Chapter 17. Meeting 17, Interfaces: Live Electronics and Circuit Bending

17.1. Announcements

- Due Thursday, 12 November: Sonic System project Draft

  Bring prototypes, sketches, ideas to class for discussion

- Bring laptops for more work with PD and Martingale
- Quiz next Thursday

17.2. Motivations for Live Electronics

- Music as performance and theater
- Cage's observation on the problem of speaker music (Holmes 2008)
- Engaging and extending improvisation

17.3. Listening: David Tudor

- Tudor began working with Cage and Cunninghnam in the 1950s developing live electronics for dance
- David Tudor, *Rainforest*, 1973
- A series of pieces beginning in 1978
- Sounds are played through transducers affixed to solid objects; objets filters and project sounds, as speakers; contact mics on objects are used to amplify sounds sent to conventional speakers (Collins 2009, p. 48)

Image removed due to copyright restrictions. "Circuit diagram for "Rainforest IV."

See: http://www.getty.edu/research/conducting_research/digitized_collections/davidtudor/zoom/grl_tudor39l.html.

- David Tudor, *Pulsers*, 1976
- Manipulation of feedback (Holmes 2008, p. 187)

- David Tudor, *Toneburst*, 1975

17.4. Listening: Gordon Mumma

- 1950s: Gordon Mumma, with Robert Ashley, begin staging weekly performances of live electronic music at the Space Theater (Holmes 2008)
- 1961: begin ONCE festival of contemporary music, continues until 1965 (Holmes 2008)
- 1966-76: Robert Ashley, Gordon Mumma, David Behrman, and Alvin Lucier form Sonic Arts Union (Holmes 2008)
- Gordon Mumma, *Hornpipe*, 1967

- "The cybersonic console monitors the resonances of the horn in the performance space and adjusts its electronic circuits to complement theses resonances": a form of feedback (Holmes 2008, p. 390)
- A long tradition of works for solo instrument and live electronics
- Do we hear interaction, or cause and effect?
- Do we hear a duet, a solo, or something else?

17.5. Listening: Robert Ashley

- Narrative and storytelling music in multimedia
- Robert Ashley, *Automatic Writing*, 1974-79
- Released in 1979
- Compared to minimalism, called text-sound composition
- Closely miked spoken voice performing involuntary speech
- Idea of four characters: two vocal, two instrument (2008, p. 392)

- Robert Ashley, *The Wolfman*, 1964
- Employs slow, modulating feedback controlled by a vocalist's mouth (2008, p. 186)

17.6. Ensemble-based Live Electronics

- Ensembles of live electronics performers, sometimes mixed with acoustic or conventional electronic instruments
- 1960s: Musica Eletronica Viva (Holmes 2008, p. 963)
- AMM: touring group of jazz and electronic musicians (Holmes 2008, p. 963)
- SuperSilent

17.7. The Isolation of the Input Interfaces

- The modular synthesizer integrated sound production, sound design, and input interfaces
- Modular synthesizers explored modular input devices: keyboards, modulation wheels, buttons, sliders, and knobs
- With the establishment of a common control language (voltages, MIDI, OSC, etc.) input interface devices are decoupled from sound production devices

17.8. The Controller

- Input interfaces as a modular component separate from sound producing components
- Input interfaces make no sound: they only provide data output
- Input interfaces may use voltages, MIDI, OSC, or other languages to communicate to sound producing entity
- With a common input language many input interfaces become interchangeable

17.9. The Parameterization of Musical Events

- Western notation began parameterization of sound-events into discrete symbols
- The modular synthesizer suggested the description of musical values in isolated units
- Synthesis and processing parameters: envelope shapes, filter frequencies and shapes, processing parameters
- The use of controllers forces explicit parameterization

17.10. Mapping

- Translation of one sequence of values to another
- May involve scaling and shifting values
- One-to-one map from one range to another; map from one type of scale to another scale
- Example: 0, 1, 2, 3 (integers) to C, C#, D, D# (pitches)
- Example: .25, .5, .75, 1 (unit interval floating-point values) to *pp*, *mp*, *mf*, *ff* (dynamic symbols of Western notation)

17.11. Mapping Input Data to Musical Parameters

- Each input type is (often) applied to a single parameter
- If the input has multiple two or more dimensions of control, each dimension can be applied to a different parameter
- Musical mappings are aesthetic, creative choices

17.12. Models of Traditional Instruments: Piano

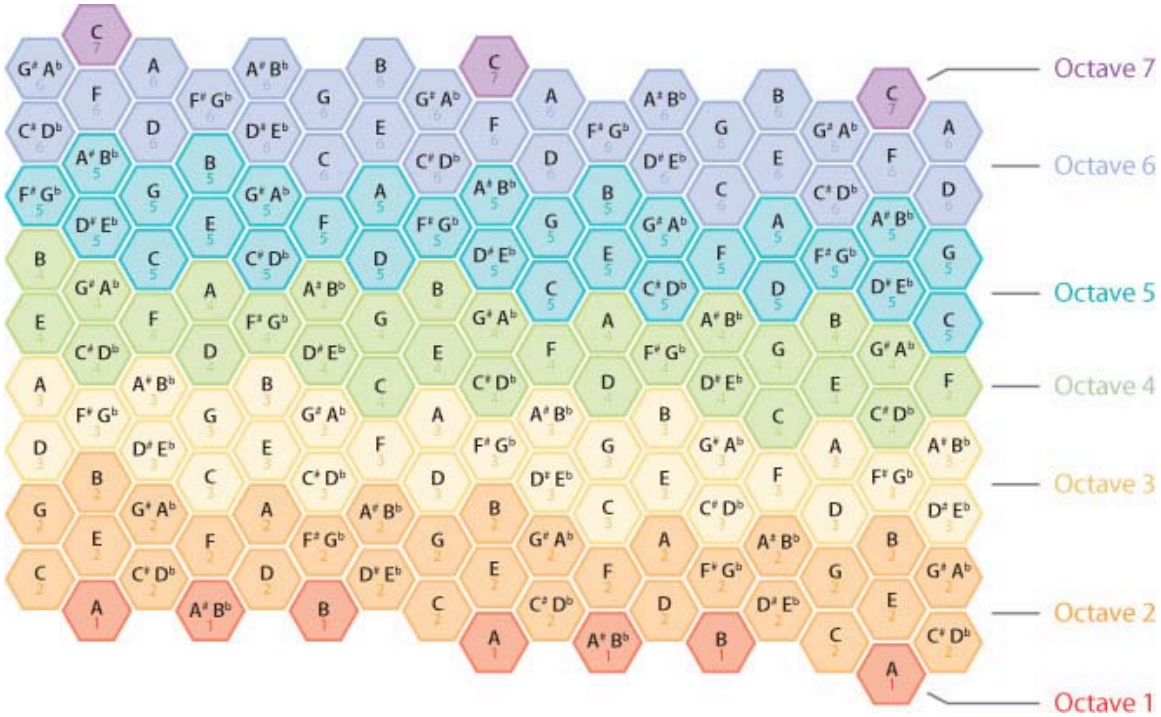
- Keyboard controllers without sound sources and the keytar
- 1980: Moog Liberation (14 Lbs)

