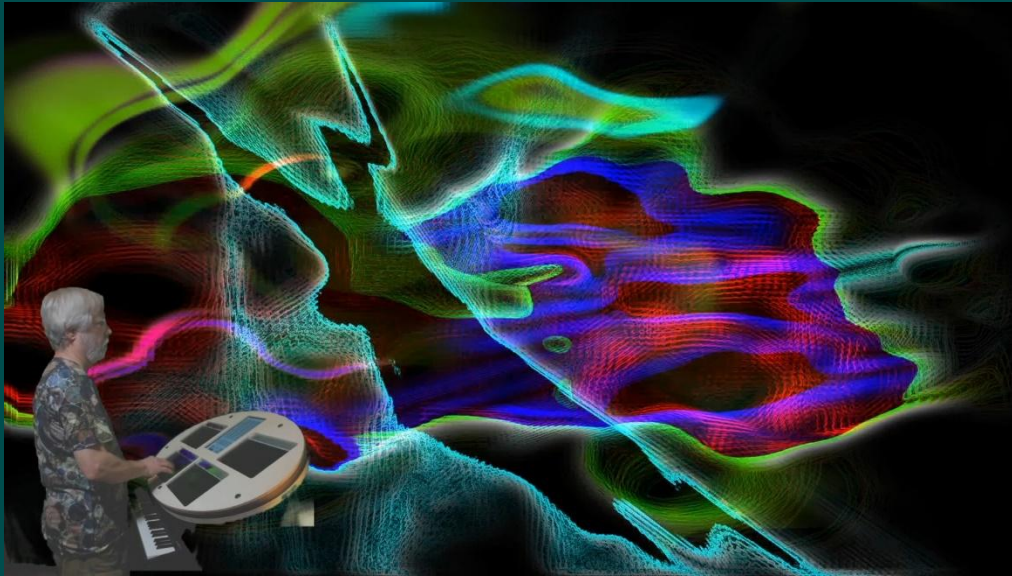


Space Palette

A Visual Music Instrument



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Outline

- Casual versus Performance Instruments
- Interactive Art and 3D Sensors
- Space Palette Classic
- Space Palette Pro

Casual versus Performance Instruments

- Casual Instruments
 - Simple, discoverable with few or no instructions
 - Immediate gratification, fun, and pleasing results
 - Direct control is obvious to the player
 - Each person sounds different and can be uniquely creative
 - Ideally has potential for deep exploration
- Performance Instruments
 - More complex control mechanisms requiring instructions
 - Proficiency may require practice

Physical Interface Goals

- A single physical interface can serve as both types of instrument
- Differences between the two types:
 - interface semantics, how they react to input
 - GUI display
- Instrument type can be changed on the fly

Physical Interfaces in Interactive Art



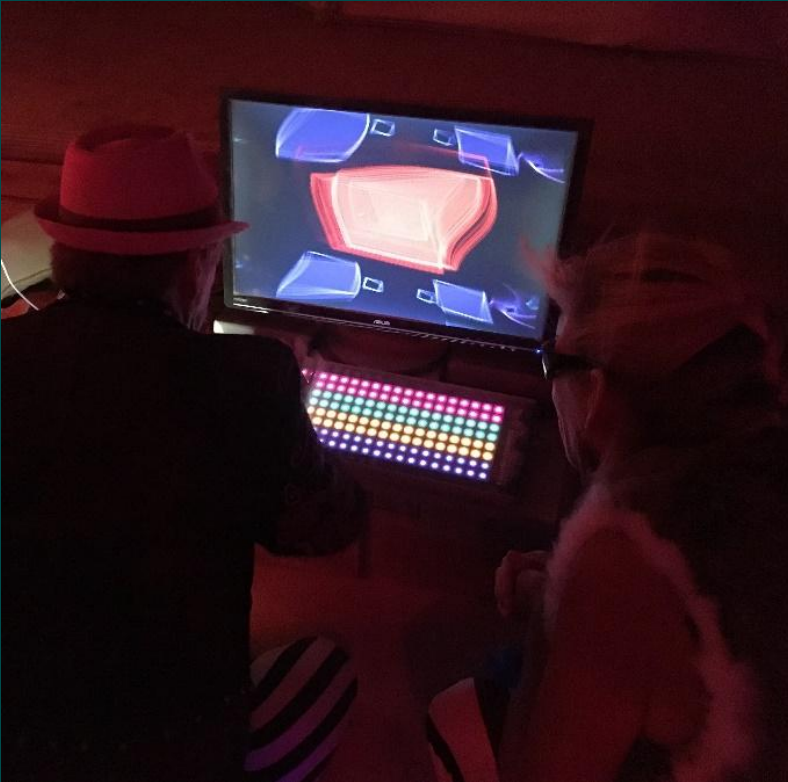
Burning Man 2003

Physical Interfaces in Interactive Art



Burning Man 2009

Unilooper – A Visual Music instrument



- LinnStrument for input
- 4-track MIDI looper
- Loops trigger visual shapes
- Implemented with KeyKit
- Looping Festival in 2015
- Burning Man in 2016

