FOLDINGS

an augmented hybrid piano for improvisation

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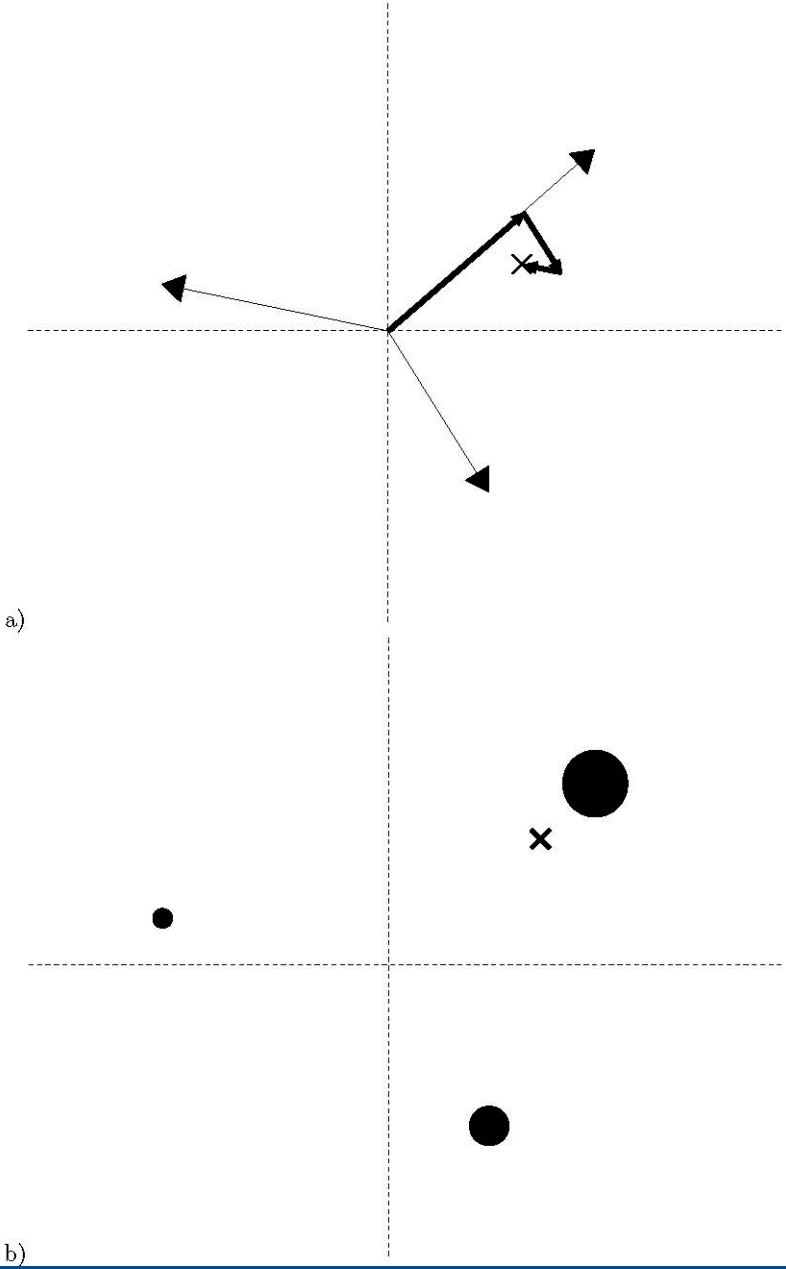
The Problem…

- How to improvise on equal terms with an acoustic musician?
  - not being tied back by prepared pocesses or presets
  - to be able to switch direction in an instant
  - to be able to explore the full sound space potential of a sound engine in performance - not editing
- A freedom equal to
  - acoustic instruments in free improvisation
  - electronic touch instruments
    - Waisvisz' Crackle Box
    - Peter Blasser's instruments (e.g., the Kittenettik)

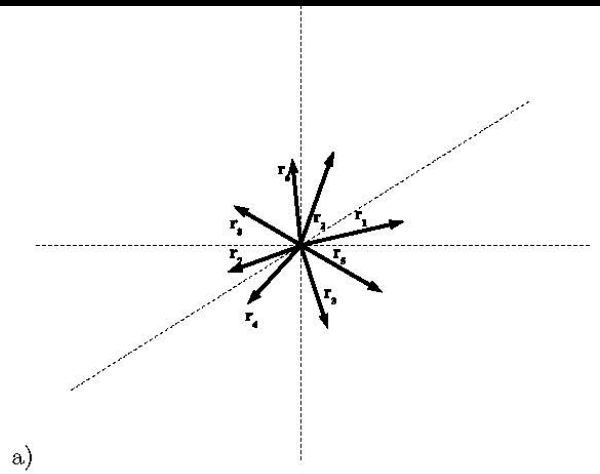
General goals

- Multi-parameter control
  - as exploration of a space of potential sounds
- Lift my hands – it goes quiet
- Physicality
  - using my body to play
  - each sonic gesture corresponds to a physical gesture
  - effort
- Intimacy (Wessel et al)
  - continuity
  - minute control / fingertip control
  - no latency
- Visibility
  - communicate with the audience



a)

b)



