Space Palette

A New Interface For Instruments

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A history of UIs for performance and installations

- 12-foot Lyre controlled by dance pads

- Antique radio controlled by one knob

- 11-foot Monolith, 100 buttons, 32 pads, 4 multitouch pads

- Controller with 32 sliders, 96 buttons, 3 multitouch pads

- Wireless QWERTY keyboard and dance pads

- Steering wheel game controllers

- Wood-cased MIDI controller with multitouch and LCD

- Handheld camera/number-pad/LCD instrument

A history of UIs for performance and installations

Recent Focus

- 3D continuous input with hands

- Third dimension can be:
    - Pressure (Continuum, Eigenharp, Linnstrument, etc)
    - Area (Fingerworks, Magic Trackpad)
    - Depth (Kinect)

- Casual instruments
    - Walk up, play, sound good
    - Control over individual notes
    - Players recognize that they're the ones controlling it

Kinect !

- Inexpensive and ubiquitous

- Good resolution and robustness

- Easy to use from C

- Tolerant of dust

- Intolerant of sunlight

Space Palette

Features

- Holes in a frame become 3D multitouch surfaces
- Any number of hands or objects, simultaneously
- Flexible layout allows many control possibilities
- Provides frame of reference for player and audience
- Larger visual footprint is more interesting to audience
- Immediately playable, no initial dexterity required
- Larger and less-restricted motion by player is relaxing and expressive

Movies

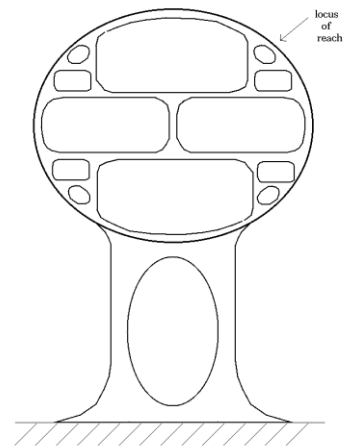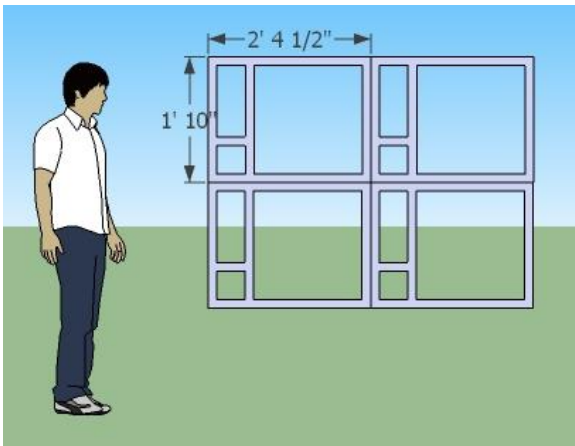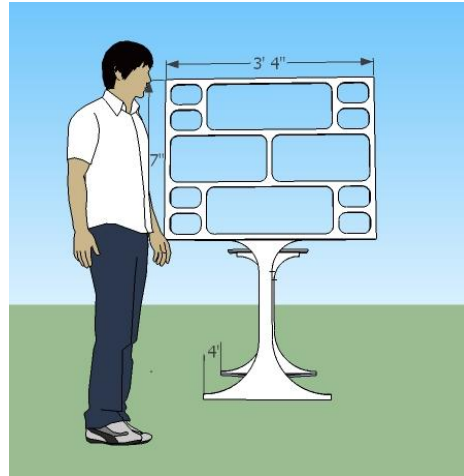Lightning in a Bottle 2011

Burning Man 2011

SF Decompression 2011

LoopFest 2011

Evolution

- Initial prototype: 4 panes

- Sweet spot: 7 panes, 4 buttons

- A little more control: 7 panes, 8 buttons

- Lightning in a Bottle

- West Coast Controller Battle

  - Tennis Ball !

- Simultaneous graphics using Processing (Java)

