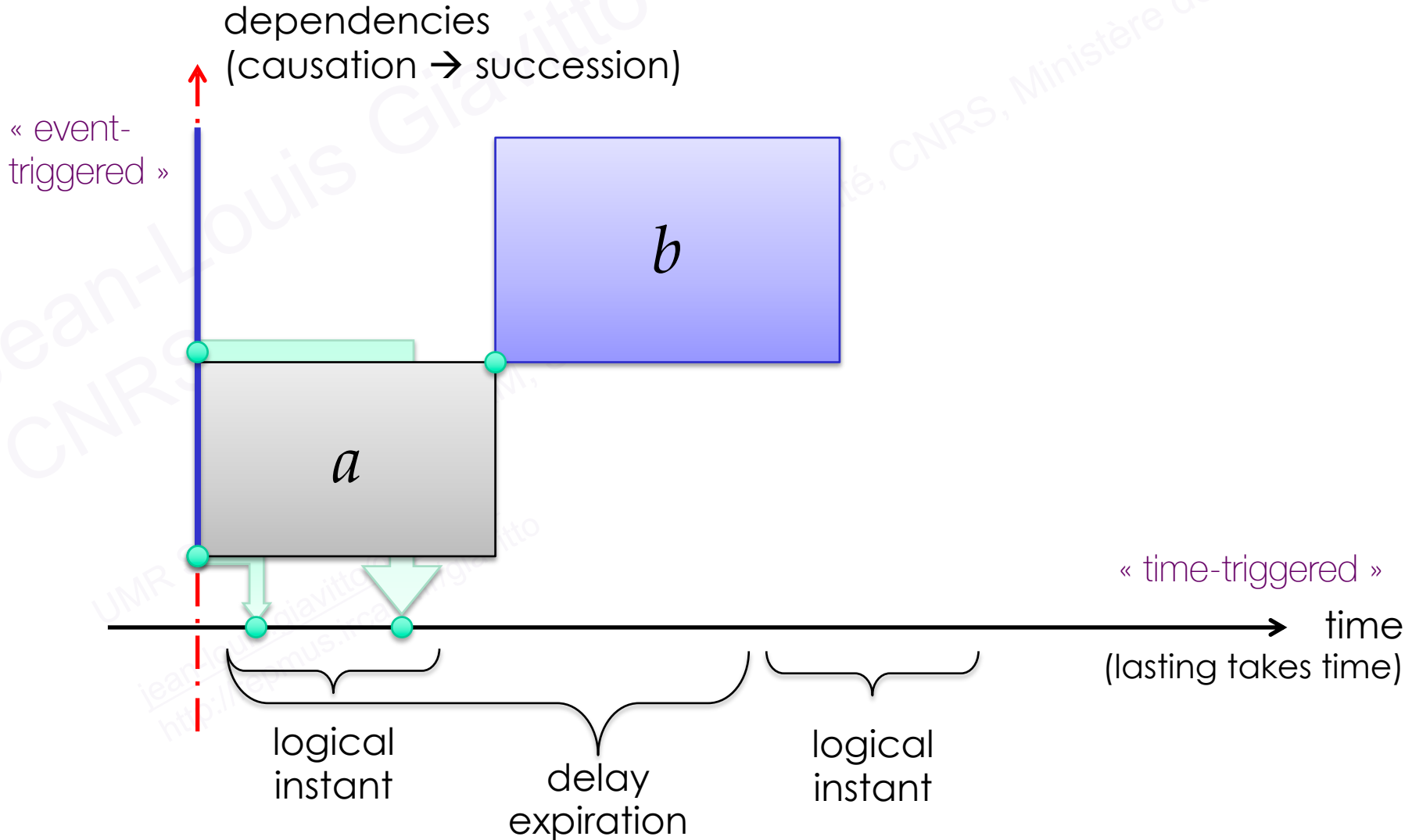
Jean-Louis
CNRS
UMR STMS (9912) IRCAM, Sorbonne Université
jean-louis.giavito@ircam.fr
<http://remonts.ircam.fr/giavito/>

de la Culture

Subordination of the objective time to the subjective ones and *not the reverse!*

- shared events are not enough:
duration is not reducible to instants
 - halving a duration
 - accelerando
 - *phrasé* (ex. rubato)
- the “conversion rate” changes in time and is known “after”. The conversion rate is *established with the weaving of time itself*.
 - A-series et B-series,
 - “out of time” (“deferred time”) of the composition *versus* the real-time of the performance
- Subjective time is useful: the score refers to this subjective time, not to physical time in second
- *In fine*, it enables a effective musical interaction between the performer and the computer

