



# Tim Thompson

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# Interests

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- Exploring new technologies through art
  - Personal tools, improvisational development
  - Public interactive installations, casual instruments
- Cross functional
  - Programming languages
  - User interfaces (soft and hard)
  - Music
  - Visuals
- Maker culture, open source, Burning Man

# KeyKit – a programming language for MIDI

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- Procedural, interpreted, multi-tasking, realtime
- MIDI is a first-class data type
- GUI with an embedded window system
  - Written almost entirely in the KeyKit language
- User interface exploration
  - Pull-off menus and buttons
  - Easy re-use of tools within tools
- Improvisational development
  - Algorithmic music, quick auditioning
  - Adding features in the midst of an editing session

# Development History

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- 1.0 - BASIC-like
- 2.0 - realtime
- 3.0 - rewrite, fast enough to avoid built-ins
- 4.0 - graphics
- 5.0 - failed multi-window attempt
- 6.0 - multi-window, pull-off menus/buttons
- 7.0 – support for multiple MIDI ports

On			
time	trans	vol%	ntime
0.75	12	78	3


On	More	Bang
Send a		
'bang' msg		
Add	Del	


Bang
Chord Palette
Console
Echo
GM Prog Map
GM Control
Group
Kboom
Mouse Matrix
Riff
Tempo
Volume

expression
reverb depth
chorus depth
pan
volume

[illegible]

Redraw  
Toggle Met  
Stop All

	
Move	
Resize	
Delete	
Tools ->	
Misc ->	
Page ->	



A screenshot of the 'More' button in the MIDI editor. The button is highlighted with a grey border. Below it, a yellow oval contains the word 'Riff' in white text. The background shows a piano roll with a melody line.

[illegible]

The screenshot shows two vertical sliders. The left slider is labeled 'Vol' at the top and has a 'REC' button below it. The 'REC' button is currently set to 'off'. Below the 'REC' button is a 'Snarf' button. The right slider is labeled 'Tempo' at the top and has a triangular indicator at the bottom.

[illegible]

On	More	1	2	3	4	5
Bass Drum						
Ride Cymb						
Acoustic						
---						

[illegible]

## Kboom (drum patts)

	Arpeggio
	Average ->
	Chan Info
	Copy
	Dedup ->
	Delete
	Echo ->
	Eventime
	Flip
	Fractal
	Info ->
	Legato

Track View Edit B1: Aud Swe B2: Aud Pla

Merged Name: New # Tracks: 16

main riff S M Acoustic Grand 1

Group (multi-track seq)

bells S M Celesta 4

## Group (multi-track seq)

```
key>
key>
key>
key>
key>
key>
```

Merged

**Name : New #**

Trk 1	S	M	X	None
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# Grab Bag

## Roller Derby

**Lo Hi Swee Sp**

# Roller Derby

## Tempo

Techn   Loop

# Techno

## Boomix!



# Boomix

Mouse Matr 1 note

## Mouse Matrix

## Bounce

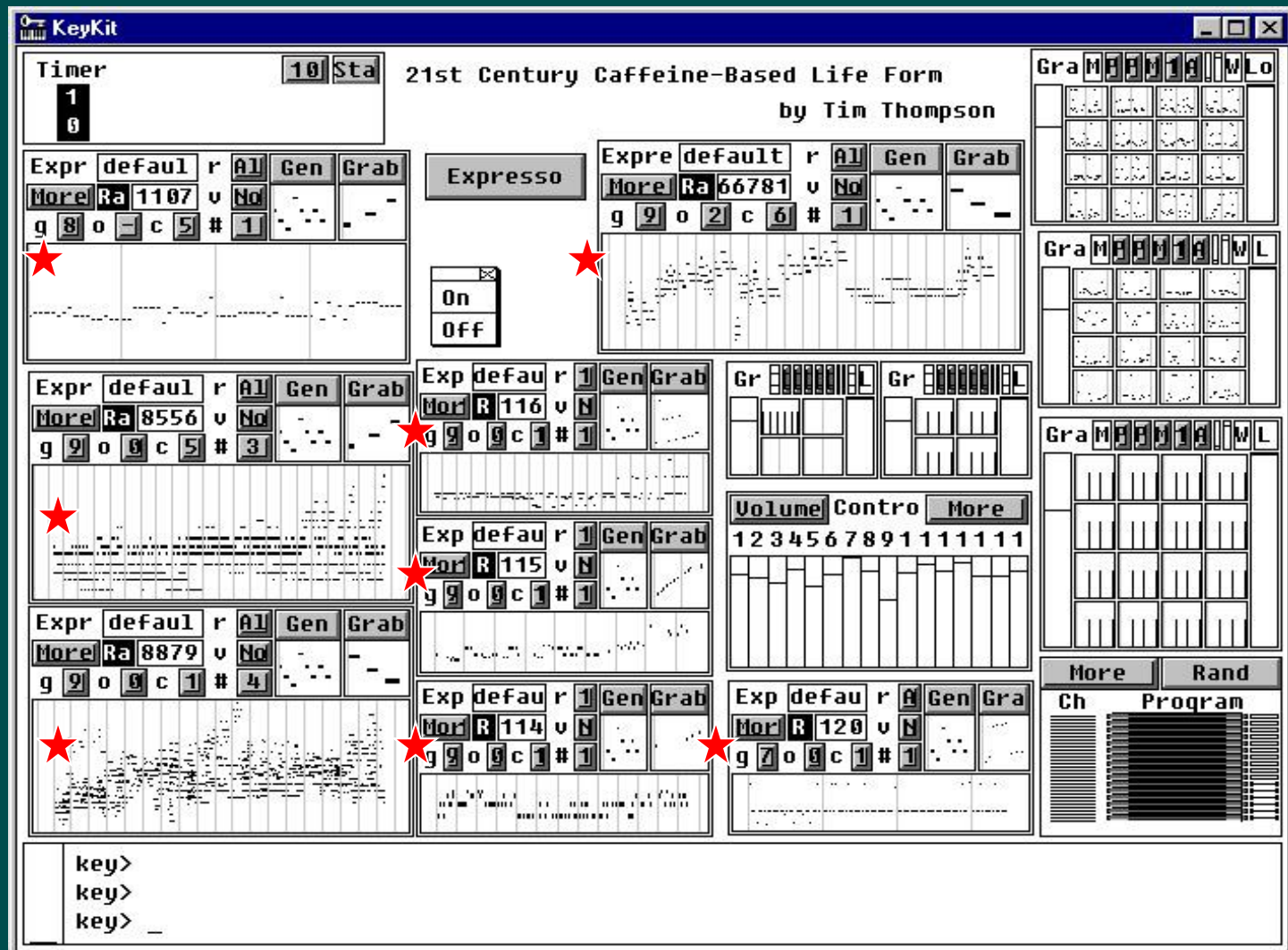
## Bounce

# I moved to Silicon Valley...

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- Woodstockhausen
- Skronkathon
- Y2Kx LoopFest
- Dorkbot
- Illuminated Corridor
- Maker Faire
- BArCMuT (Bay Area Computer Music Technology) Meetup
- Visual Music Meetup
- LoveTechSF
- SHARE San Jose
- Zero1.org, ZER01, 01SJ Biennial, SubZero Street Faire