- Burning Man 2011

  - Multi Multi Touch Touch theme camp

- MusicTech Summit, Venice Art Crawl, Decompression, etc
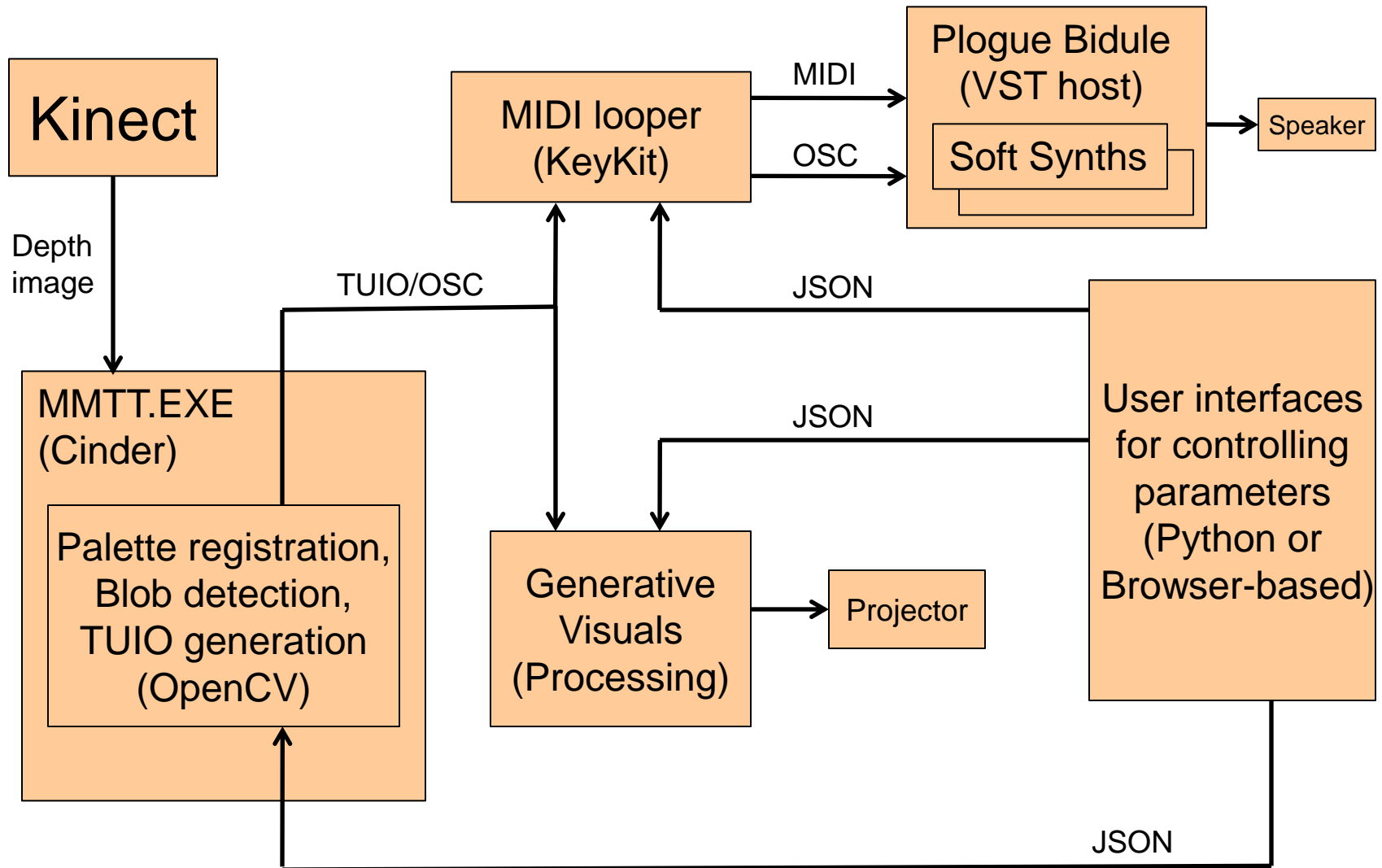
Variations

MultiMultiTouchTouch (MMTT)

- C++ program uses libfreenect to talk to Kinect

- Uses depth image only

- Blob detection using OpenCV

- Trainable interactively on new frames, holes of any shape

- Trainable without a frame, using a specially-colored image

- Browser interface to control it, using JSON over HTTP

- Output is TUIO (a standard multitouch format) over OSC (a standard UDP protocol)

- Windows-only, freely available:

  http://multimultitouchtouch.com/dist

Design

Controlling the Music

- Each large hole plays a different sound
- Horizontal position is pitch
  - All notes forced onto a particular scale and key
  - Typically two octaves across
- Vertical position controls timing quantization - "time frets"
  - Three bands: one beat, half-beat, quarter-beat
- Depth position:
  - Converted to MIDI aftertouch
  - Typically used for vibrato, filtering, and mixing
- Small holes are buttons to change key, scale, sounds, looping

Controlling the Graphics

- Each large hole is an independent 3D drawing surface
- Each hole's drawing has independent shape/color/motion
- Depth controls the size of graphics
- Small holes are buttons to change color, shape, motion

Things Observed and Learned

- Small holes are magnetic

- Labels are usually not read

- Musicians know how to rest

- Time-frets aren't intuitive, but provide useful variety even if you aren't aware of how it works

- Hand motion tendencies sometimes limit the pitch range used:
    - Depth-only with no up-down or left-right motion
    - Up-down with no left-right motion

- Looping is confusing

- Casual use vs. performance use influences the design a lot

Software

- MMTT (MultiMultiTouchTouch)

- KeyKit (interpreted MIDI programming language)

  – Receives OSC, implements multitrack MIDI looper

- Plogue Bidule (VST host)

  – Receives MIDI, outputs audio

- Soft synthesizers:

  – Omnisphere, Battery 3, FM8, Massive

- Processing (Java)

  – Receives OSC, instantiates sprites, uses OpenGL

- Python-based and browser-based GUIs

  – Talks JSON to control parameters

More Info

- Source Code for MMTT (Kinect-to-TUIO)

    `http://multimultitouchtouch.com/dist`

- Search YouTube for "Space Palette"

- Email: `me@timthompson.com`

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