Courtesy of Roger Luther (http://www.moogarchives.com). Used with permission.

- Roland AX-7 (6 Lbs)

- C-Thru Music Axis 64

Courtesy of C-Thru Music Ltd. Used with permission.



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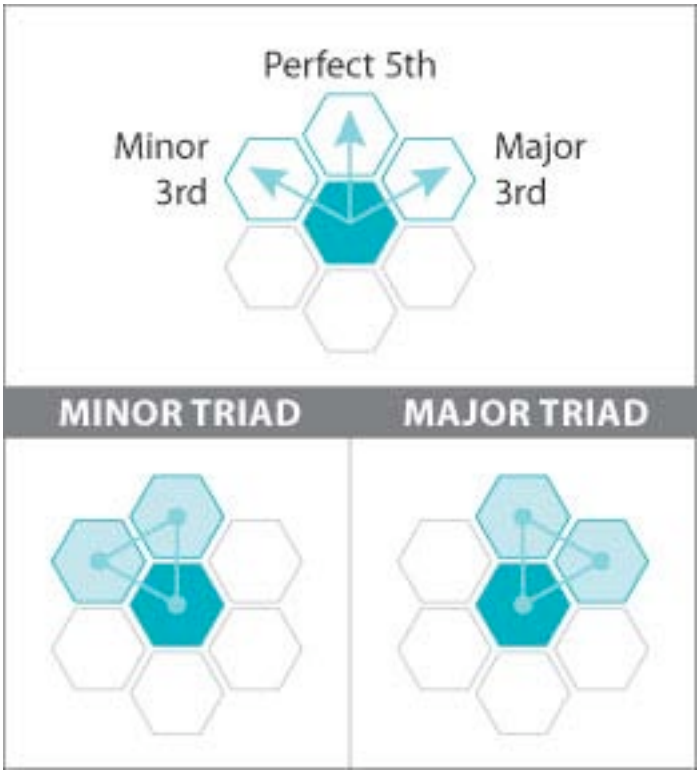

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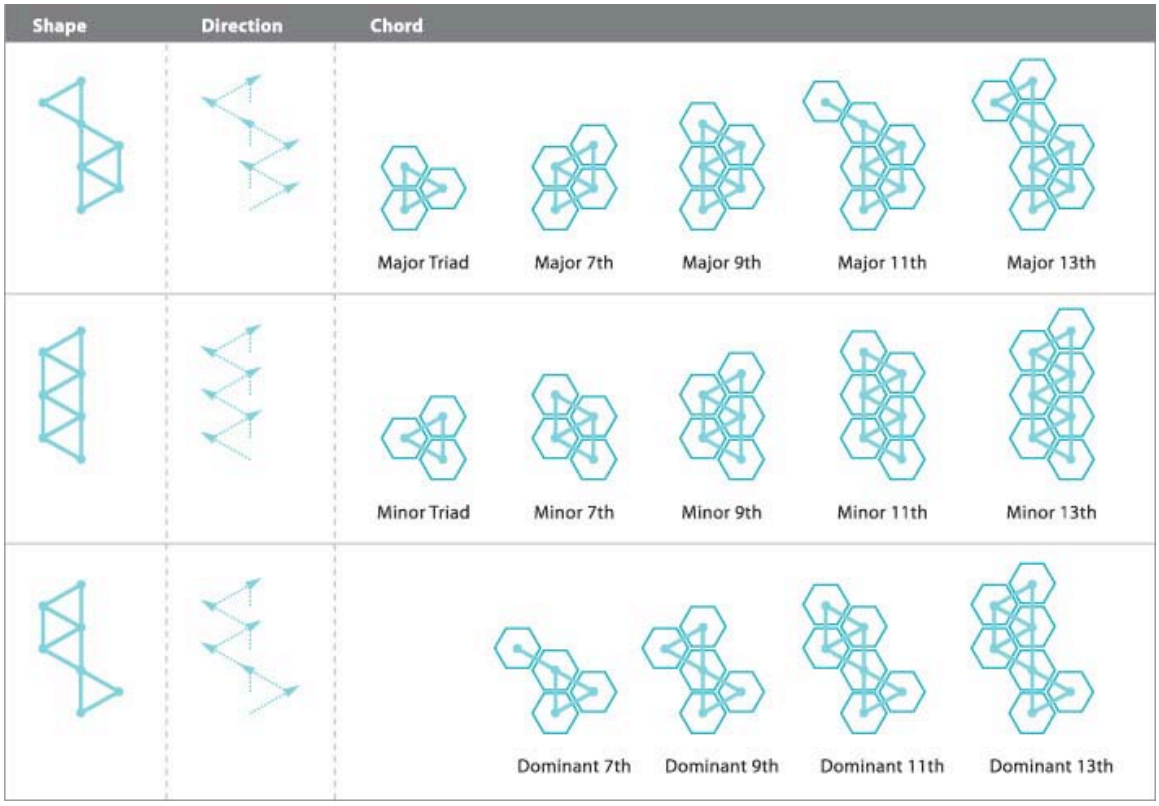


Courtesy of C-Thru Music Ltd. Used with permission.

