


The “Air Worm”: An Interface for Real-Time Manipulation of Expressive Music Performance

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Outline

- Introduction
- Air Worm, Air Tapper, and Mouse Worm
- Discussion and Conclusion

Goal

- Exploring various ways of *interacting with expressive performances*, especially for non-expert music-lovers.
- Start with *expert expressive performances*, and allow users to *edit or modify them*.

Air Worm

- Interface: for users to control **tempo and loudness**.
- Input device: digital theremin
- Performance format:
 - MIDI: tempo, loudness, articulation
 - Audio: tempo (synchronous overlap and add, SOLA method), loudness

Digital Theremin

- Theremin: a musical instrument developed in early 1900's by the Russian physicist Leon Theremin.
- http://www.obsolete.com/120_years/machines/theremin/index.html
- Two high frequency oscillators.
- Two antenna:
 - vertical – change frequency of the oscillator
 - horizontal – change loudness
- Continuous control of pitch and intensity




MIDI Theremin

- Mixing discrete and continuous representation of sounds
- A change in pitch is transmitted as a pitch bend message.
- http://www.moogmusic.com/detail.php?product_diagram_s=1&modify=true&main_product_id=11

Air Worm

- Performance Worm: 2-D tempo-loudness space. Trajectory reflects expression.
- Air worm: real time control of a performance trajectory using the MIDI theremin.
- MIDI:
 - Tempo factor: $F_{out} = k \frac{F_{in}}{s^{1/2}}$
 - Volume: $V_{out} = \frac{V_{in}}{127}$
- Audio: advanced methods
- Mouse Worm

Air Tapper

- Use a more standard conducting paradigm.
 - Tempo is defined by the inter-beat interval between successive minima of quasi-periodic vertical hand movements.
 - Input device: theremin
 - Beat is extracted by tracking the distance of user's hand from the horizontal antenna and find the local minima.
 - Dynamics are controlled by the proximity of the hand to the vertical antenna
 - Timing of beats is supplied by metadata
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Discussion

- Limitation:
 - No musical context is considered
 - Only control a small subset of all interpretative possibilities.