

Game

Audio

Visual

Scripting

GACO 2022

Learn game audio online.

*School of*  
Video Game Audio 

SoVGA.com

Leonard Paul - School of Video Game Audio  
**SoVGA.com**

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# Overview

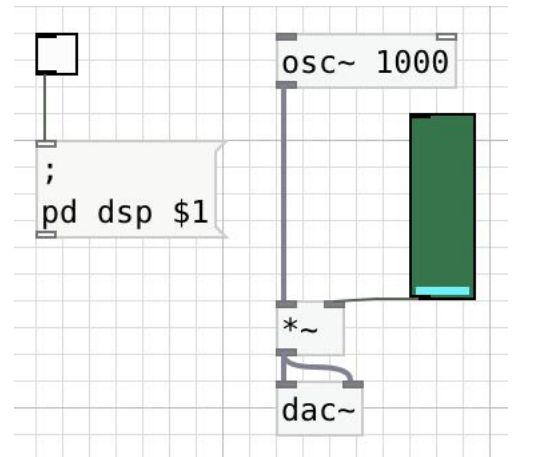
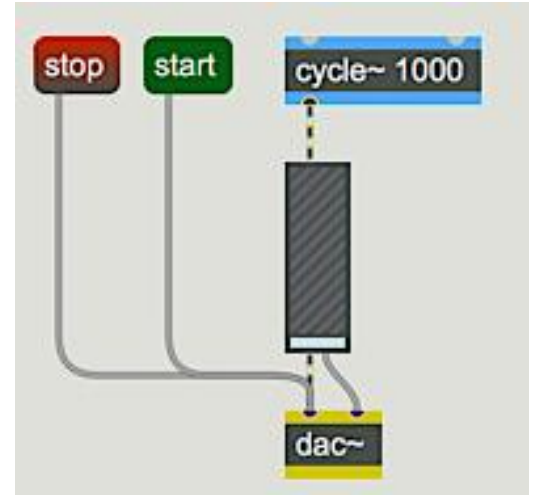
- Some examples
- A bit of history
- Advantages
- Challenges
- The future

The screenshot displays a Pure Data patch window titled "SimCell\_GenerativeMusic\_I Paul-VideoGameAudio.com". The patch is organized into several color-coded sections:

- Scenes:** A section on the left with a BPM control set to 90 and a "pd 16counter" sub-patch.
- Inst1-4:** Four sub-patches for individual instruments, each containing various signal processing and routing objects.
- Beats:** A sub-patch at the bottom left for generating beat patterns.
- Sim\_Cell:** A central orange box containing the text "Generative Music Synthesizer" and a URL.
- Seq:** A large grid-based sequencer in the center, with columns for notes and parameters.
- Mix\_Seq:** A green section at the top right for sequencing mix events.
- Grain\_Seq:** A green section below Mix\_Seq for sequencing grain events.
- Granular:** A blue section at the bottom center for granular synthesis, including a "load samples/AmbiMotobike.wav" object.
- Mix:** A large section on the right for mixing, featuring multiple "pd mixer\_8\_chan" objects and a "pd beatdelayiff" object.