# An Algorithmic music “instrument” used for “21<sup>st</sup> Century Caffeine-based Life Form” at Woodstockhausen 2000





# Oops, I made a typo

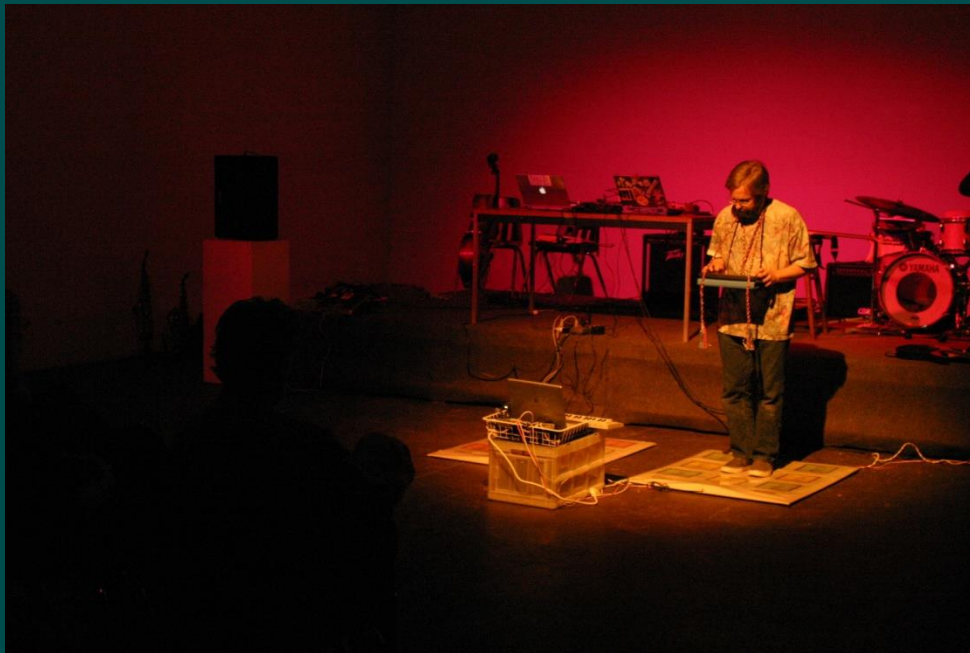
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- Woodstockhausen  
2001
- All-QWERTY  
Performance



# Performances with dance pads

- Woodstockhausen performance – Happy Feet
  - Done entirely on 4 dance pads
  - No hands, No light, and EL-wire-outlined pants
- With Wireless QWERTY keyboard



# The Mother of All Opportunities



# Dance Pads at Burning Man 2002

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[Movie](#)



# Burning Man 2003

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# Dancing under the Stars of Lyra

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[Movie1](#)

[Movie2](#)

# Radio Free Quasar at Burning Man 2004





# Burning Man 2004 - Radio Free Quasar



Audio



# Graphics gets interesting

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- Affordable equipment
  - Webcams
  - Video mixers
  - Security cameras
  - Video processors
- GPUs and CPUs fast enough for realtime
- Visual Music

# Custom Controller for Performing Graphics

- Fingerworks iGesture pads
  - Multitouch with area-detection
  - Extremely responsive



# Dud – improvisational musical group

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- Visuals-only accompaniment to improvisations
- Multitouch drawing, Python graphics, webcam [movie](#)
- 21 Grand : dancers, indoor/outdoor cameras, four projectors, FreeFrame video looping [movie](#)

# Different Skies 2007 - Arcosanti



[Full movie](#)

[2 hours](#)  
[In 2 minutes](#)



# Other uses of Fingerworks iGesture pads

- Finger Fresco at Maker Faire 2007



[Movie](#)

# Finger Painting with Planets

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- Maker Faire 2008



[Movie](#)

# Finger Painting with Planets

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- KeyKit – input and realtime processing
- Plogue Bidule – VST host for sounds
- Salvation – Freeframe host for visuals
- Planets – Freeframe plugin
- Cairo – drawing on bitmap (from Python)
- Chipmunk – Physics simulation (from Python)
- OpenCV – raster manipulation (from C)
- OSC – communication between KeyKit and Planets

# Finger Painting with Planets

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- Night Lights show at Climate Theater



[Movie](#)



# Finger Painting with Planets

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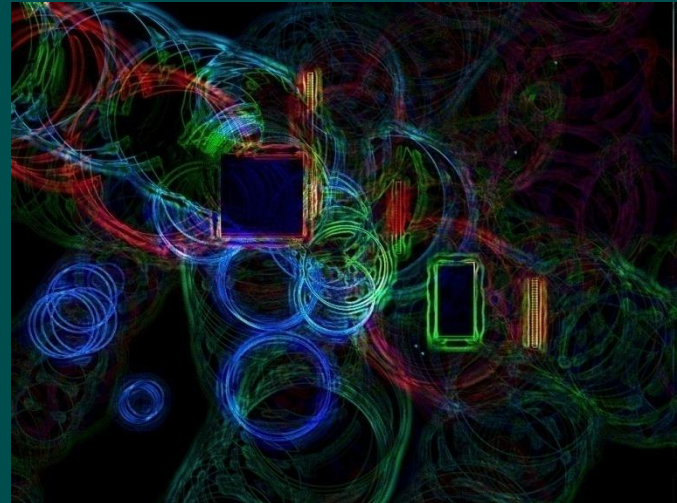
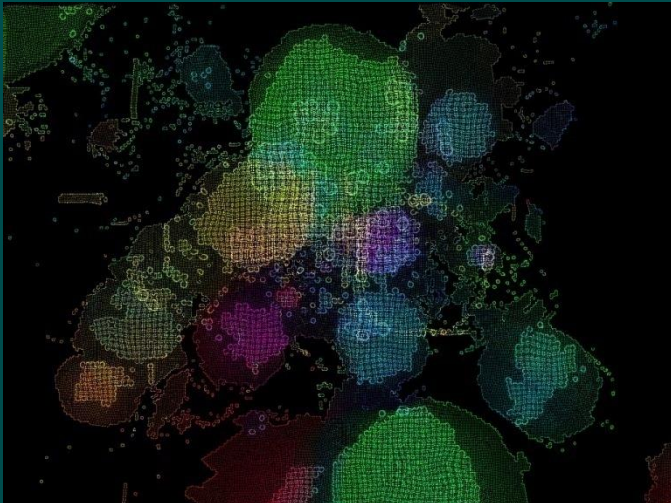
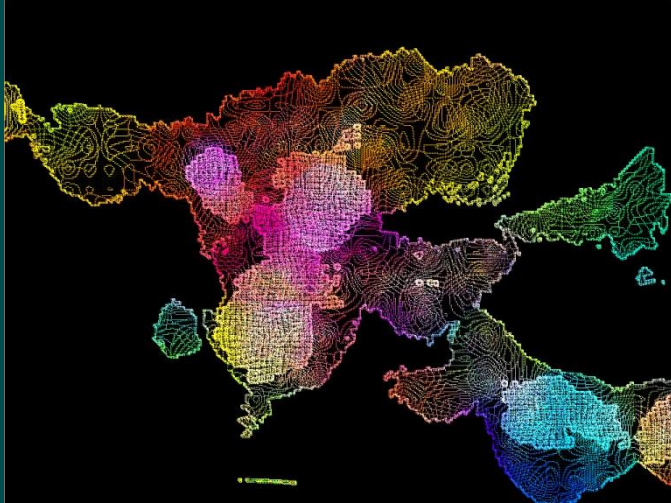
- Yuri's Night



[Movie](#)

