

Real-time generation of music notation using algorithms and physical movement

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v0.02

Research Streams

- Real-time generation of algorithmically generated music
- Real-time generation and presentation of algorithmically generated notation
- Real-time physical interaction

‘algorithmic’ here means ‘computer-generated algorithmic music which happens to be realtime in production’ (Collins 2008)

Why is real-time so important?

- Apart from the composition process all ‘traditional’ music and music performance happens in real-time. I argue that there is a fundamental difference between music performed/generated in real-time and ‘press-play’ music, and that it is the interchange between these two ‘forms’ that is crucial.

Background

- algorithmic generation, but not in the ‘bottom up’ sense: many different algorithms are used here - the idea is to create collections that together generate music that could have been ‘written’ by a ‘normal’ composer...
- hardware interfaces and controllers

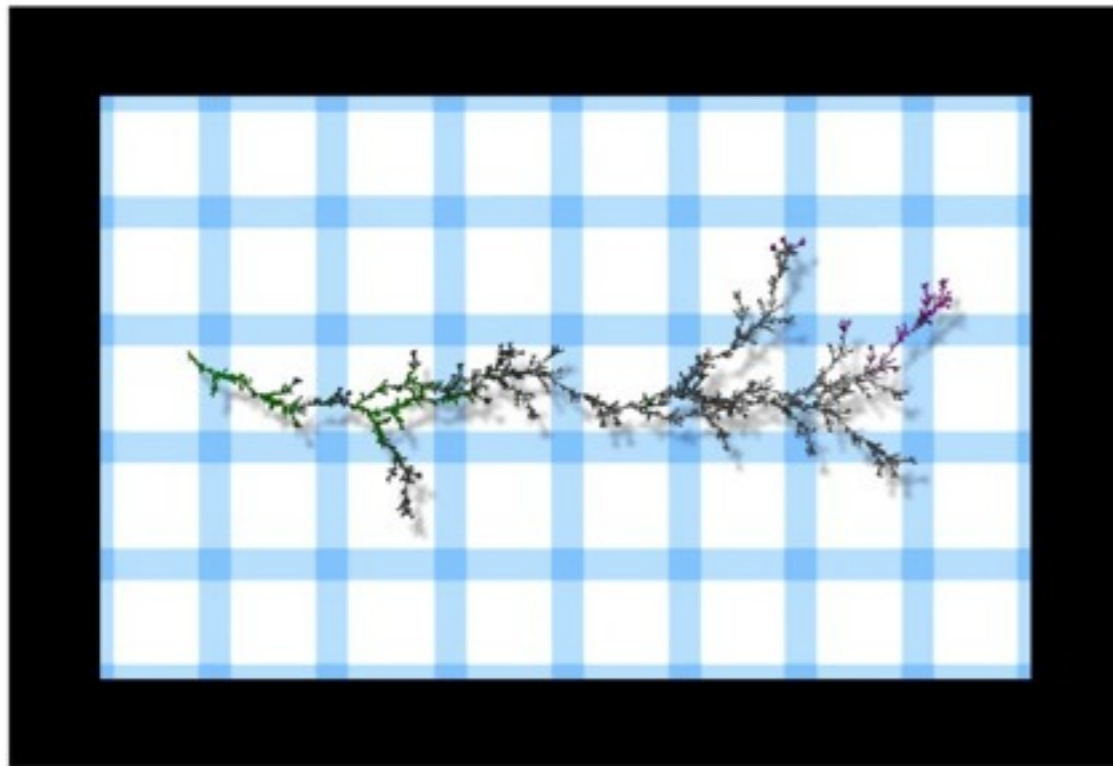


Figure 1. *Vine and Tablecloth*

Mark Franz 1997 Mathematics and Art



Figure 11. A landscape made from IFS attractors.

- Algorithmic music has been analysed in terms of it being either ‘top down’ (macro-structure-based) or ‘bottom up’ (micro-structure-based)
- The tendency is for algorithms to work on a micro-structure as ‘vignettes’ (cf. James McCartney, SC), or as inordinately long installations (minimalist)

- The majority of western music is of intermediate length (say, between 3 minutes and 3 hours) and use structures where there is a ‘top down’ component.
- Usually composers work somewhere along the continuum between these two extremes.
- A useful metaphor compares composing to mapping a new territory.

Some examples of previous work using algorithms and physical computing...