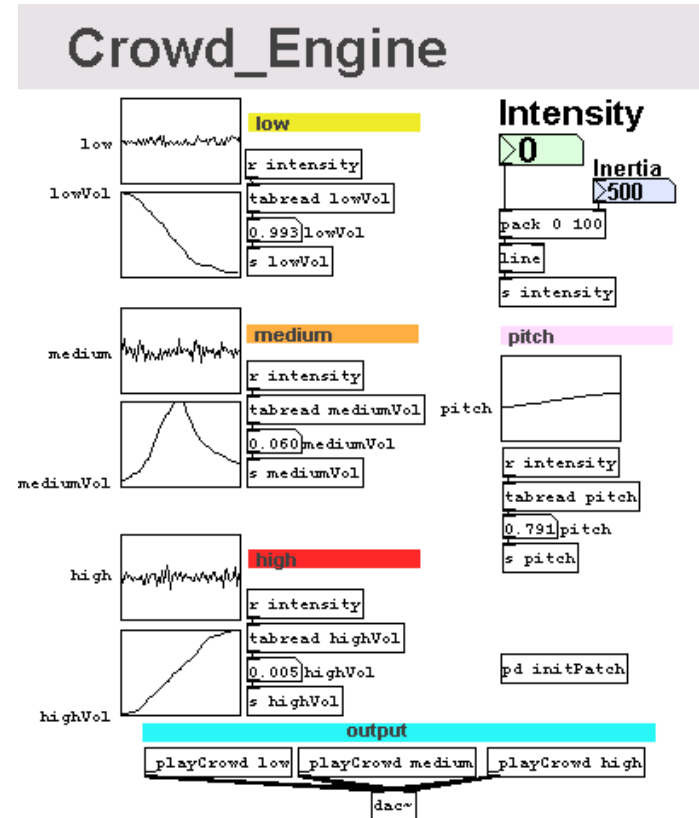
# Max/MSP + Pd

- 1985 - **Max** was just audio when I used it in 1991
- 1996 - **Pure Data** – open source version



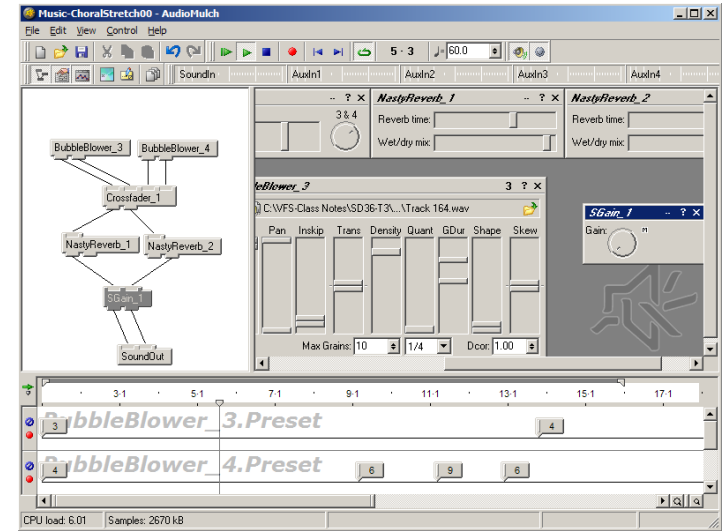
# Pd Game Audio Education & Prototyping

- *Audio Prototyping with Pure Data*
  - Gamasutra 2003
  - Adaptive music
  - Sound effects
  - Crowd engine
  - Stitched speech
  - Used for teaching at AI Vancouver



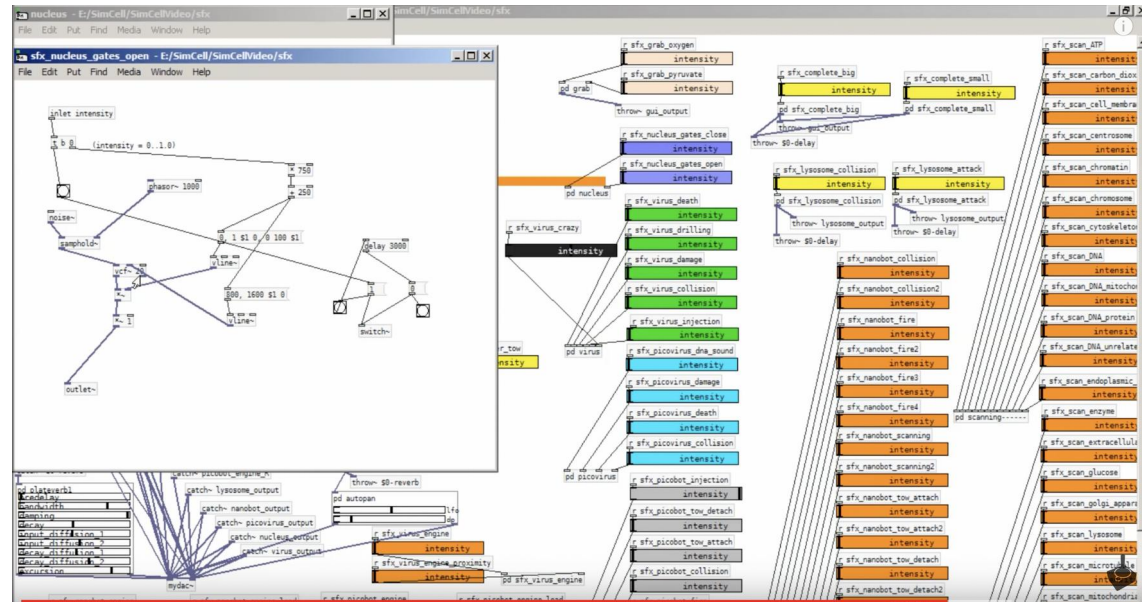
# Examples my Work

- *The Corporation* doc used AudioMulch
- *Beep* documentary score using Pd noted on Billboard Magazine
- *Sim Cell* video ([Stanford talk](#) extended)
- I want to create music that feels “alive”