YouTube (http://www.youtube.com/watch?v=D7OeRkXWTtQ)

17.13. Models of Traditional Instruments: Guitar

- Conventional guitar used as a MIDI controller

  YouTube Video (http://www.youtube.com/watch?v=JTjoy_CQn1g)

- Casio DG 20

Courtesy of Uncyclopedia User:Kaiser Sma

YouTube Video (http://www.youtube.com/watch?v=cpdq-Anid-U)

17.14. Models of Traditional Instruments: Aerophones

- Example: Yamaha WX5

- Example: Akai EWI 4000s

YouTube (http://youtube.com/watch?v=N4Ex1sC4xMc)

- Example: YamahaBc3a

Single parameter breath controller

- Example: Morrison Digital Trumpet

YouTube (http://www.youtube.com/watch?v=BxLlym502bI)

17.15. Models of Traditional Instruments: Percussion

- 1988: Akai MPC60

- Example: Akai MPD-16

- Example: Roland Handsonic HPD 15

YouTube Video (http://youtube.com/watch?v=UYoCBWDHVt0)

17.16. Data Input: Sliders and Knobs

- Example: Evolution UC-33

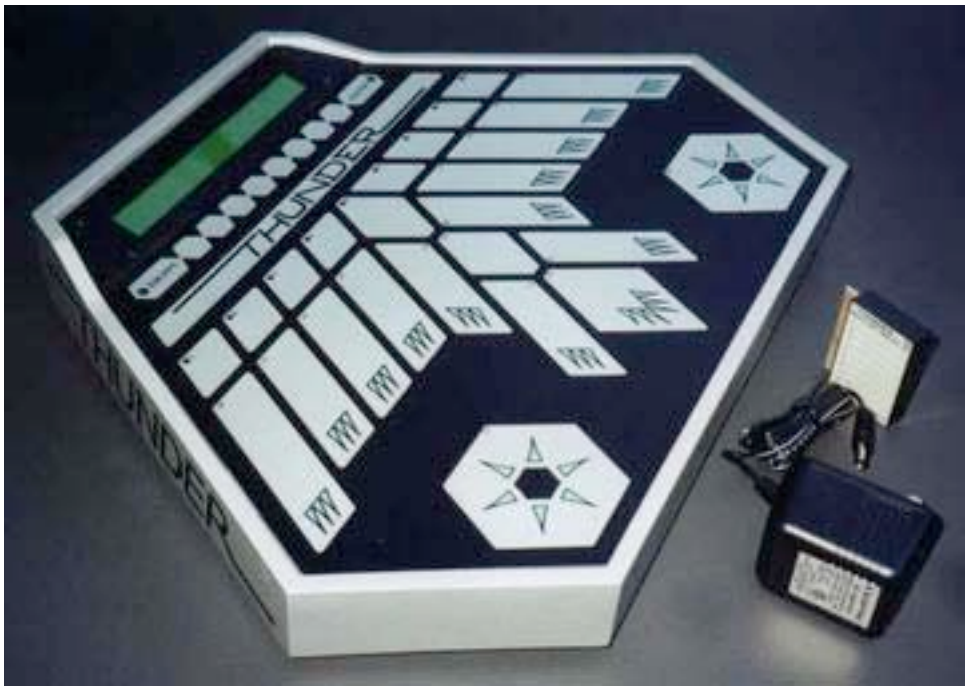
- Example: Novation Remote Zero

- Example: Evoluion X-Session

- Example: Bitstream 3x

17.17. Data Input: Touch Pads

- Example: Buchla Thunder (1990)



Courtesy of Buchla and Associates. Used with permission.

Courtesy of Buchla and Associates. Used with permission.

YouTube (http://www.youtube.com/watch?v=GYBEoZXxym4)

- Example: Novation Remote 81

- Example: Korg KAOSS

YouTube (http://youtube.com/watch?v=9LxWnHZESeg)

YouTube (http://youtube.com/watch?v=1hdhCSSWn-s)

- Haken Continuum

  Three parameters on touch surface (x, y, and pressure)

Courtesy of Lippold Haken. Used with permission.

YouTube (http://www.youtube.com/watch?v=Mrmp2EaVChI)

- Example: Monome

  YouTube (http://www.youtube.com/watch?v=LuV9Eg6HC34)

  YouTube (http://www.youtube.com/watch?v=14HG0QOp-0g)

  YouTube (http://www.youtube.com/watch?v=F0A8xR8ieek)

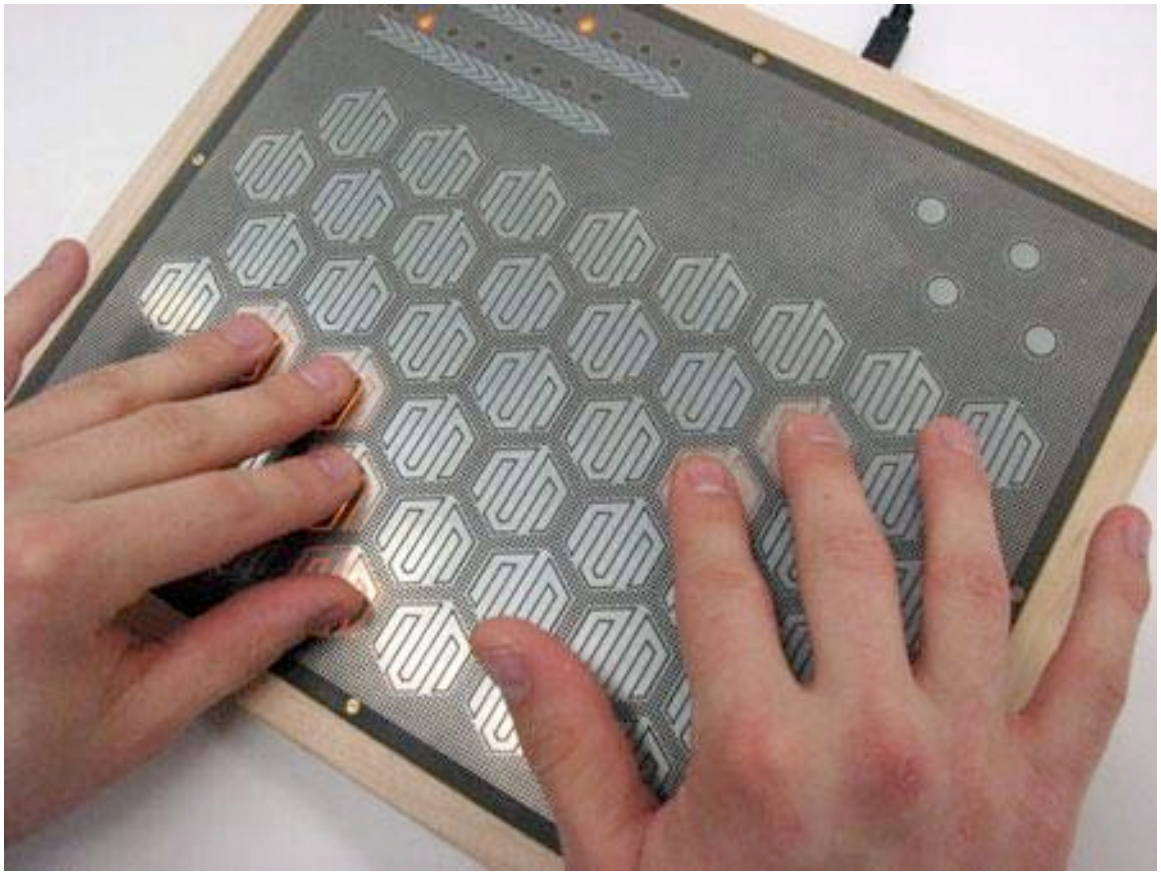
- Example: Yamaha Tenori On ($999.99)