HCI 2009



external video link: <http://vimeo.com/7710584>

MIST 2010



external video link: <http://vimeo.com/13801015>

Triggered: Metapiano, June 2011



external video link: <http://vimeo.com/25465581>

Calder's Violin

combining research streams:

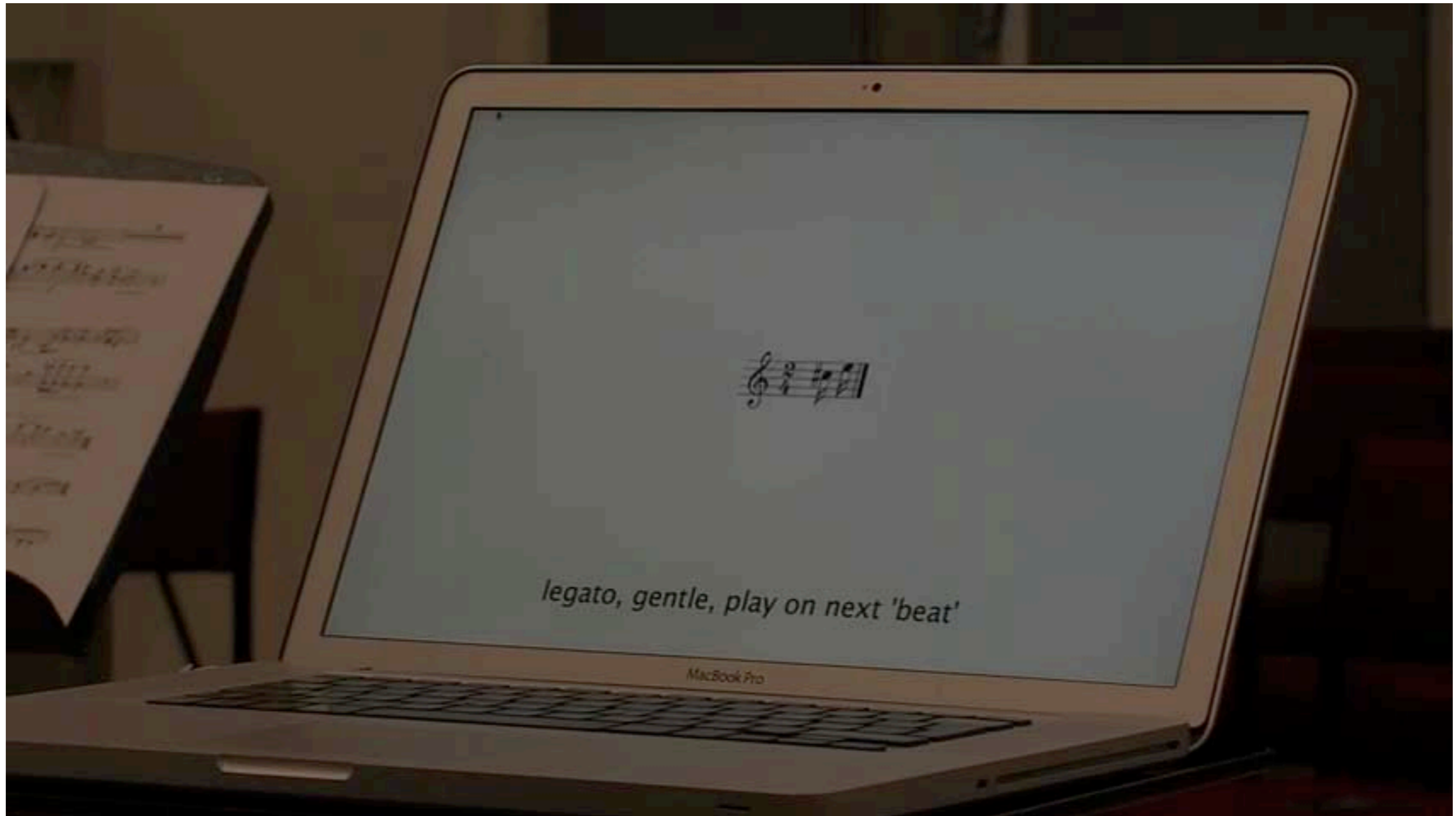
- algorithmic composition
- music composition, performance, improvisation and notation
- physical computing, perhaps (title?)

involving

- SuperCollider (primarily MDA Piano) for audio and programming...
- ...linked via OSC to INScore (<http://inscore.sourceforge.net/>)...
- ...also uses microprocessor (Arduino or mBed) for physical computing (not in current version of piece)

some excerpts...

Calder's Violin (excerpts), Mifune Tsuji, October 2011



external video link: <http://vimeo.com/32520438>

Why do it?

- *comprehension*: writing algorithms allows a deeper understanding of basic compositional processes - it's both 'different' from but similar to 'normal' composition (it certainly doesn't save time!)
- *imagination*: it allows insight into and exploitation of areas of thought not normally considered consciously: differently balanced phrases and coloured harmonies...