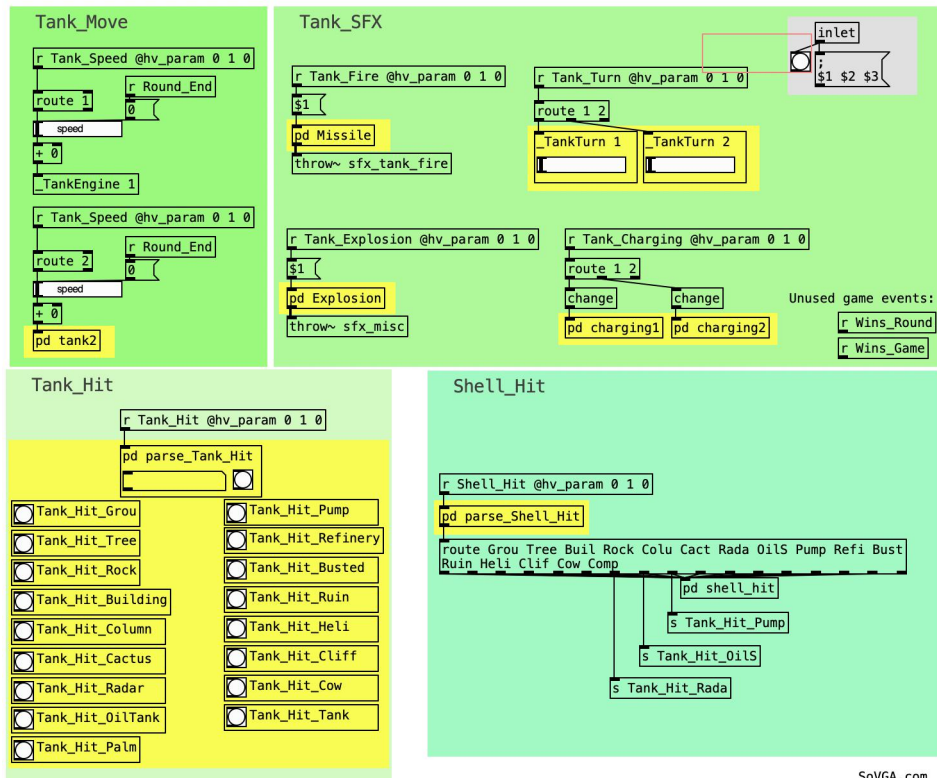
# Procedural Sound Design

- *Sim Cell* video overview
- Each playback is different
- Samples + fx + synths
- Low disk/RAM space
- “High” CPU



# Procedural Sound Design Demo

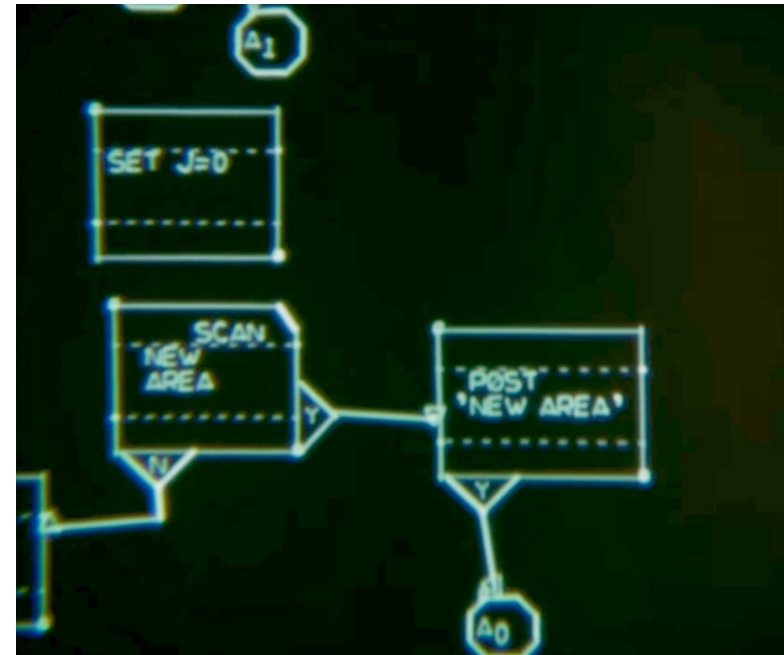
- Tanks (Unity + Pd + OSC)
- Free download:
  - [SoVGA.com](http://SoVGA.com)