YouTube (http://www.youtube.com/watch?v=_SGwDhKTrwU)

YouTube (http://www.youtube.com/watch?v=R1ulyBiKf9M)

- Example: Snyderphonics Manta ($700)

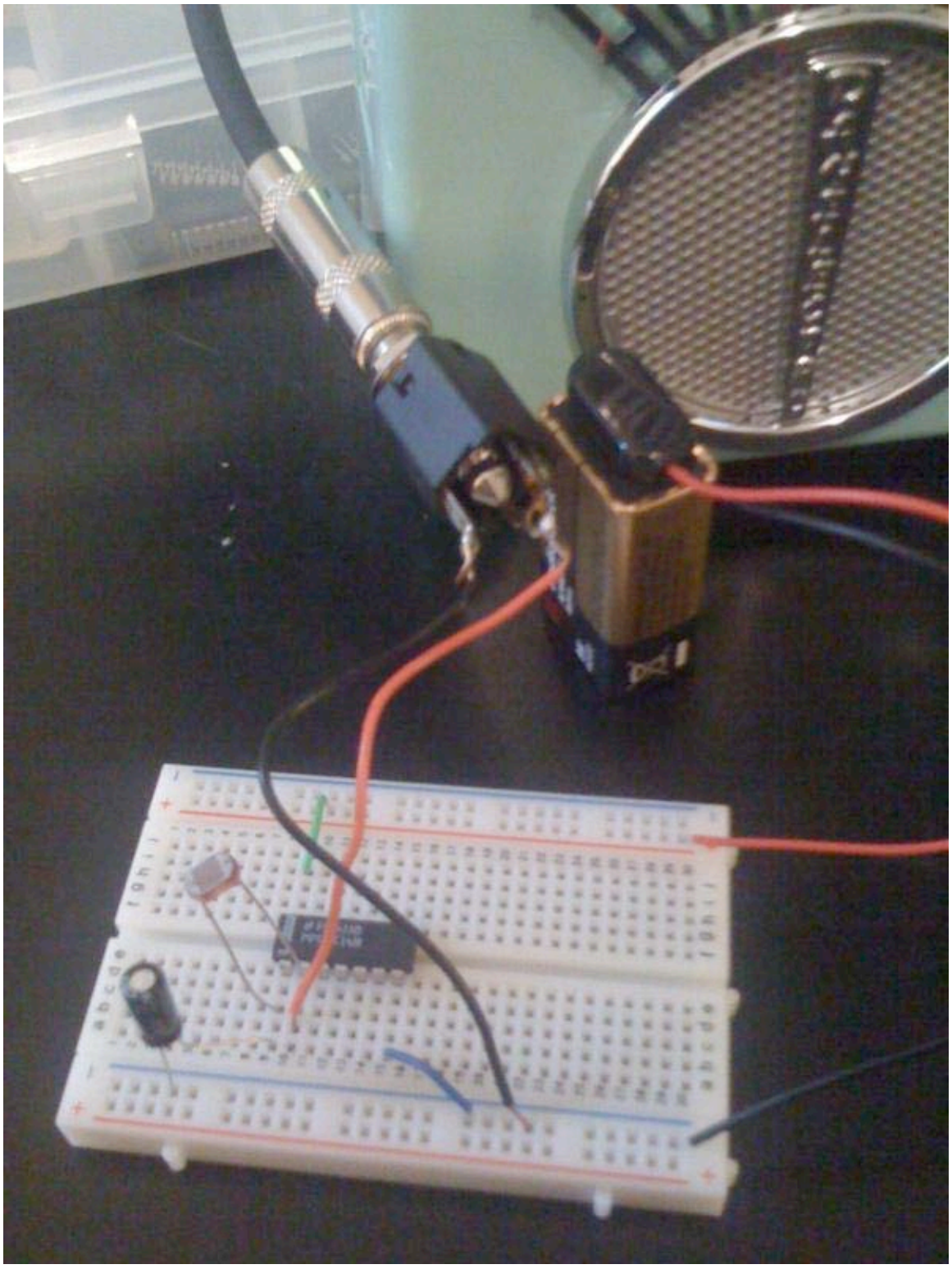
  Triggers that report amount of finger surface area as a parameter



Courtesy of Snyderphonics. Used with permission.