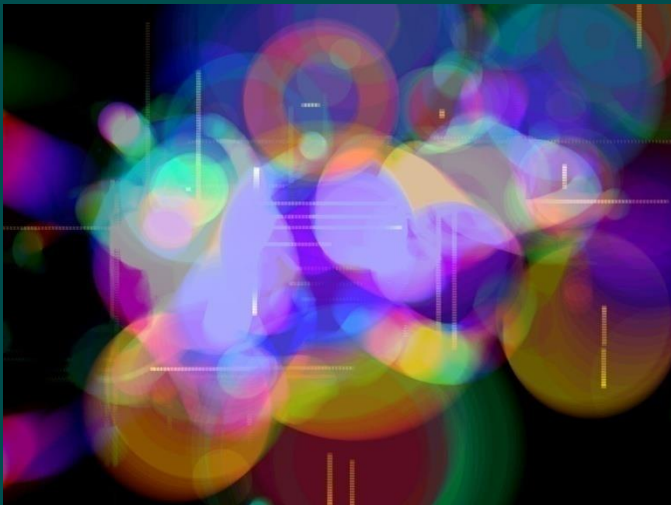
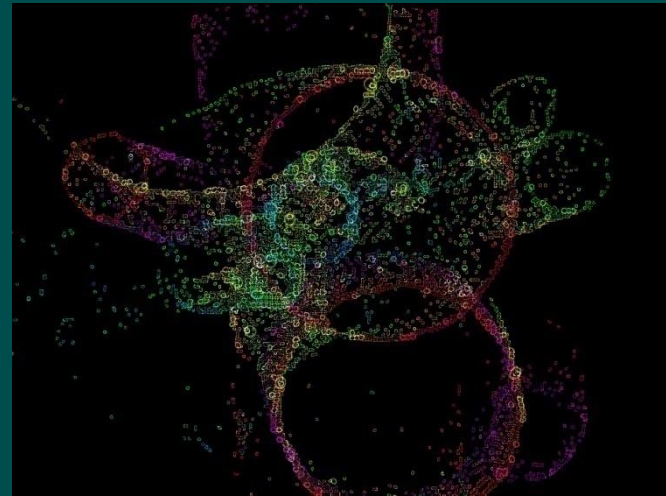
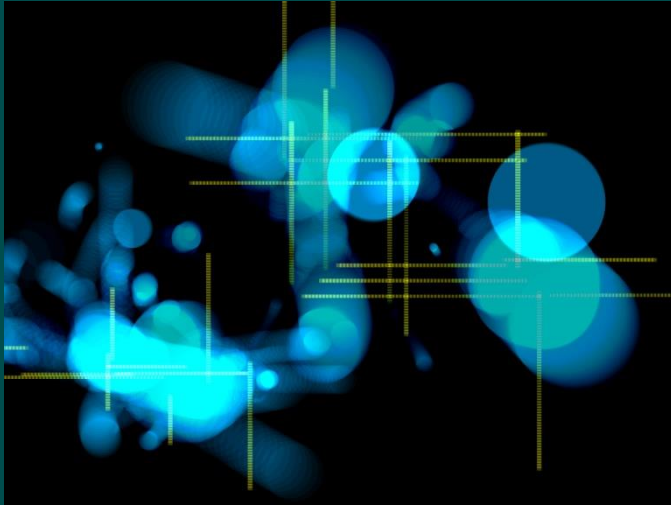
# Examples of Visual Output

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# Examples of Visual Output

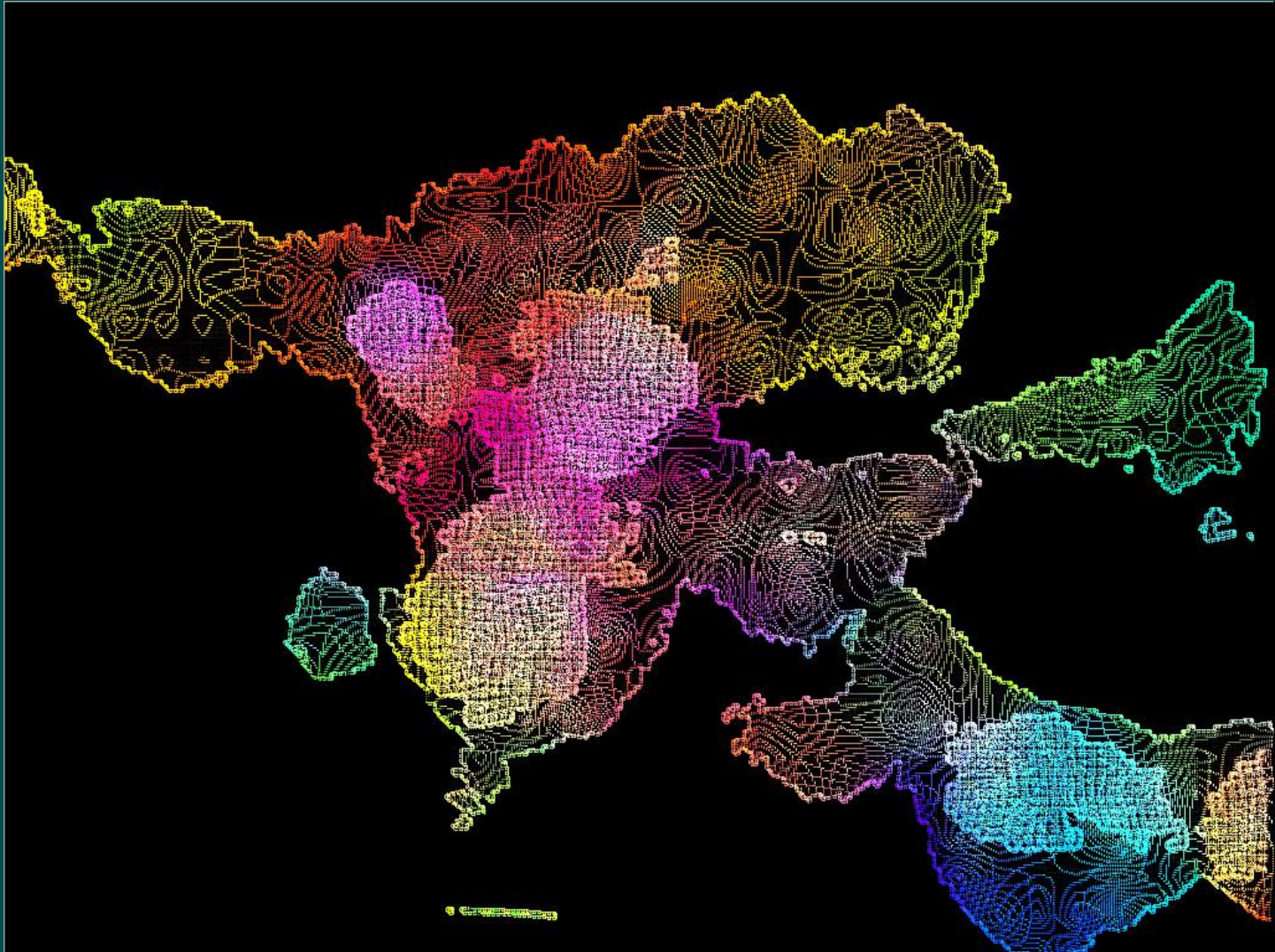
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# Examples of Visual Output