SoVGA.com

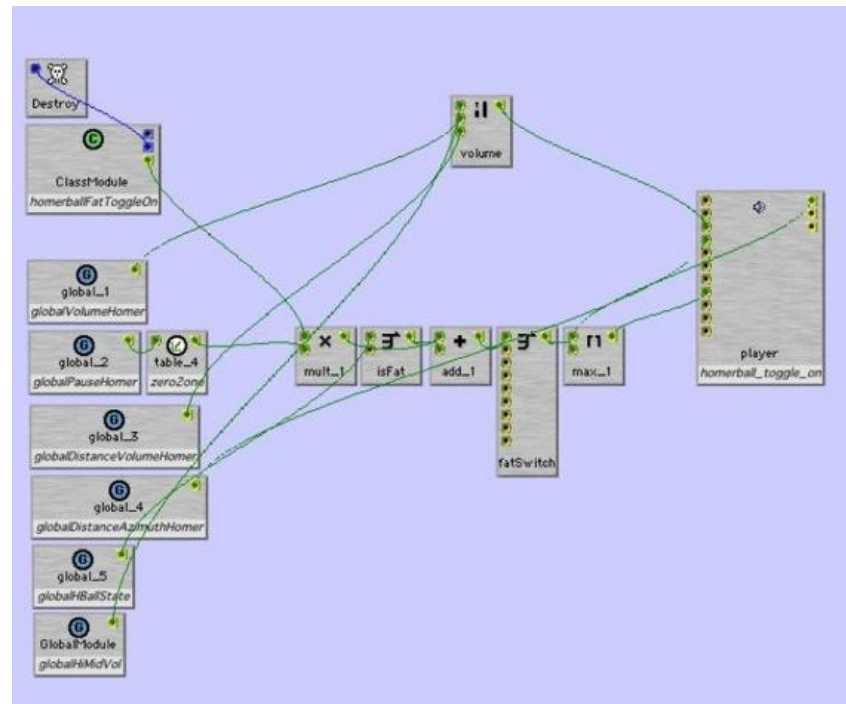
# History

- 1963 – Sketchpad & 1968 – GRAIL
- 2002 – EA AEMS
- 2003 – Scratch
- 2008 – Electronic Art’s Frostbite
- 2014 – Guerilla Games’ **Visual Scripting**
- 2016 – Rockstar’s AMP