[Movie](#)

3D Input Device #1 - Fingerworks

- Capacitive multitouch with finger area detection
- Extremely responsive, excellent driver support
- First exposure to 3D input



3D Input Device #2 – Microsoft Kinect

- Fastest-selling consumer electronics device ever
- Inexpensive and ubiquitous
- Good resolution and robustness
- Easy to access from custom software
- Can be used as a 3D scanner
- Tolerant of dust, intolerant of sunlight

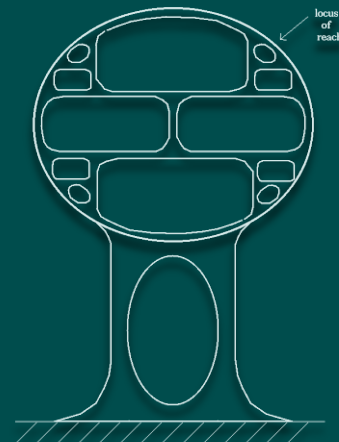
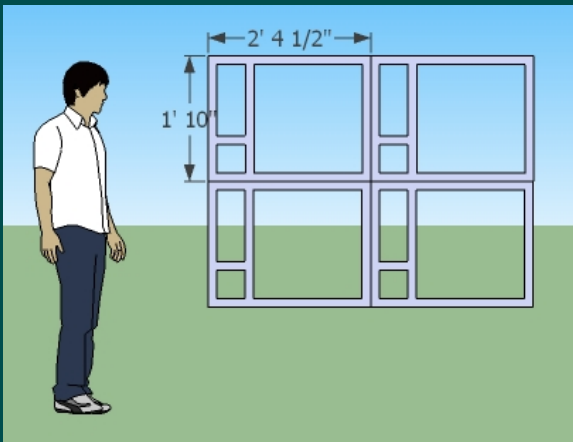
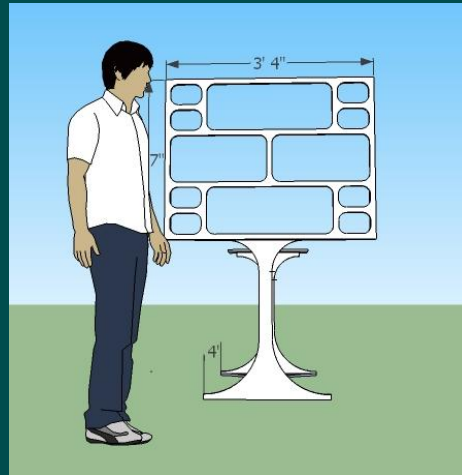
3D Input in Physical Interfaces

- Fingerworks pads showed the expressive potential
- Physical interface providing a third dimension can be:
 - Slider or scroll wheel
 - Pressure (Wacom, Continuum, Eigenharp, Linnstrument, etc)
 - Area (Fingerworks, Magic Trackpad, iPad)
 - Vibration, Orientation, Acceleration (smartphones, joysticks)
 - Spatial (Kinect, Leap Motion, Senz3D)
- 3D input provides natural and expressive input
 - Music: third dimension is useful for vibrato and filters
 - Graphics: very natural for position and size control

3D Input Sensors I've explored

- Fingerworks iGesture pad
 - Finger area is the third dimension
- Microsoft Kinect
 - Breakthrough consumer product, structured light
- Leap Motion
 - Mind-blowing resolution [Movie](#)
- Creative / Intel / Senz3D / RealSense
 - Shorter range than Kinect, Time-Of-Flight
- Microsoft Kinect 2
 - Higher-resolution, Time-Of-Flight
- Sensel Morph
 - Multitouch and Pressure-sensitive