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# Examples of Visual Output

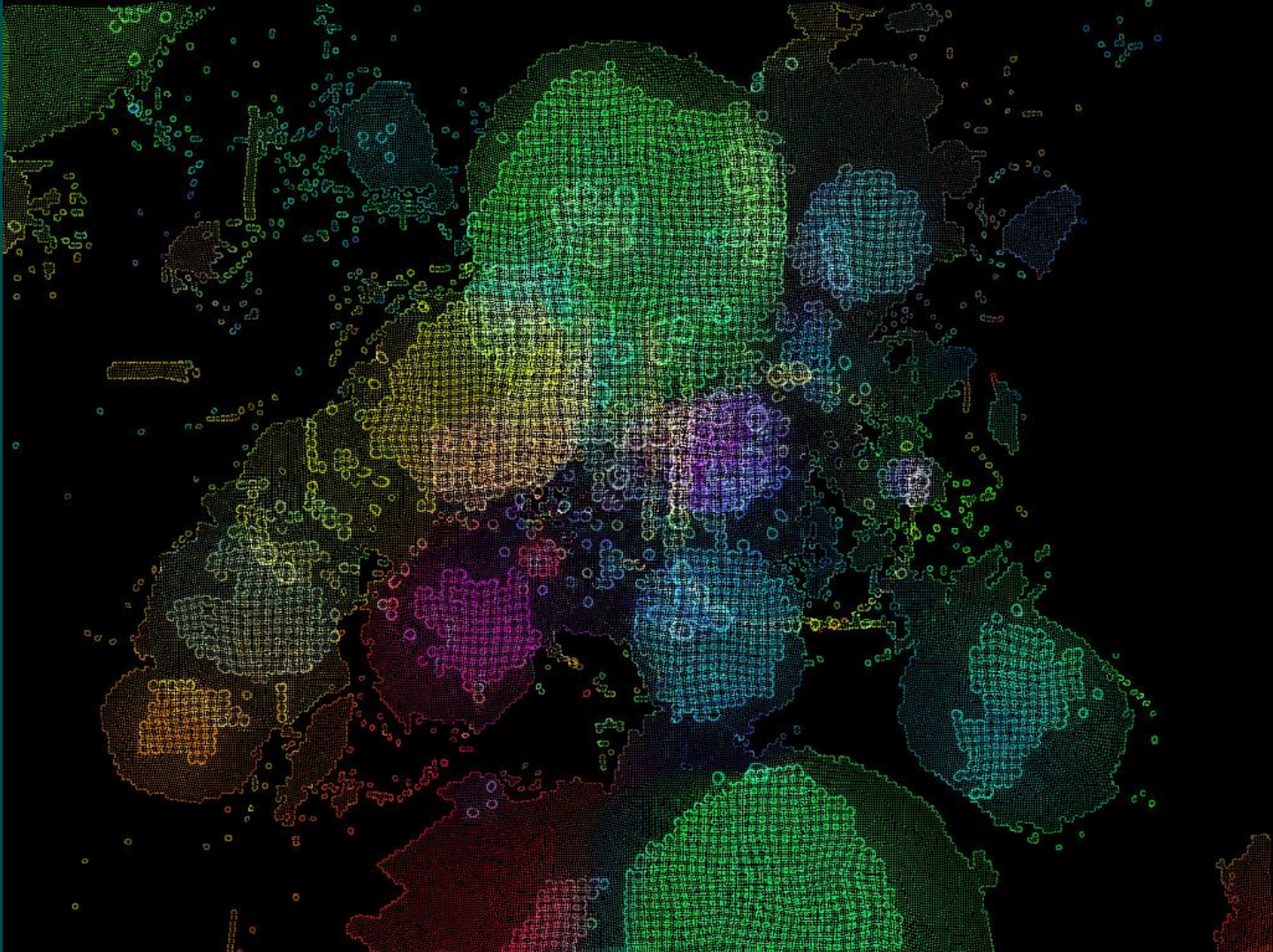
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# Examples of Visual Output

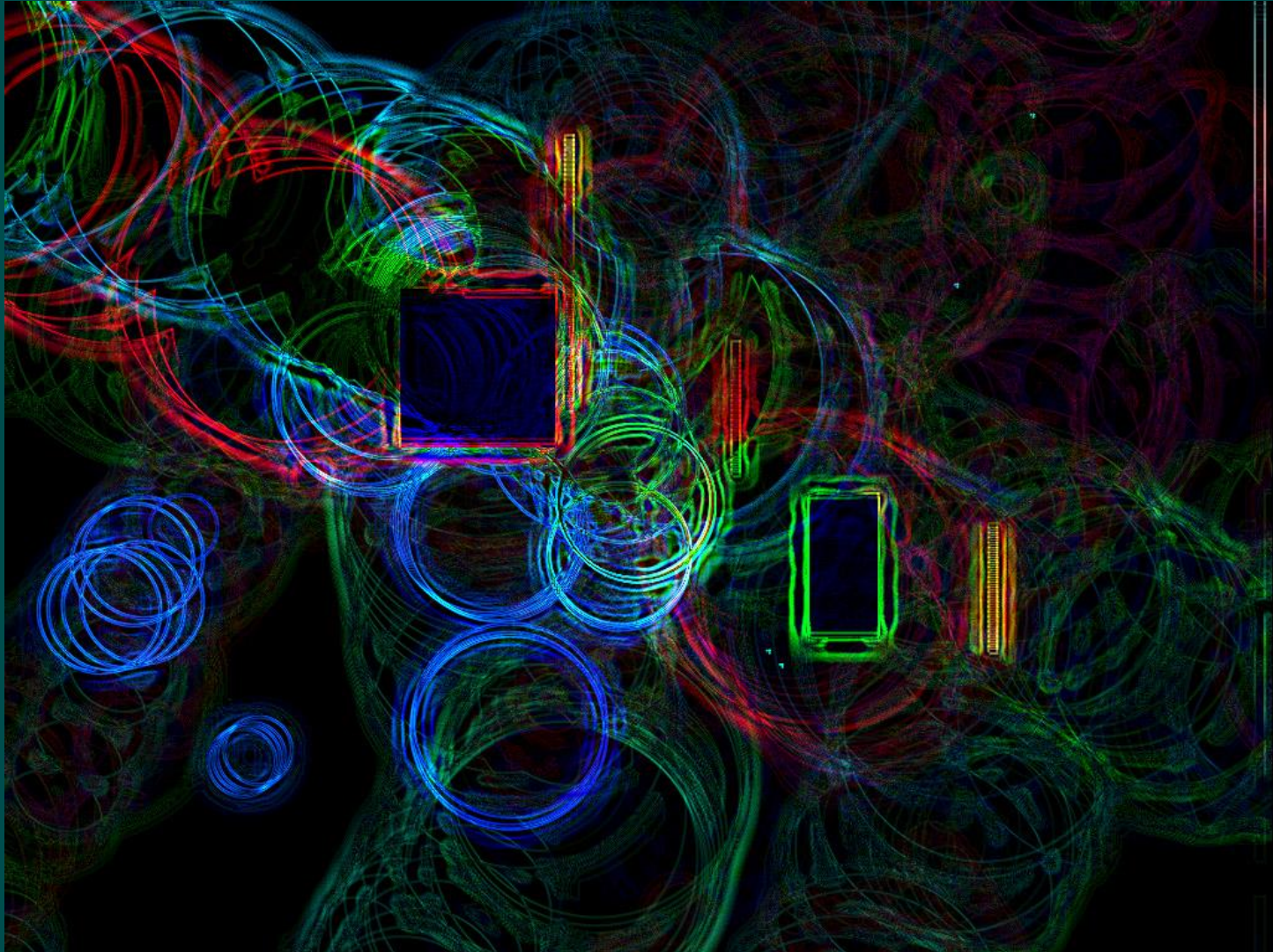
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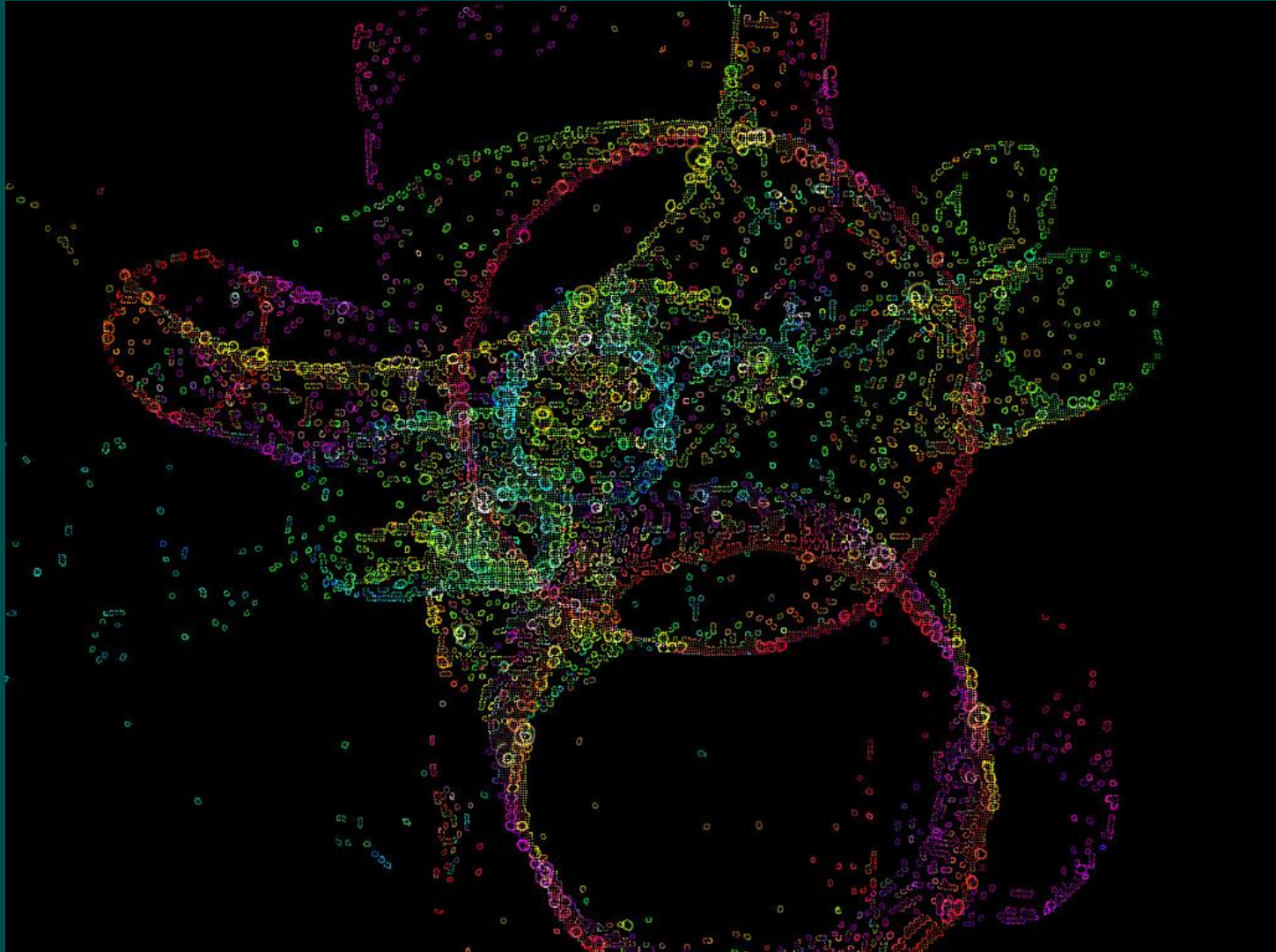
# Examples of Visual Output