17.18. Data Input: Light and Infrared Sensors

- Photoresistors have been used in custom electronics since the 1960s



- Example: Roland D-Beam

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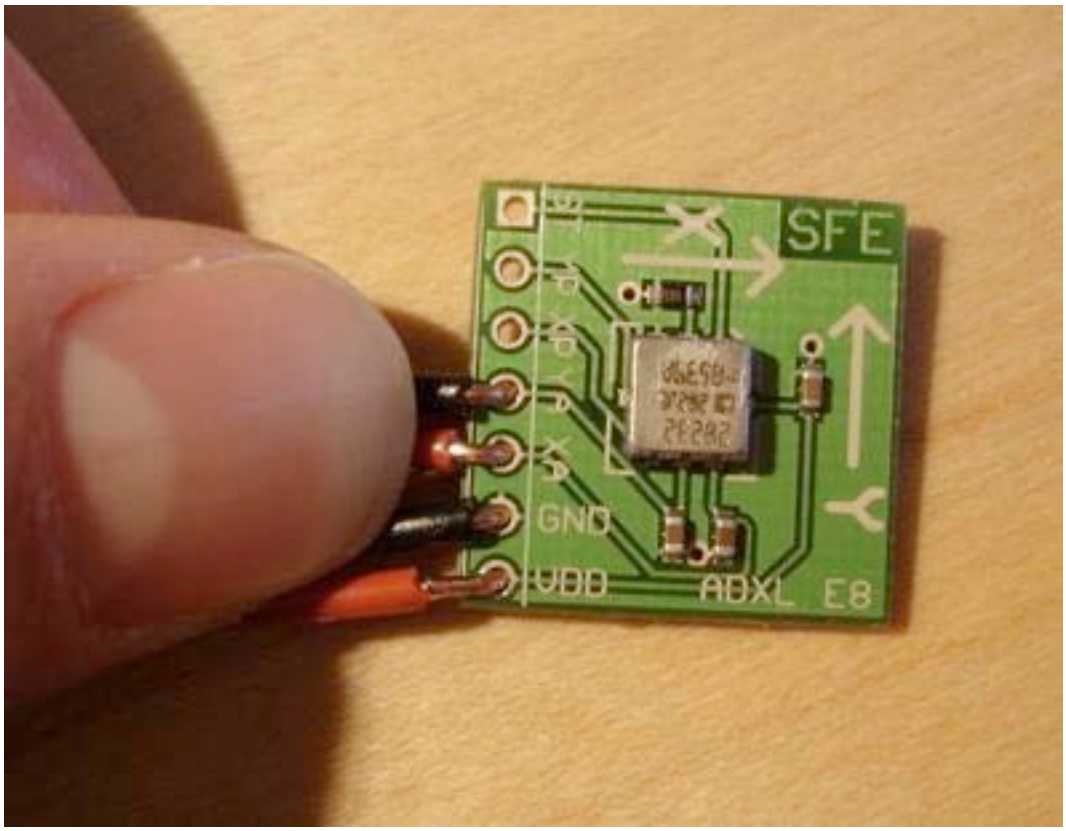
YouTube Video (http://youtube.com/watch?v=8Ir22l-TTZQ)

17.19. Data Input: Spatial and Movement Detection

- Radio signals and theremin style antennae have been used since 1960s

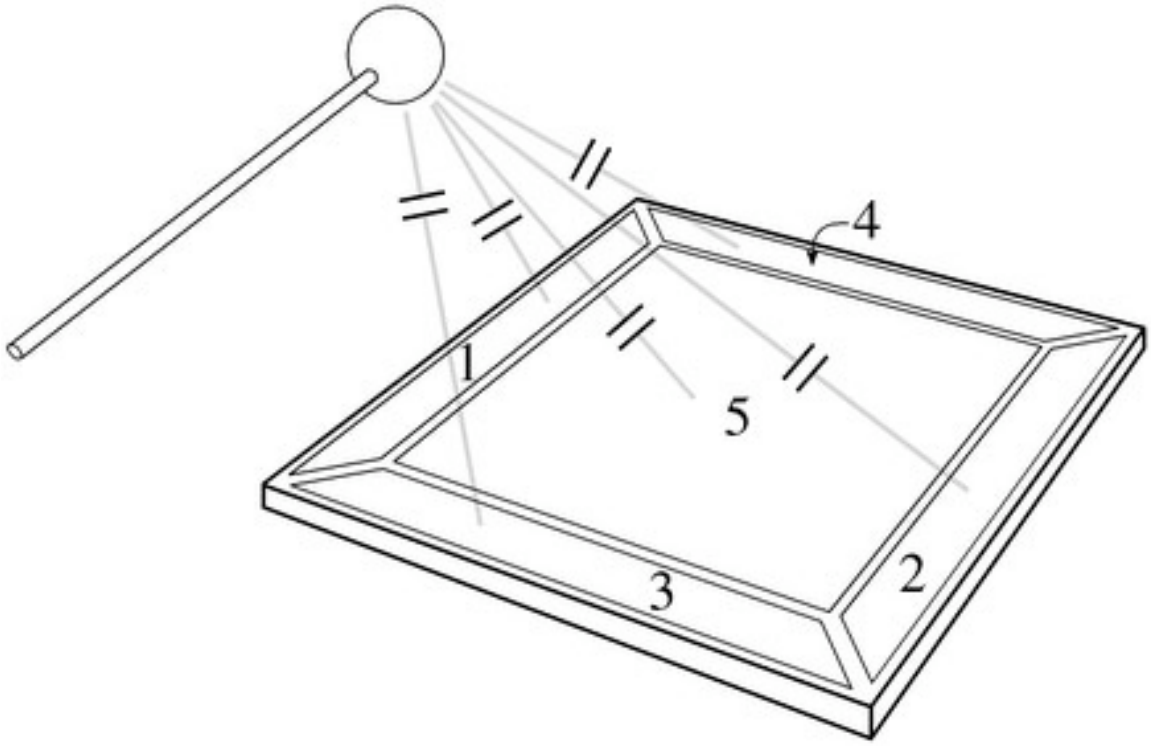
  Contemporary accelerometers offer an expensive and widely-used option



Courtesy of Anita Lillie. Used with permission.