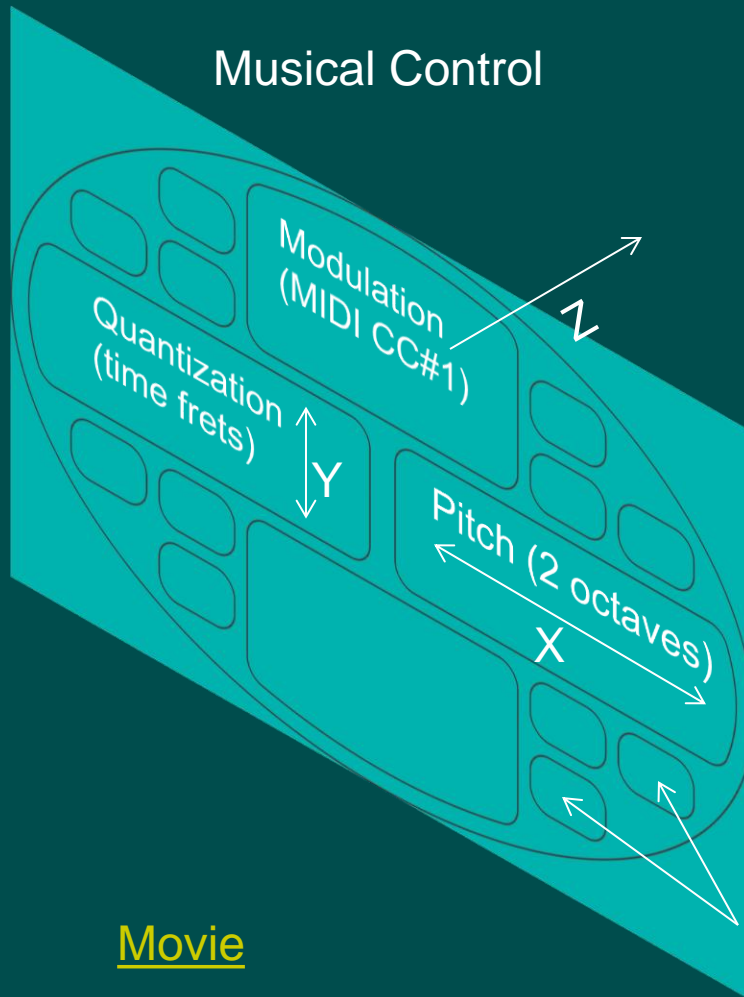
Space Palette Prototypes for Kinect



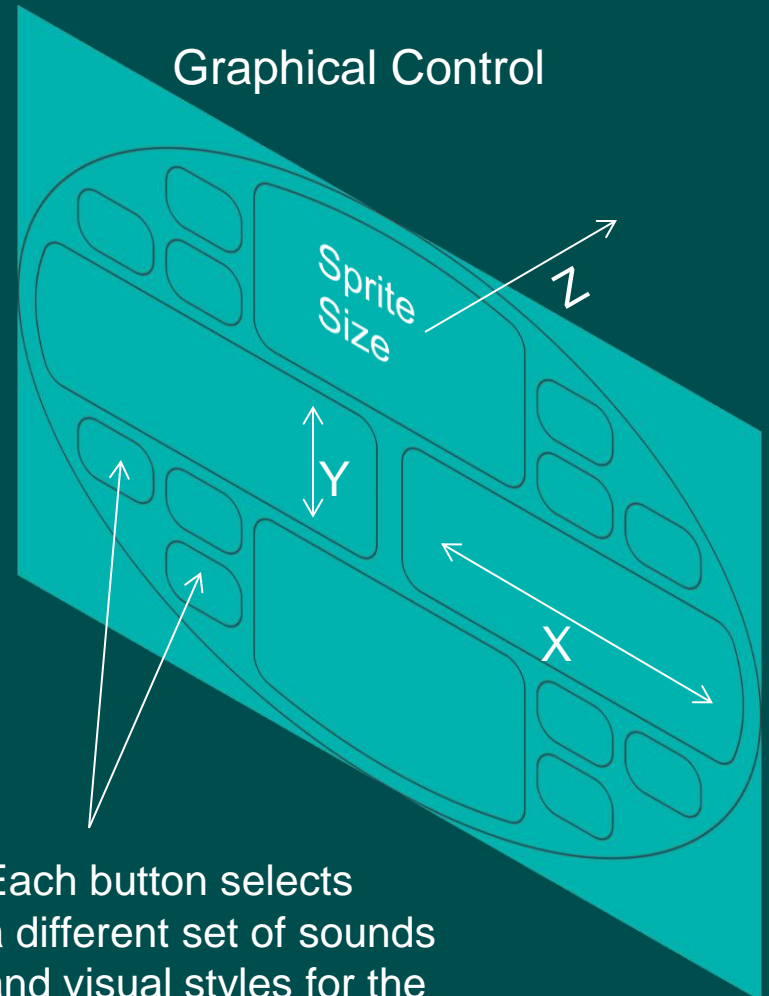
Space Palette - Festival Appearances



Space Palette Interface



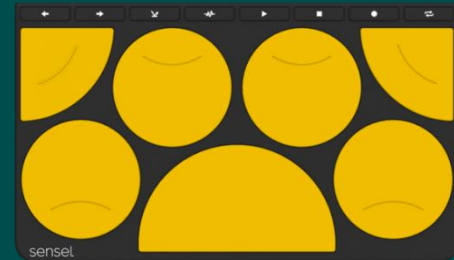
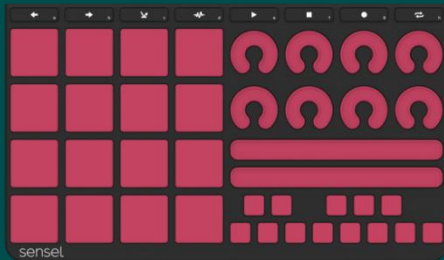
Movie



Each button selects a different set of sounds and visual styles for the four big holes

Sensel Morph - a dream come true for 3D input