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# Examples of Visual Output

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# Double Vision

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- Collective of dancers, musicians, and media artists
- Free innovation within a particular theme
- First show's theme was DNA
- Installation consisted of Conway's game of Life, audience could add DNA letters as patterns to it, and the generations of cells would trigger music and graphics



# Double Vision – SpectraBall

- Dance pads used to control balls bouncing around in a maze
- Balls hitting the walls would trigger sounds in 4 speakers surrounding you - the sound location would match the direction in which the wall was hit



# Double Vision – Cellspace show

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- Steering wheel controllers used in two installations:
  - Art of Driving: drive around and “fire” graphics
  - Bouncing off the Walls: drive around a maze, firing balls, resulting in 4-channel music around you

[Movie](#)



# DoubleVision – performing graphics

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- Red Ink Studio – performing graphics with dancers and musicians





# LoopyCam

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- Camera-based visual performance instrument
- Integrated control of camera position and visual processing
  - 8 video loops captured and processed in realtime
- Version 1 - security camera and \$10 game controller
- Version 2 – number pad and LCD display



# Monolith 2.0 for Burning Man 2009



# Monolith 2.0 on the playa

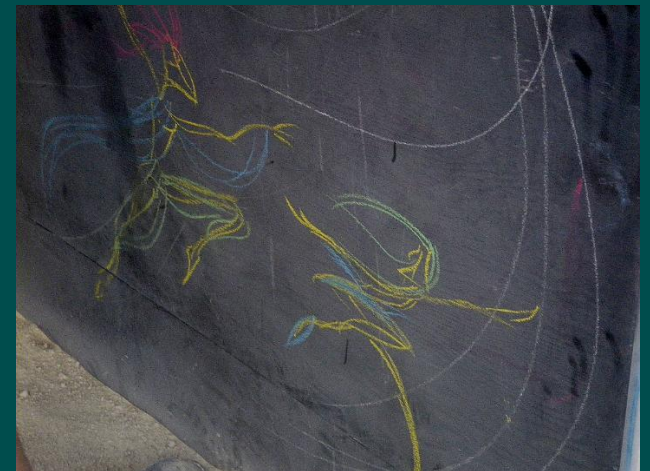




# Monolith 2.0 – on the playa

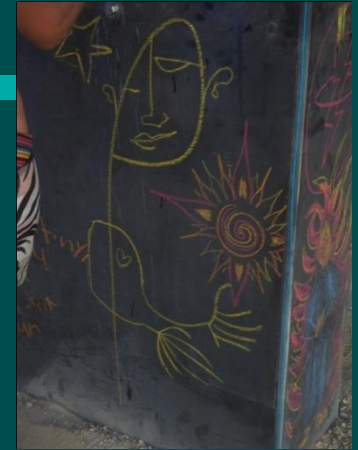


[Movie](#)