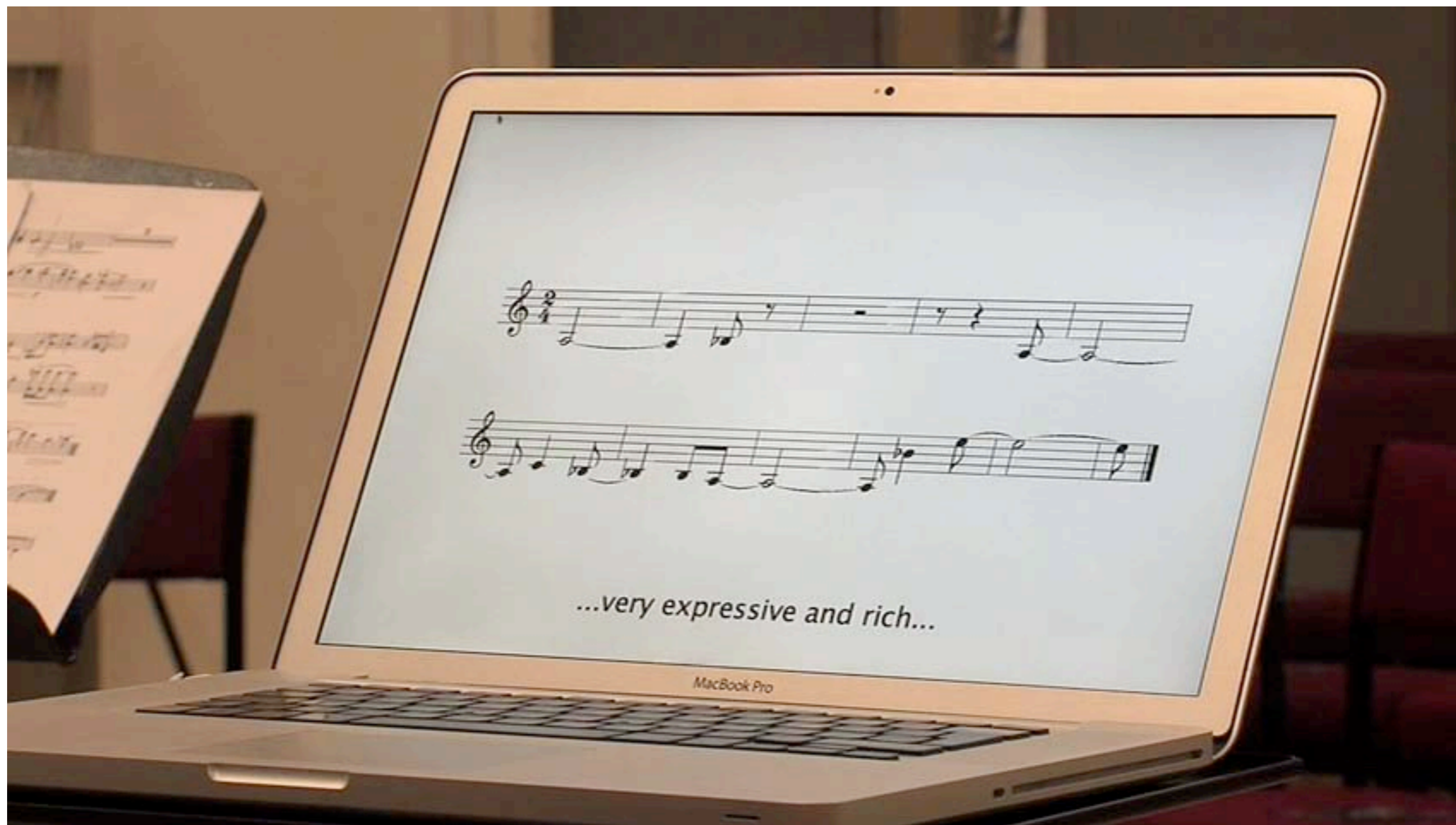
- *predicability*: it allows immediate audition but maintains an element of unpredictability. Balance with control and micro/macro structuring.
- *unpredictability* here attempts to mirror the unpredictability of performance, which is really both genuine unpredictability and the effects of the physicality of the performer (brain, action, conscious and sub-conscious thought, perception, etc.)

Matters arising

- the work provides interesting perspectives on...
- ...*acoustic composition*, the score, trills and ornamentation
- ...*performance practice*, sight-reading, rehearsal, synchronisation...

- ...*effort* - what 'value' are the notes, the phrases, the music produced, when they are produced, like all algorithmic material, apparently without effort? (The code means as much to me as pages of score), for instance:





Issues

- Other software (MaxScore, Bach, Lilypond, eScore). The functional emphases are different: quality, speed, variety of rendering, etc.
- Music notation is “deficient, inconsistent, and redundant” ??? Certainly complex and contradictory
- Traditional, graphic, both?

Issues *display (how to display it)*

- time and presentation: when to display, what to display, when to remove?
- what to include: cue parts, or a cue line for the performer to follow?
- if the music is being notated 'live' on a page, how much 'movement' of the existing notation is acceptable, if any? (INScore defaults to central alignment).
- what about synchronisation between many parts?