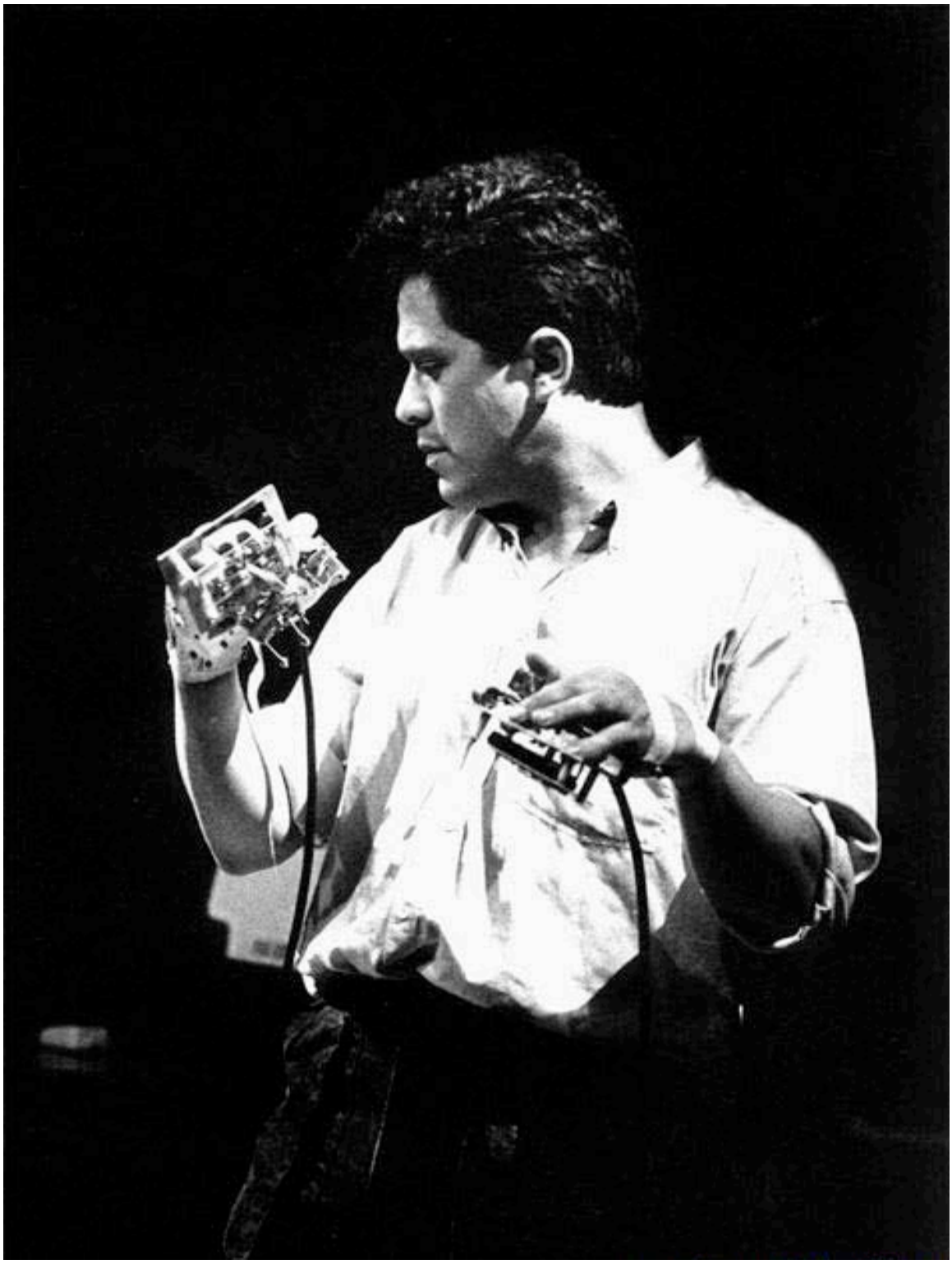
- Example: Radio Baton, Max Mathews (1980), developed with Oberheim

  Each baton has provides three parameters: x, y, and z position



Courtesy of Max Mathews. Used with permission.

- Example: The Hands, Michel Waisvisz (1984)



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17.20. Data Input: Joysticks

- Example: Novations Remote 81

- Example: JL Cooper Panner

Courtesy of JLCooper Electronics. Used with permission.