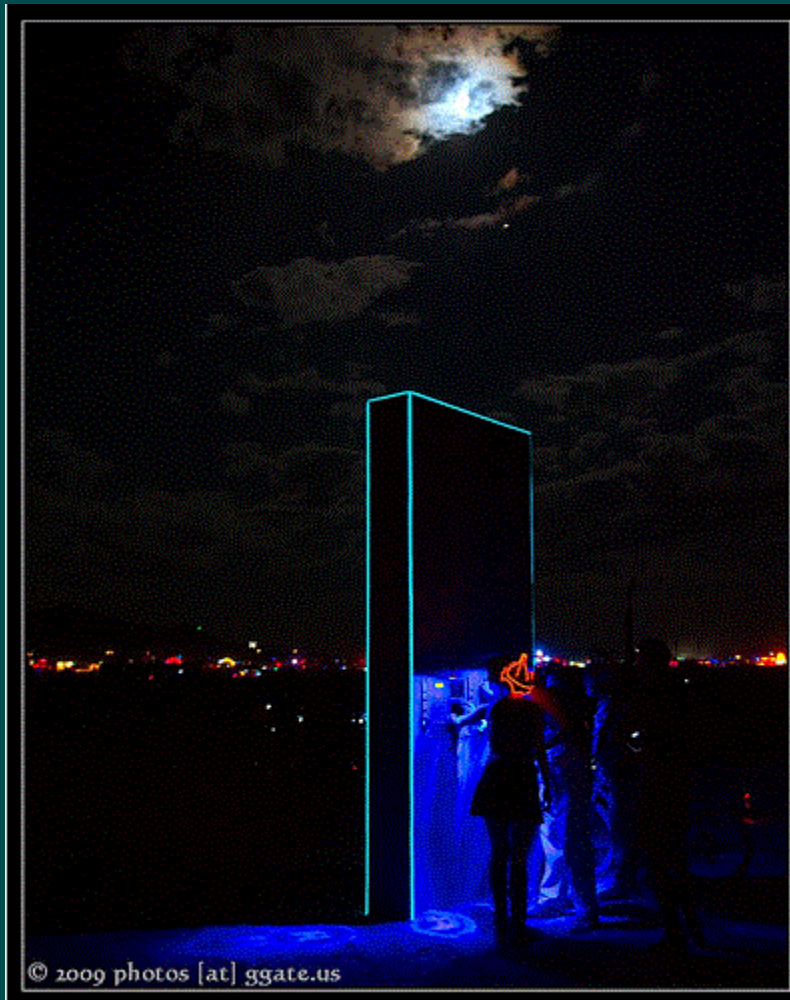




# Monolith 2.0 on the playa



# Monolith 2.0 on Flickr

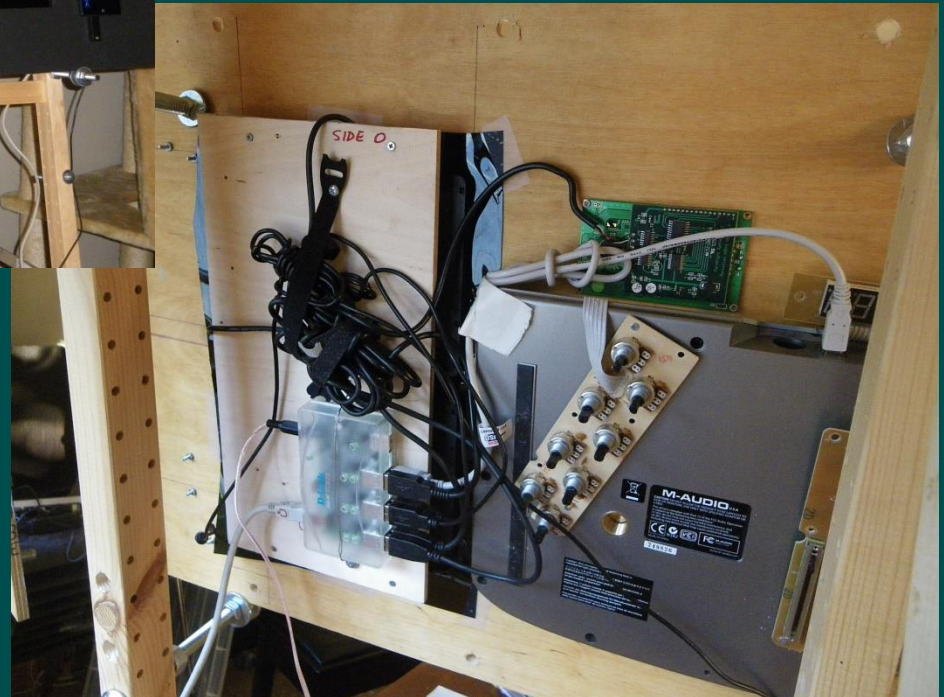




# Monolith 2.0 – the controllers



- Korg Nanokeys used as buttons
- M-Audio Trigger Fingers used for drum pads



# Buttons

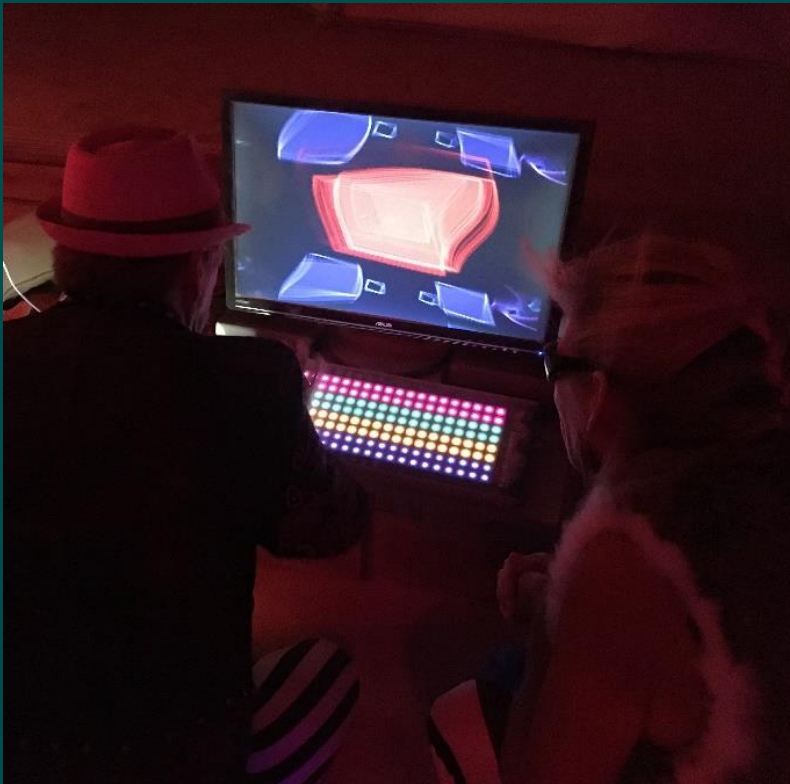
- Originally was going to use arcade buttons
- Worldwide shortage of buttons due to release of Street Fighter IV
- Korg Nanokeys are cheap and come in black
- Convenient for labels
- Removed configuration buttons and covered in flexible acrylic for dust





# UniLooper

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

[Movie](#)

# LoopyCart at Burning Man 2010

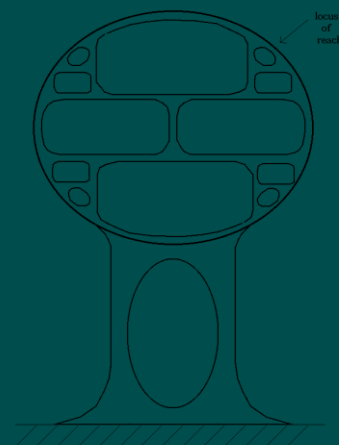
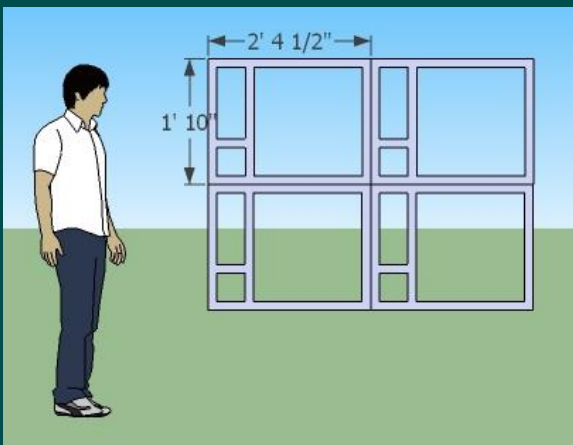
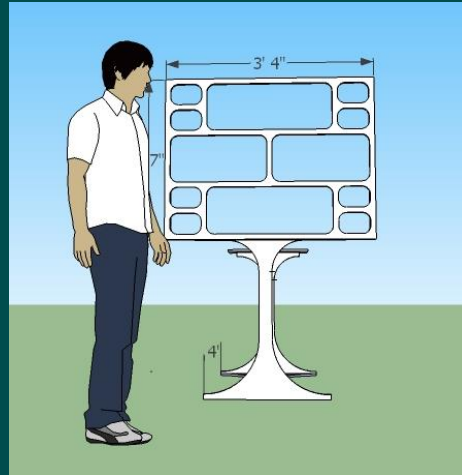