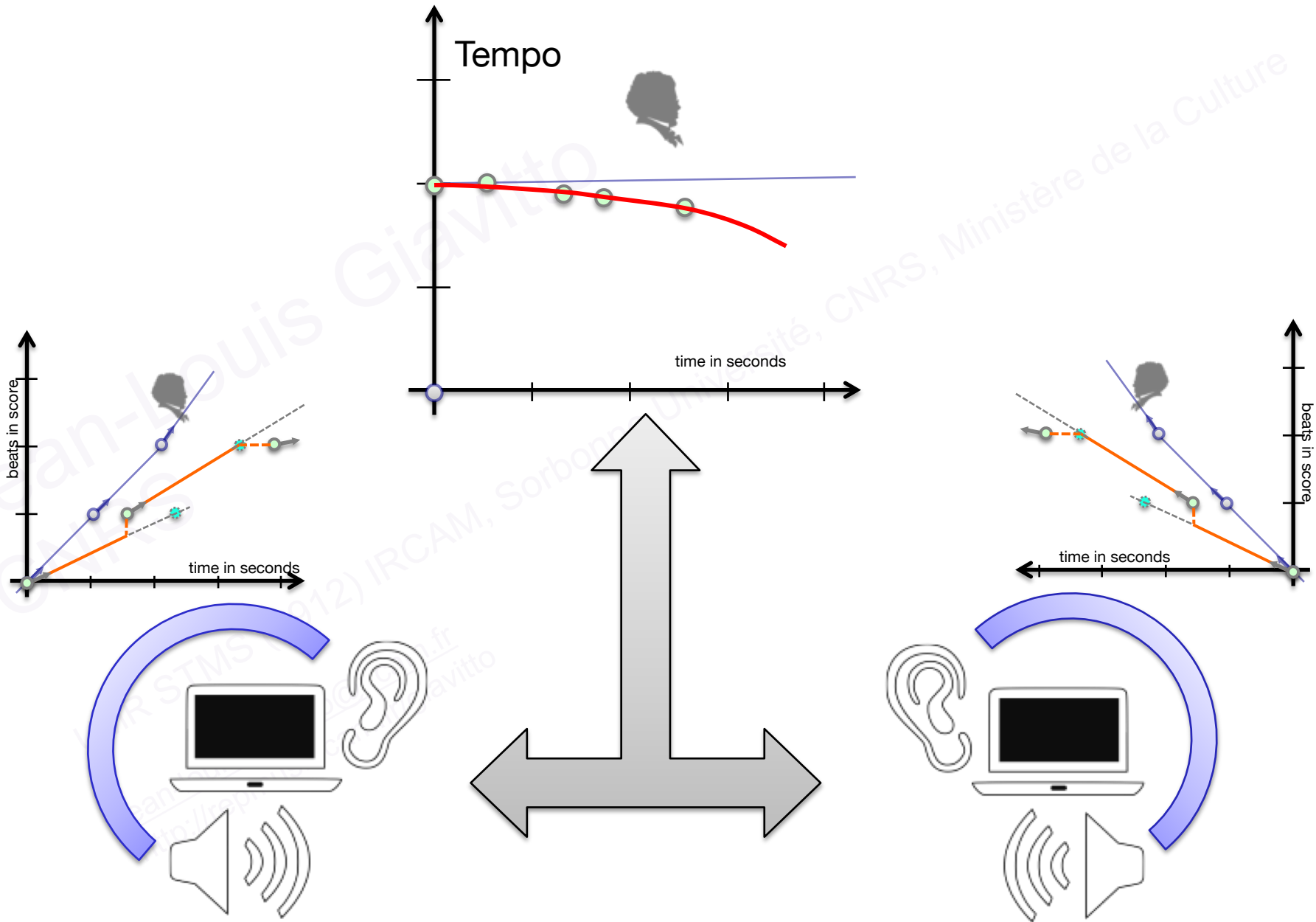
The passing of time: causality & duration





Jean-Louis Giavitto
CNRS
jean-louis.giavitto@ircam.fr
http://repmus.ircam.fr/~giavitto
IRCAM, Sorbonne Université, CNRS, Ministère de la Culture

NEGOTIATING TIME IN A NETWORK OF INTERACTIONS





UMR STMS (9912) IRCAM, Sorbonne Université
jean-louis.giavitto@ircam.fr
<http://repmus.ircam.fr/giavitto>

CNRS, Ministère de la Culture



ulture

[jean-louis
http://repmus](http://repmus)