- Example: Logitech Dual Action Gamepad

- Example: Logitech Force

17.21. Data Input: Modular and Programmable Input Devices

- Mawzer Modular Interface

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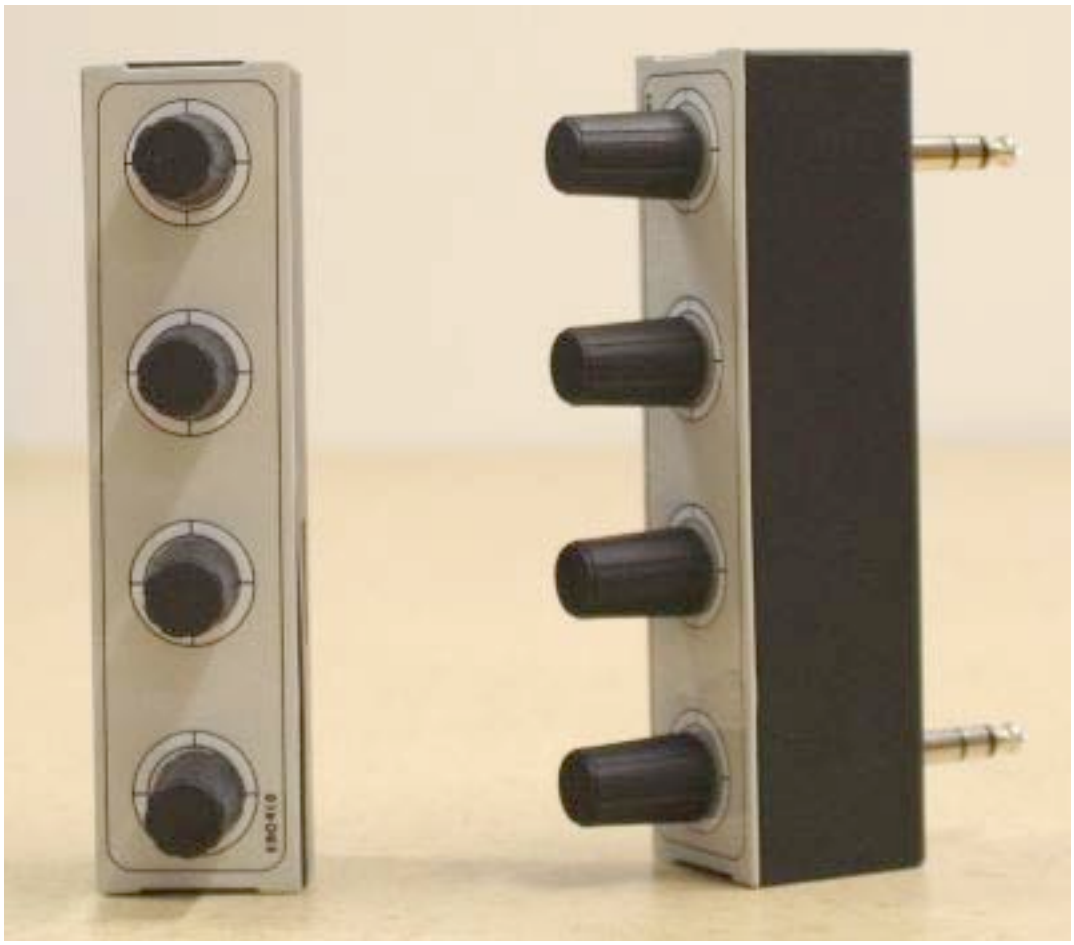
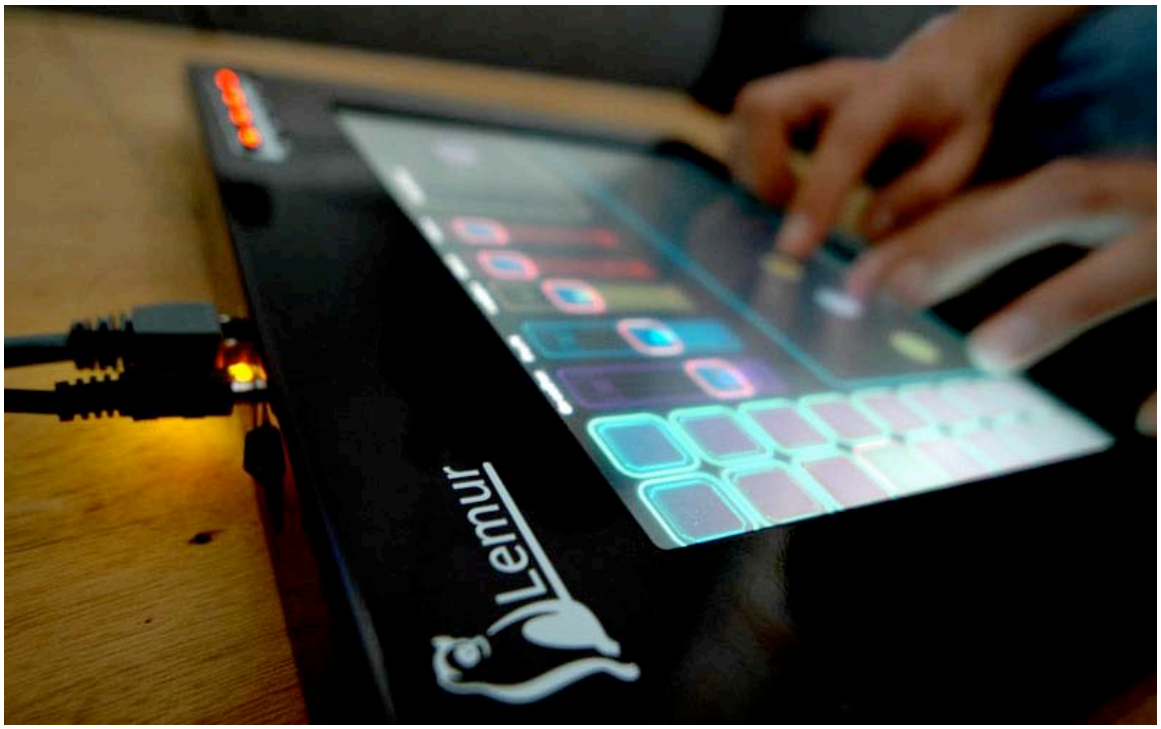
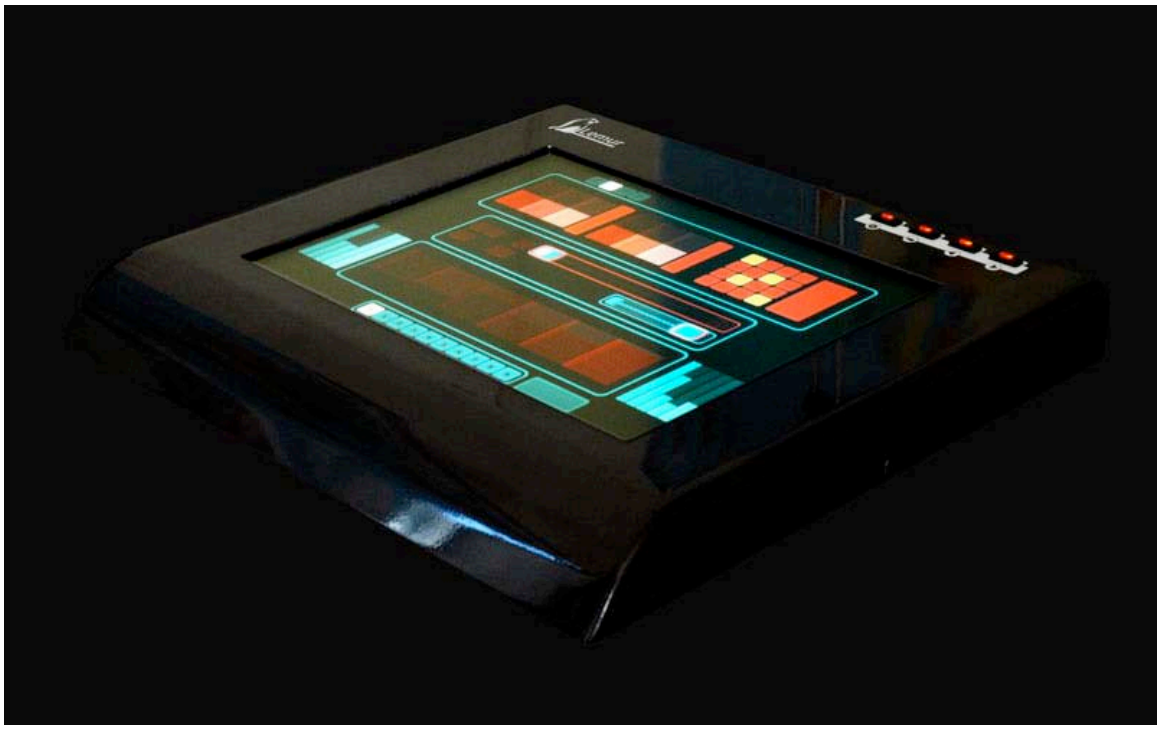


- JazzMutant: Lemur





YouTube (http://www.youtube.com/watch?v=59JFTisR-oc)