# 3D Input Devices for expressive input

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- Fingerworks iGesture
- Microsoft Kinect
- Leap Motion [Movie](#)
- Creative Sens3D / Intel Realsense
- Kinect 2 (for Xbox)

# Space Palette - Evolution and Variations





# Space Palette “Classic” – Kinect-based

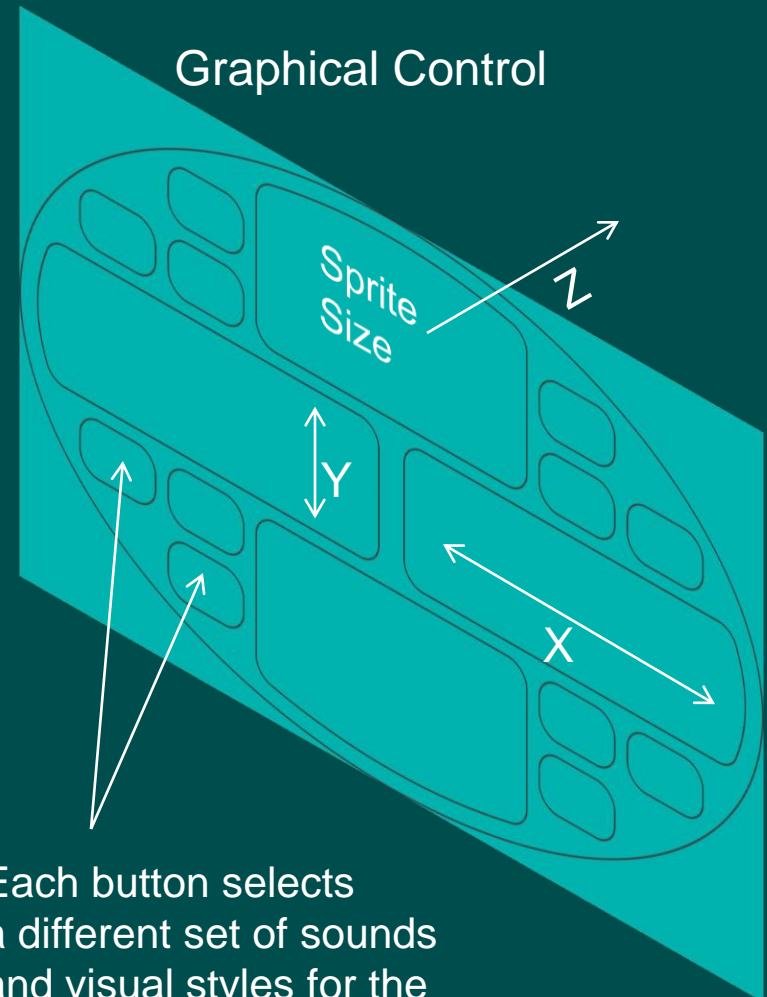
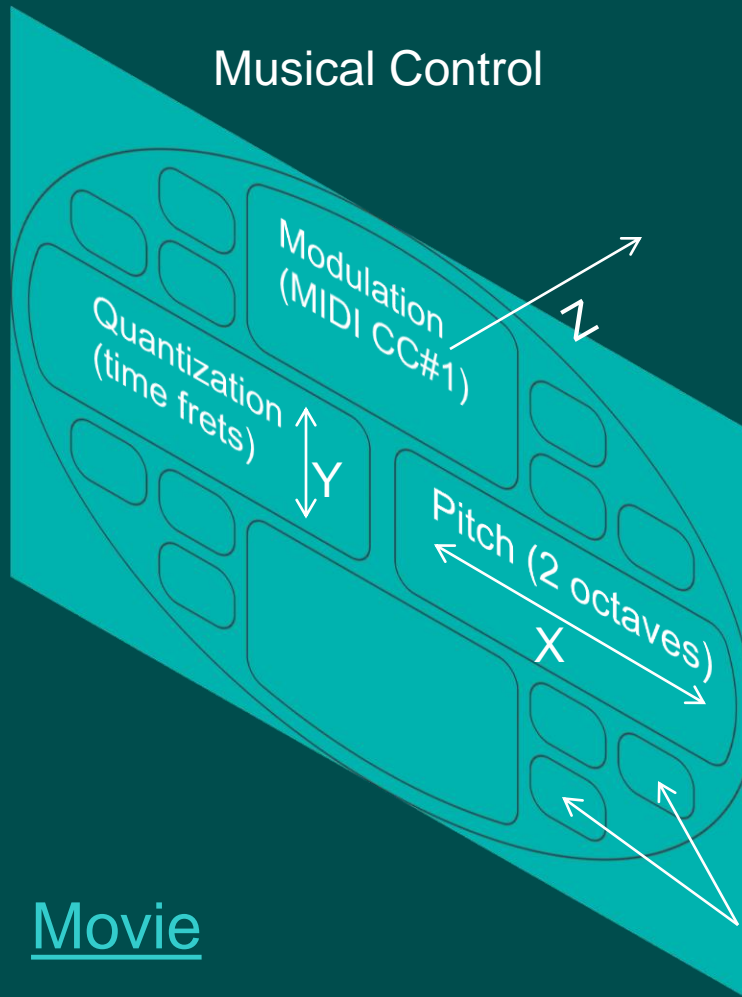


[Movie](#)

[Movie](#)



# Space Palette Interface



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

# Comments about the Space Palette

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- Most common:

- I want one in my living room.
- How much? Where can I get one?
- I could stay here all night.