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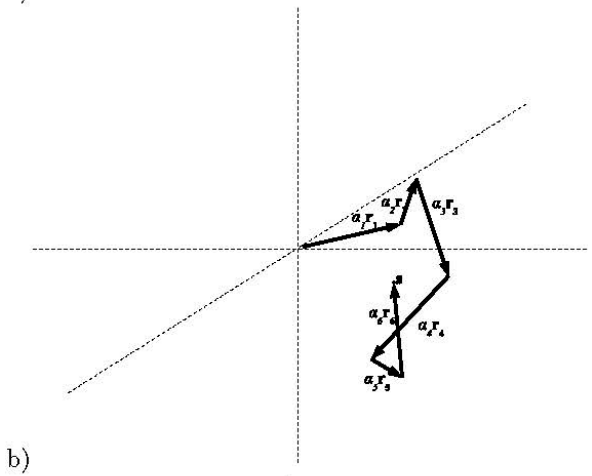

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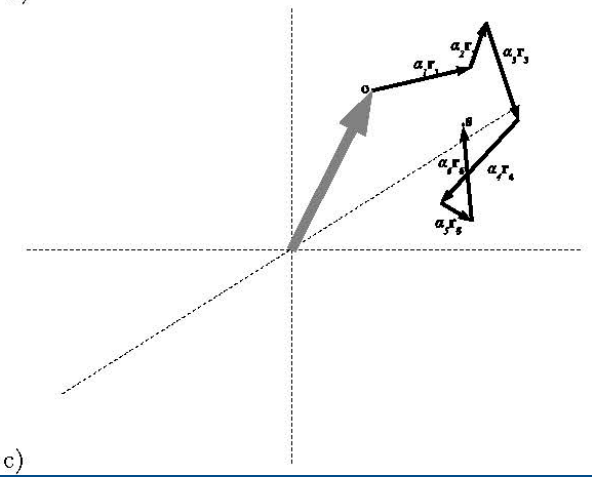

c)

Implementations so far

- Dynamic vectorization control->synthesis/processing
  - as a way to gesturally explore a parameter space
- exPressure Pad (duo pantoMorf, w Per Anders Nilsson)
  - multiple FSRs
- Percussion instruments (together with Olof Wendel)
  - pitched
  - non-pitched
- Keyboard – for synthesis
- GuitarHero controller (YouHero project, w Duo EN.D.E)
- Wind controller (in progress, w Per Anders Nilsson)
- ***Keyboard hybrid instrument***

Evaluation

- Qualitatively
- In rehearsals, concerts, recordings
- Solo, with other musicians, by other musicians
  - Use with or by Evan Parker, John Tilbury, David Wessel, Gino Robair, Nina de Heney, Mats Gustafsson, Sten Sandell
- Over long time – several years
  - Very few changes after initial design period
  - To develop skill over time

Sound engines

- The mapping technology is universal
  - Can be applied to any control->synthesis or processing mapping
- Goals for sound engines with the piano
  - Only use audio from the piano as source
  - Only make sound when I play
  - Merge with and add to the piano's acoustic sound
  - Contain some feedback aspects
  - Avoid external controllers
- Three engines so far

The Ballad engine

- For each key
  - A virtual string, excited with signal from mics
  - Adaptive dynamic control for infinite sustain, while maintaining external sound feed
  - A side-chain with filtered, longer delay structures
    - For complexity and gestural gerativity
- Controlled by vector mapping
  - micro-tuning
  - Parameters for how generated delay structure interact with the virtual string and how we hear it directly

The Shuffle Engine

- An adaptive short loop records sonic activity
  - Always active, no start/stop
- Parameters from vector mapping controls
  - Start and stop points
  - Playback speed

Playing techniques

- Exploit resonances in held notes or mute keys
- Feed extra-pianonical sounds (knocks, scratches, screams) or any alternate playing techniques
- Exploit difference in gravity decays
  - Create coninuous gestures from dicrete key data, controlled by velocity and timing
- Alternate between providing sound and playing them (even though both are always active)
- Articulation – held keys, short notes, pointillism altered with longer tones

That feedback thing

- Whatever you play…
  - Is heard in the room
  - Changes the processing parameters
  - Brings out processed sound based on processing parameters
- A non-linear system…on two levels
  - Sound
    - Processed sound goes back into the strings and into the microphones (not so well with this speaker placement)
    - Helps create an organic, coherent hybrid sonic entity
  - Gesture
    - Unexpected quirks provides gestural input to me
    - Helps generate the musical structure (by emergence)
    - Gives the piece/performance an identity… (Is it a piece or an instrument? Ref. *Per Anders Nilsson*'s research)

Other sound sources

- Harpsichord, celesta (digital versions)
  - Used together with Noh flute player in a stage project
- Digital piano
  - For practical reasons sometimes

- Advantage
  - More control of the balance between source sound and processed sound (e.g., pedal control)
  - Control of the feed independent of sound in the room
  - Play on the processed sound

Future

- Filters on virtual strings for Karplus-Strong-type response
- Exploit alternative playing techniques (playing inside the piano)
- Different sound engines, with more complex processing, and more controlled parameters
  - Like we've done with synthesized instruments

Conclusions

- To me it is a successful merge of acoustic and electronic musicianship, allowing the me to use my keyboard technique together with advanced electronic synthesis and processing, without the hassle of alternative controllers, or annoying laptops.
- The new instrument, because it indeed feels like a new one, feels very acoustic, organic, and responsive .

Creative Performance

- Creative Performance (2011-2014)
  - technologies for realtime exploration of sound spaces
  - computer-mediated interaction models
  - autonomous co-players
  - interactive environments for audience creativity

- funded by the Swedish Research Council

…thank you!