

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 Input

- Well-suited for artistic applications
 - Simultaneous and continuous inputs
 - Natural, expressive, effortless, relaxing, engaging
 - Error-tolerant
- Third dimension can be:
 - Finger pressure (Continuum, Eigenharp, Linnstrument)
 - Finger area (Fingerworks, Magic Trackpad)
 - Accelerometer, Gyro (iPad/iPhone)
 - Depth (Kinect)

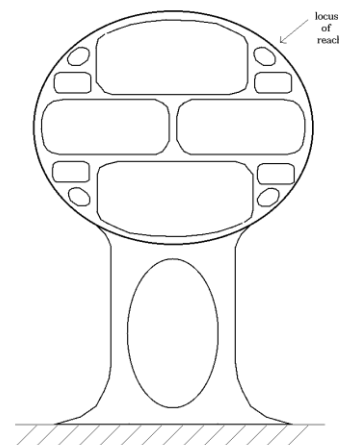
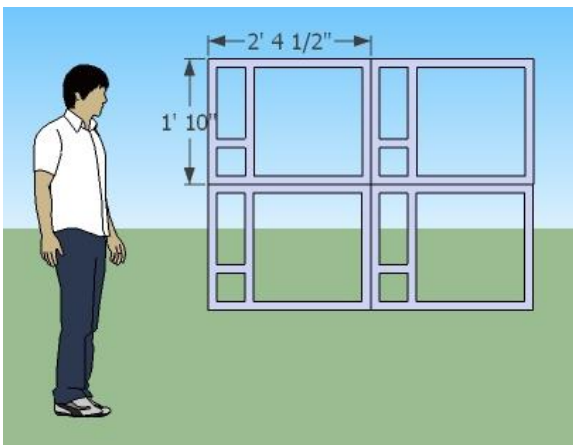
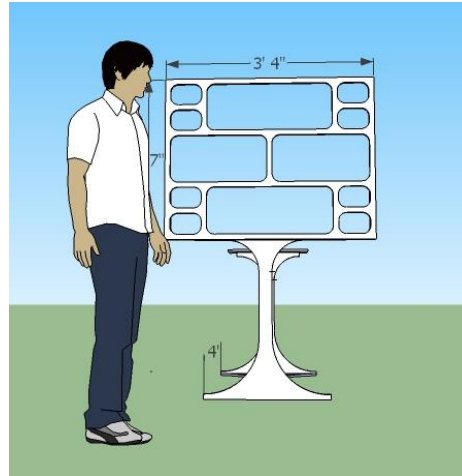
Space Palette – a 3D Interface for Instruments

- 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

Casual versus Performance

- As a Casual Instrument
 - No learning curve: walk up, play, sound good
 - Natural interaction, effortless, engaging
 - Control over individual notes
 - Players recognize that they're the ones controlling it
- As a Performance Instruments
 - Physical presence is more visible and entertaining
 - Performer's larger movement engages the audience
 - More obvious correlation of physical actions to output
 - Frame of reference allows more and better control

Evolution



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, Sea of Dreams, TechShop San Jose

Space Palette in the Wild



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 modulation controller
 - Typically used for vibrato, filtering, and mixing
- Small holes are buttons to change key, scale, sounds, looping
- Dynamic allocation of synths to channels for smoother changes