17.22. Controller Case Study: Logitech Dual Action

- Standard USB input device: preferred for low coast, high ergonomics
- 10 buttons, 1 pad controller, 2 x/y analog joysticks
- Developed as an interface in conjunction with other controllers for performances with KIOKU

KIOKU site (http://www.kiokugroup.com/)


AKAI

17.23. Controller Case Study: Filtered Noise with Joysticks

- Various types of noise filtered with a low-pass and high-filter
- Joystick A: y axis controls amp; x axis high pass filter
- Joystick B: y axis controls filter resonance; x axis controls low pass filter
- Buttons trigger diverse noise sources

17.24. Controller Case Study: A Synth Bass with Joysticks

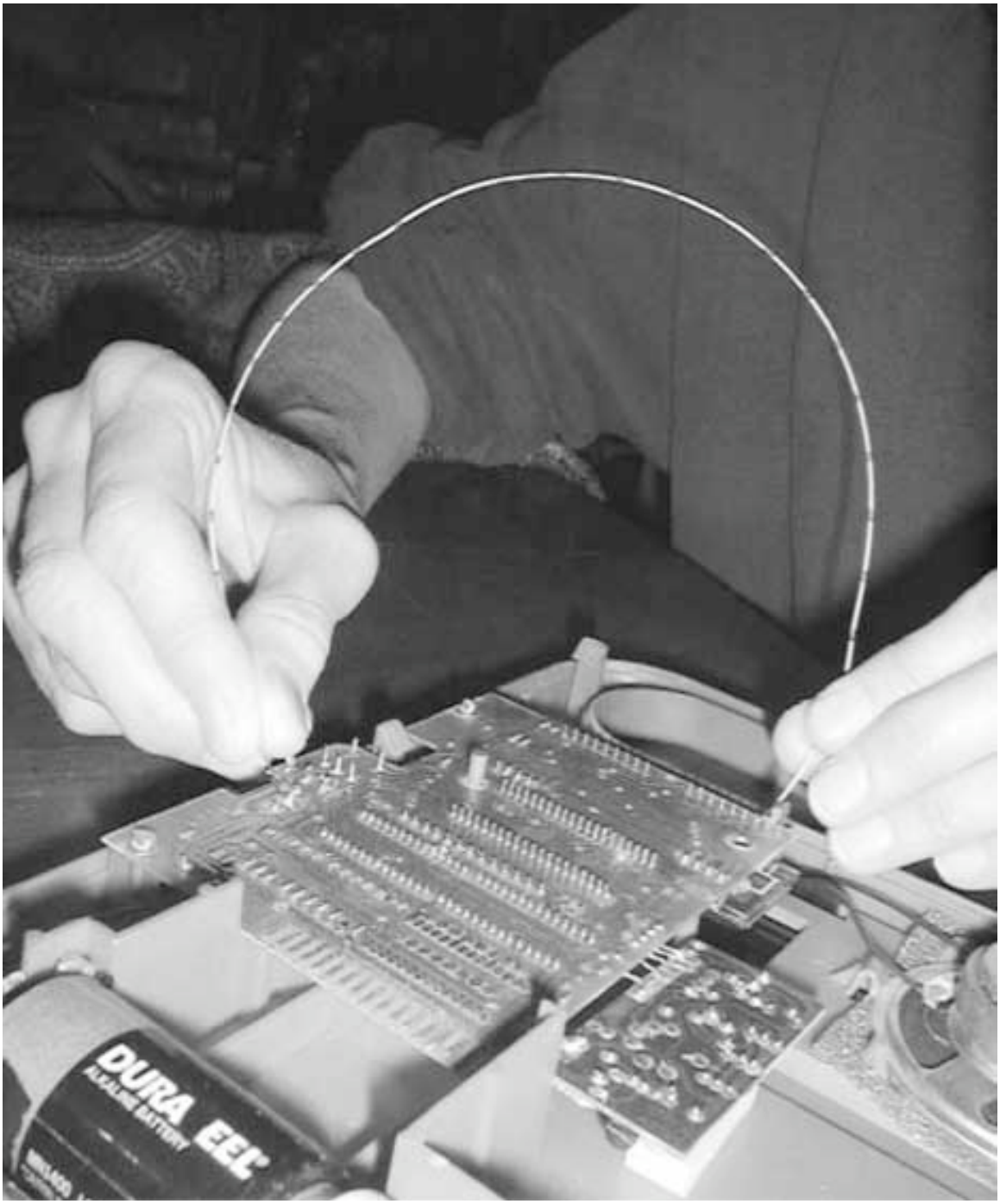
- Synthesized bass tone made of square and sine waves
- Joystick A: y axis controls amplitude; x axis controls pitch bend
- Joystick B: y axis controls low pass filter; x axis controls square wave width
- Buttons trigger pitches
- Pad switches octave

17.25. Controller Case Study, Variable-Speed Buffer with Joysticks

- Looped samples
- Joystick A: y axis controls amplitude; x axis controls playback speed
- Joystick B: x axis scales end position of loop
- Button opens envelope
- Pad switches samples within a two-dimensional grid

17.26. Circuit Bending

- Modification of conventional electronics for creative musical (aesthetic) output
- Applied to battery-powered toys, effects, old synthesizer, or any electronic device that makes noise
- The interface is extended to include modifying circuit boards
- Often results are obtained from blind experimentation



Courtesy of Qubais Reed Ghazala, http://www.anti-theory.com/. Used with permission.

17.27. Reading: Ghazala

- Ghazala, Q. R. 2004. "The Folk Music of Chance Electronics: Circuit-Bending the Modern Coconut." *Leonardo Music Journal* 14(1): 97-104.

- Examples: incantor, bent Speak and Spell

www.anti-theory.com (http://www.anti-theory.com/bentsound/incantors/incantor_straight_03.mp3)

www.anti-theory.com (http://www.anti-theory.com/bentsound/incantors/sg6.mp3)

- How does chance electronics relate to chance music?
- What does Ghazala mean when he refers to the immediate canvas?
- Why is the metaphor of a coconut useful in understanding circuit bending?
- For Ghazala, is anti-theory against theoretical understanding of music and circuits?

17.28. Circuit Bending: Documentary

- What is Circuit Bending (2004) by Derek Sajbel

  YouTube (http://www.youtube.com/watch?v=w6Pbyg_kcEk)

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