- 20,000 force-sensing resistors, detects 5g to 5kg
- Raw data is easily obtained
- Overlays for different control layouts



- Magnets in overlays allow detection and swapping
- No overlay == blank canvas

Space Palette Pro

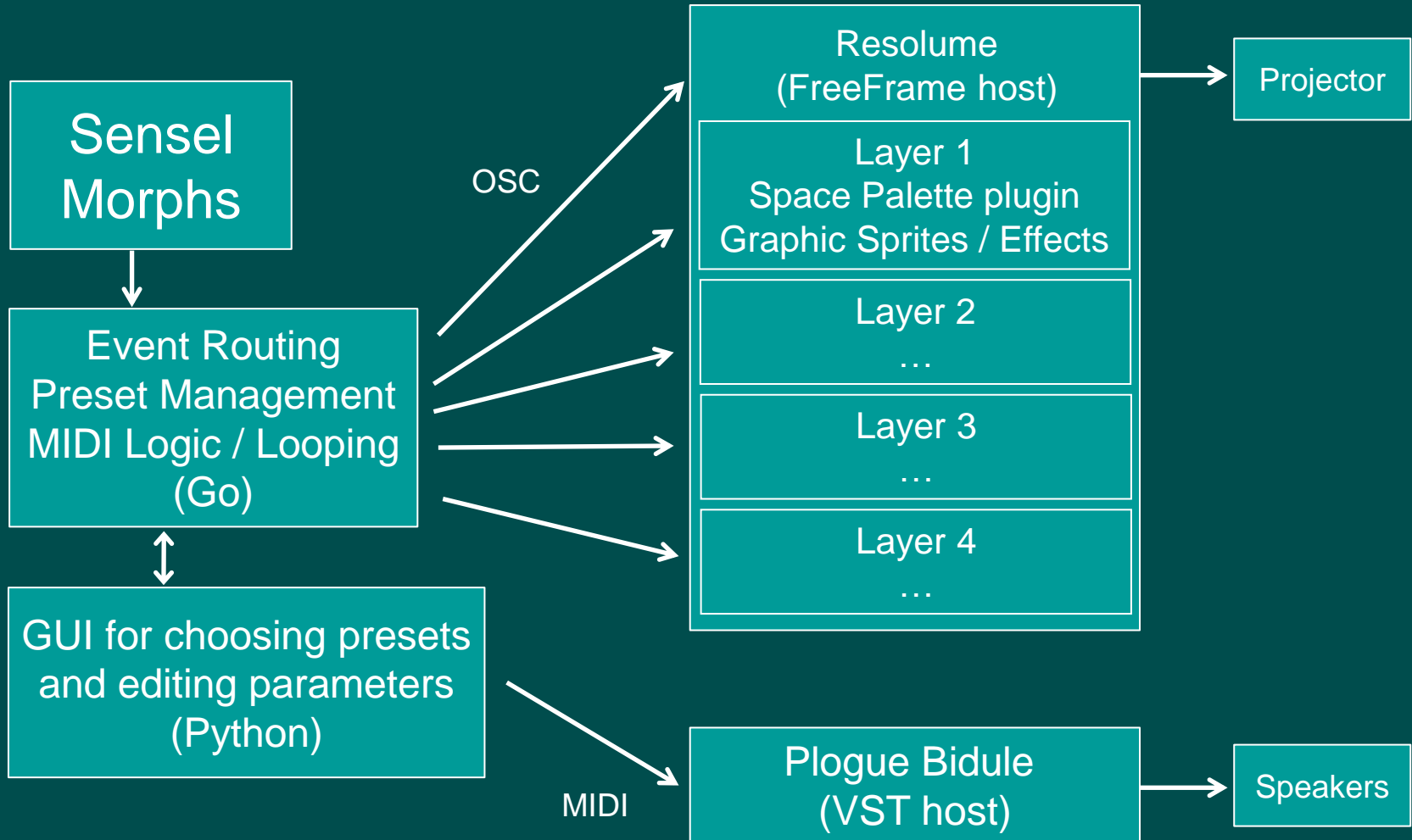
- Differences from Space Palette:
 - Sensel Morphs and a touchscreen
 - Pressure rather than depth
 - Five 3D cursors per hand
 - Separate visual layers, greater variety