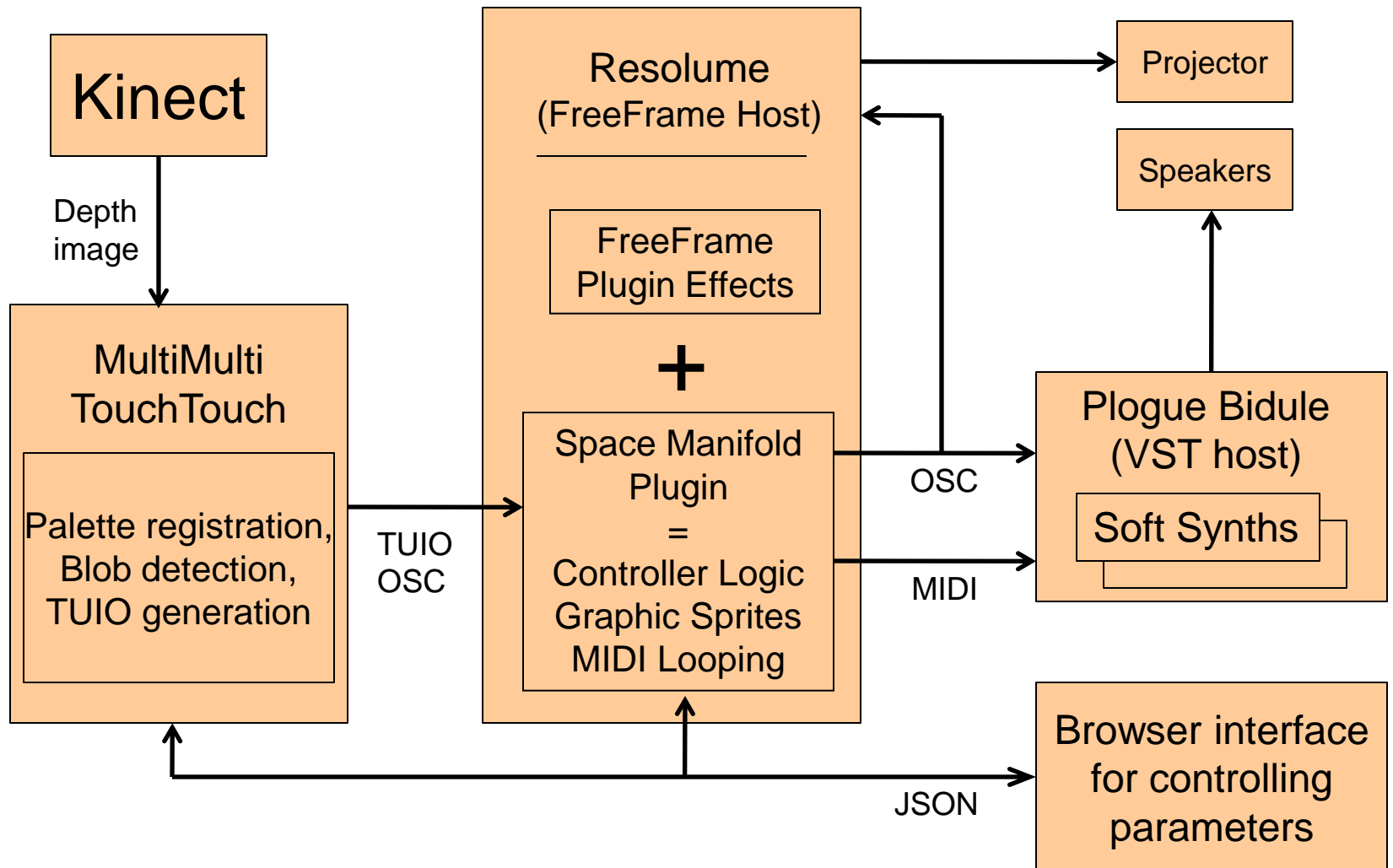
Controlling the Graphics

- 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

Design



Software

- MMTT (MultiMultiTouchTouch)
 - Kinect to TUIO/OSC (multitouch standard protocol)
- Plogue Bidule
 - VST host for soft synths: Alchemy, Battery 3
- Resolume
 - Freeframe host, visual effects
- Space Manifold
 - FreeFrame plugin
 - Does both graphics (OpenGL, sprites) and music (MIDI) generation
 - Talks to Resolume using OSC to control visual effects
- Browser-based GUI
 - JSON over HTTP to control parameters

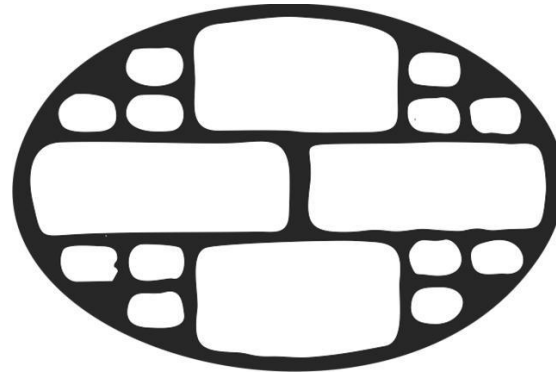
MultiMultiTouchTouch (MMTT)

- 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 over OSC, each hole is a separate 3D surface
- Windows-only, freely available:

`http://multimultitouchtouch.com/dist`

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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