- Most interesting:

- Why, it really opens up what an instrument is, right?
- You gotta try it, you gotta try it, you gotta try it!
- For those who can't cross that barrier [of playing music], they're literally crossing that barrier [hands reaching through].
- Gorgeous... and powerful. (from a two-year old girl)
- I never knew I was a creative person till I walked in there

# Types of Instruments

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- Casual Instruments

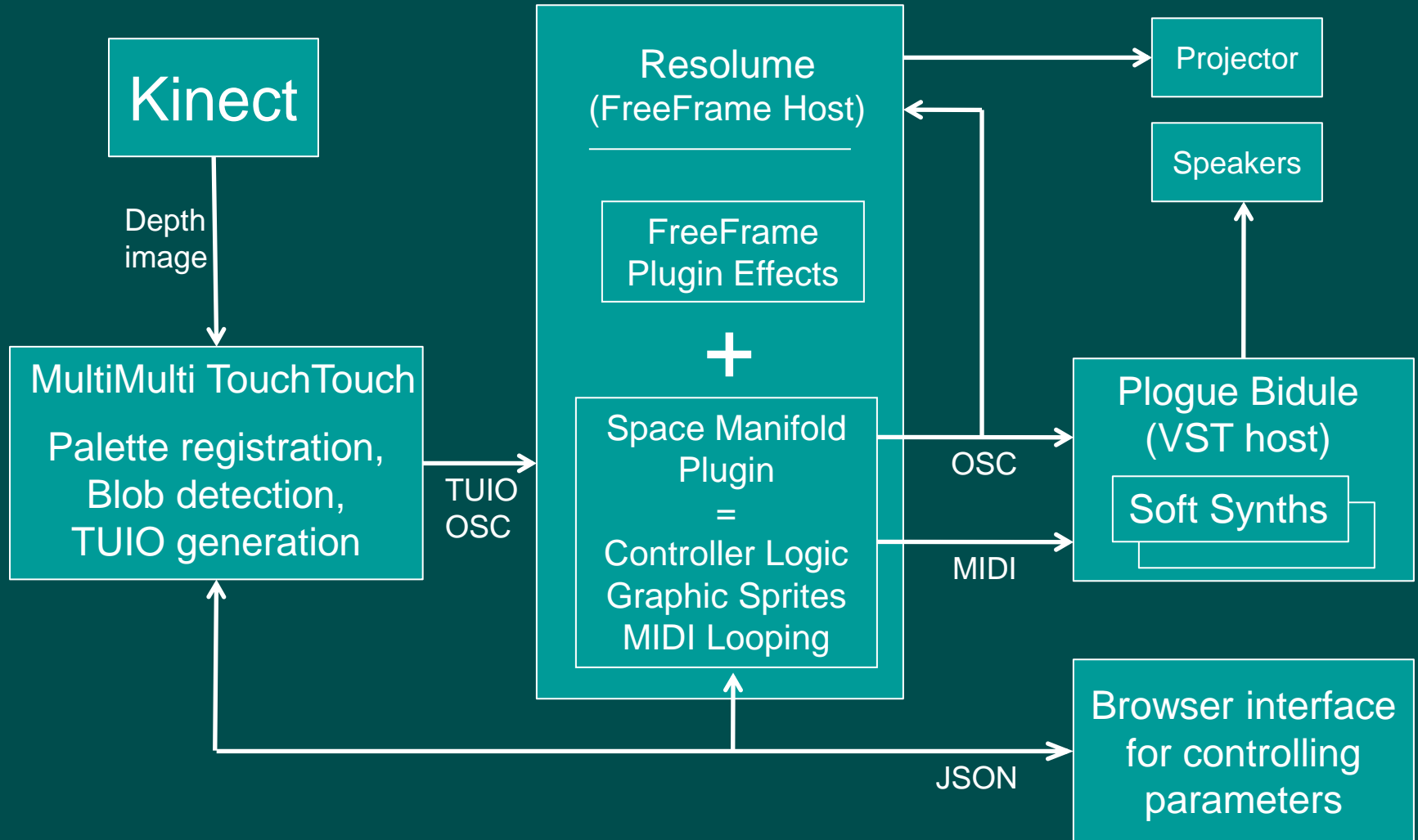
- Prioritize fun and enjoyment
- Few or no instructions
- Immediate gratification, no learning curve
- Path to proficiency is nice to have, but not required

- Performance Instruments

- Prioritize proficiency and control
- Instructions or training usually required
- Proficiency requires practice, learning curve
- Visualizations for audience are beneficial



# Space Palette Design - 2012



# 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

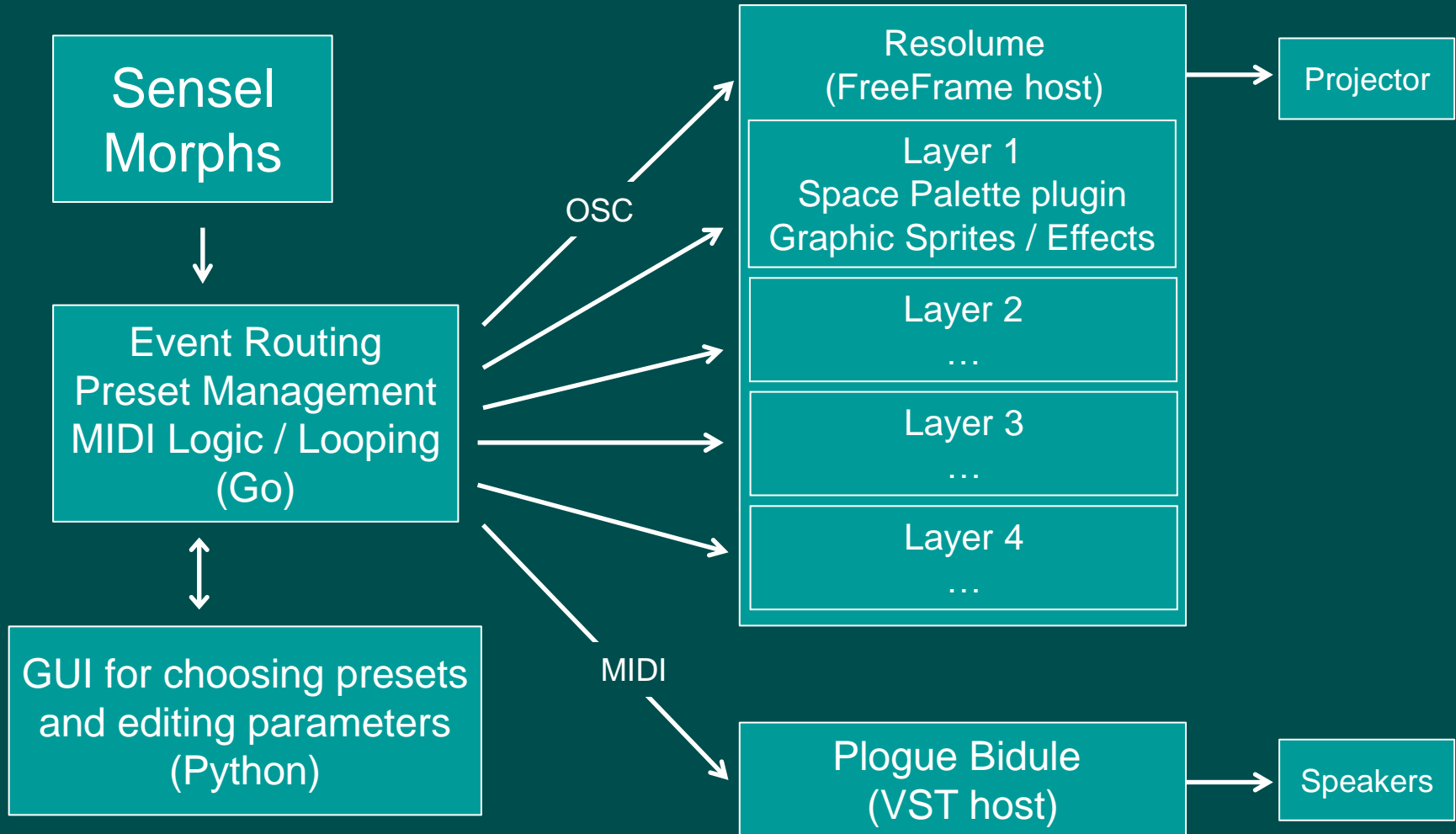


# Space Palette Pro - Overview

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- 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

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**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

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**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
Scatalogical 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](#)

# Space Palette Pro for Performance

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- MIDI keyboard controls the scales that you're playing in realtime.







# Tim Thompson

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