Space Palette Pro - Overview

- Each of the 4 Morphs has independent control of:
 - Gesture looping; gestures generate both MIDI and graphics
 - Visual effects applied to graphics within Resolume
 - Sounds (Omnisphere 2)
- Python-based GUI for preset selection and editing
- Go-based router
 - Handles all input - TUIO, MIDI, APIs
 - Generates MIDI output
 - Realtime looping of gestures
 - APIs for parameter and preset control (used by GUI)

Space Palette Pro - Design



Space Palette Pro - GUI

Casual

Presets

| | | | |
|------------------|----------------|-----------------|------------------|
| All Drums | Basic Chaos | Bellsy Bells | Bold Strokes |
| Complex Kaleid | Deep Triangles | Dream Puddles | Drifting Borders |
| Dusty Pools | Edgy Kaleid | Endless Colors | Explosive Shapes |
| Full Bodied | Ghost Puddles | Line Dance | Organic Growth |
| Perky Trails | Plucky Stuff | Shape Shards | Simple Organism |
| Smooth Breathing | Smooth Dust | Spiro Graphical | Too Square |

Actions

| | | | |
|---------------|----------------|-----------|-------------|
| Looping OFF | Length 8 Beats | Fast Fade | Clear Loops |
| Default Scale | | | Reset All |

Performing

Space Palette Pro

☐ Monitor ☐ MidiScale ☐ Midipassthru ☐ Midisplit

Preset: < 000_Guitars > Save Send

Effects: < Smooth_Dust >

Chan: 1 Port:

ANO Slower Faster Reset

Transpose: Next Prev Reset

Clear All Fade All Loop All Loop Non

AreaA

S: Smooth_Dust_1 Edit

V: Smooth_Dust_1 Edit

L: Record Play Fade Clr

Leng: 4b Fade: Fast Rpts: Inf

AreaD

S: Smooth_Dust_4 Edit

V: Smooth_Dust_4 Edit

L: Record Play Fade Clr

Leng: 4b Fade: Fast Rpts: Inf

AreaB

S: Smooth_Dust_2 Edit

V: Smooth_Dust_2 Edit

L: Record Play Fade Clr

Leng: 4b Fade: Fast Rpts: Inf

AreaC

S: Smooth_Dust_3 Edit

V: Smooth_Dust_3 Edit

L: Record Play Fade Clr

Leng: 4b Fade: Fast Rpts: Inf

Space Palette Pro – Performing GUI (take 3)

Preset

| | | | |
|------------------------|-----------------------|---------------------|-------------------|
| African Borders | African Modern | Amoebic Drips | Amoebic Growth |
| Another Kaleidoscope | AquaBell Elevations | Basic Shapes | Bending SpaceTime |
| Blobby Borders | Blobby Pop | Blurry Kaleidoscope | BubblesOf Bliss |
| Burn Barrels | Candied Blobs | Circular SpiderWebs | Cloud Flowers |
| Cloudy Circles | Dirty Virus | Drum Fragments | Fireful Foursome |
| Floating GuitarSquares | FourSided Flowers | Fractured Squares | Glowing Lava |
| Guitar Flowers | Horizontal Percussion | Kaleidic Space | Lava Blobs |
| Mirrored Mania | Pastel Lozenges | Percussive Purple | Ruptured Terrain |
| Scatological Chaos | SeaOf SodaStraws | Simply Circles | Smooth Fractures |
| Softest Circles | Synth Blobs | Synth Symphony | Traffic Jam |
| Trembling | Universe | Voracious | WhiteBorders |