Issues *how soon is now?*

- When does something happen: when it is initially computed, when it is output?
- What happens when there is a conflict between computation and output?
- If you calculate all the data and then output that calculated data, what's the difference from simply 'pressing play'? When should 'now' be?

Digiphone Demo

- now add physical computing
- *why?* creative reasons (dancer causes playable notation), educational/therapeutic (fool-proof sight-reading!), analytical: analysis of algorithmic output (although how useful is this if you know the algorithm?)...
- it's also just an interesting thing to do.

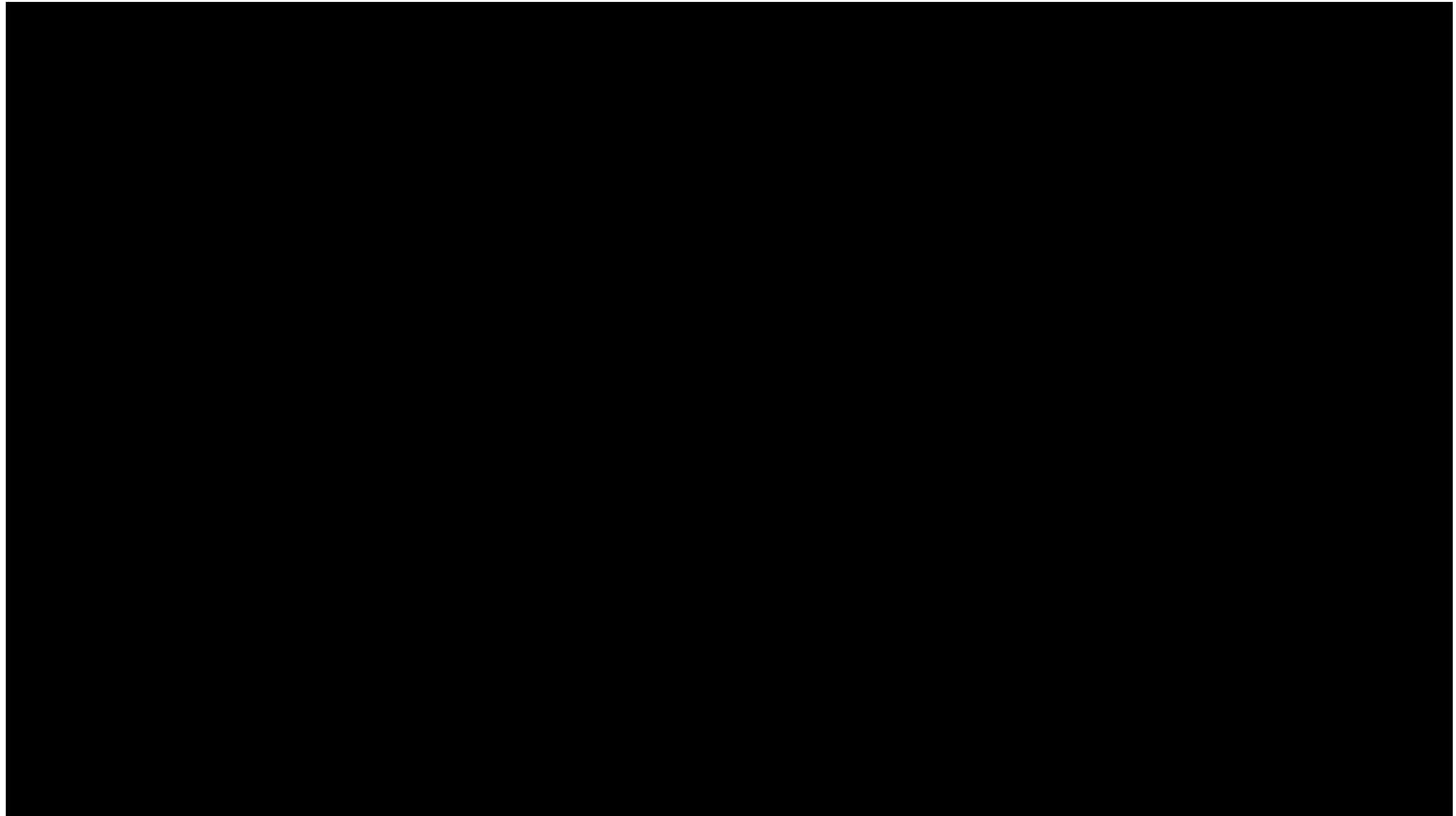
Calder's Violin

Tuesday April 17th 2012, City University, London,
part of the SuperCollider Symposium

Metapiano installation

Conway Hall, London, April 13th - 14th

Calder's Violin (excerpts), Mifune Tsuji, October 2011



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Thank you