Perform

Looping is OFF Loop Length 8 beats Loop Fade Fast Loop Clear Transpose 0 Reset All

*

Preset **Snapshot** **Sound** **Visual** **Effect** **Sliders**

Save

| | | | | | | | |
|----------------|---------|----|---|---|---|---|----|
| alphafinal | 0.000 | << | < | . | . | > | >> |
| alphainitial | 1.000 | << | < | . | . | > | >> |
| alphatime | 2.289 | << | < | . | . | > | >> |
| aspect | 1.000 | << | < | . | . | > | >> |
| bounce | false | << | < | . | . | > | >> |
| cursorSprites | true | << | < | . | . | > | >> |
| filled | true | << | < | . | . | > | >> |
| huefillfinal | 0.000 | << | < | . | . | > | >> |
| huefillinitial | 288.000 | << | < | . | . | > | >> |
| huefilltime | 5.000 | << | < | . | . | > | >> |
| huefinal | 252.000 | << | < | . | . | > | >> |
| hueinitial | 252.000 | << | < | . | . | > | >> |
| huetime | 2.003 | << | < | . | . | > | >> |
| lifetime | 6.000 | << | < | . | . | > | >> |
| luminance | 0.500 | << | < | . | . | > | >> |

Perform **Main** **Sliders1** **Sliders2** **Sliders3**

| | | | | | |
|----------------|---------------------|----------------|--------------|----------------------|-----------|
| Looping is OFF | Loop Length 8 beats | Loop Fade Fast | Loop Clear | Transpose 0 | Reset All |
| Fret Quantize | Pressure Vol | Newage Scale | Tempo Normal | Recording & Playback | |

*

Space Palette Pro - Burning Man 2019

- Photon Salon



- PlayAlchemist Grand Pyramid



[Movie](#)

As a Performance Instrument

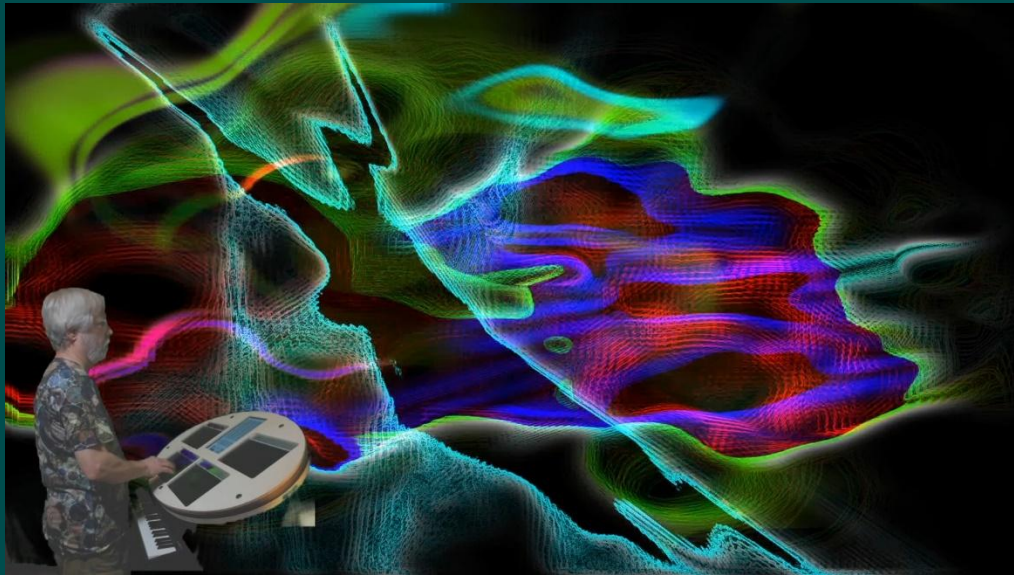
Performance at Indexical in Santa Cruz

Future Possibilities

- More interesting finger painting behaviour
 - Two-handed control
 - Different pressure semantics
- More interesting musical behavior
 - Phrases rather than notes
 - Scanning sequences
- Interactive Shader Format
- Recording and uploading to YouTube

Space Palette Pro

A Visual Music Instrument



These slides can be found at timthompson.com/talks

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