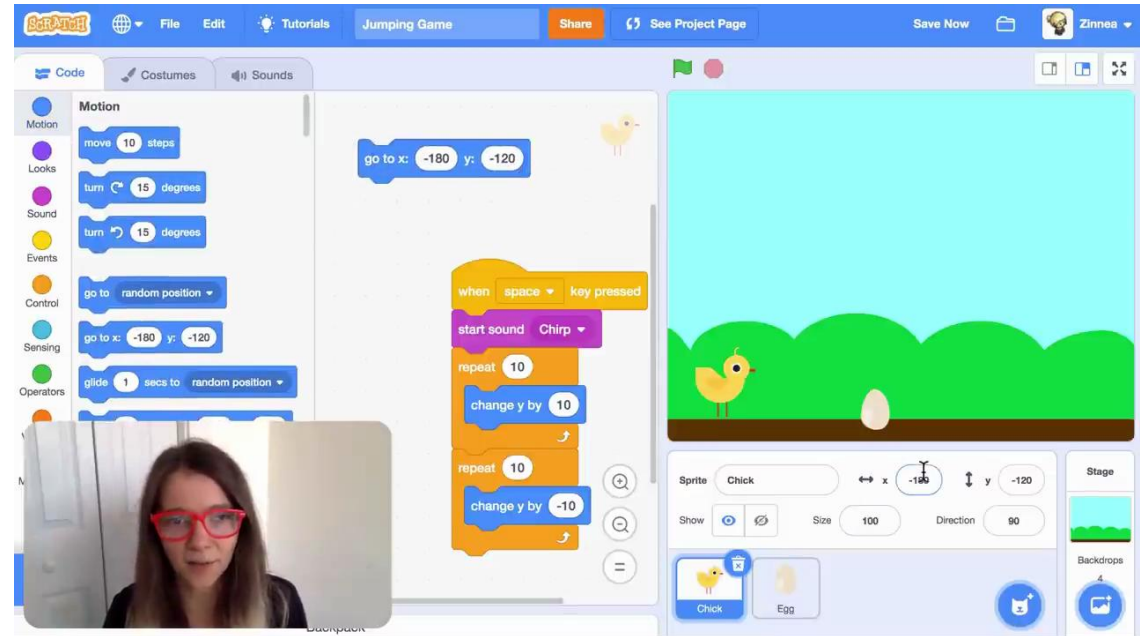
# EA's AEMS

- Electronic Arts
- Audio Event Management System
- *The Simpsons Game* example



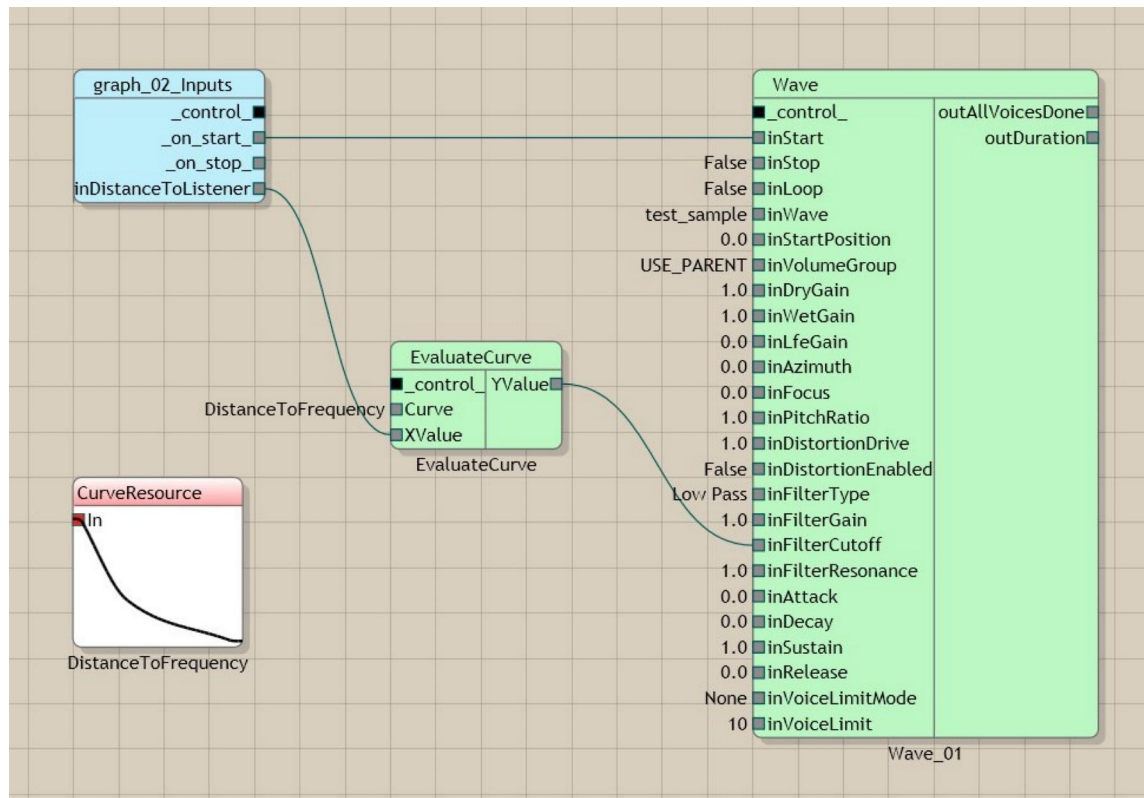
# Scratch

- Designed for kids
- Large project library
- Can make basic games
- Colourful
- Audio too



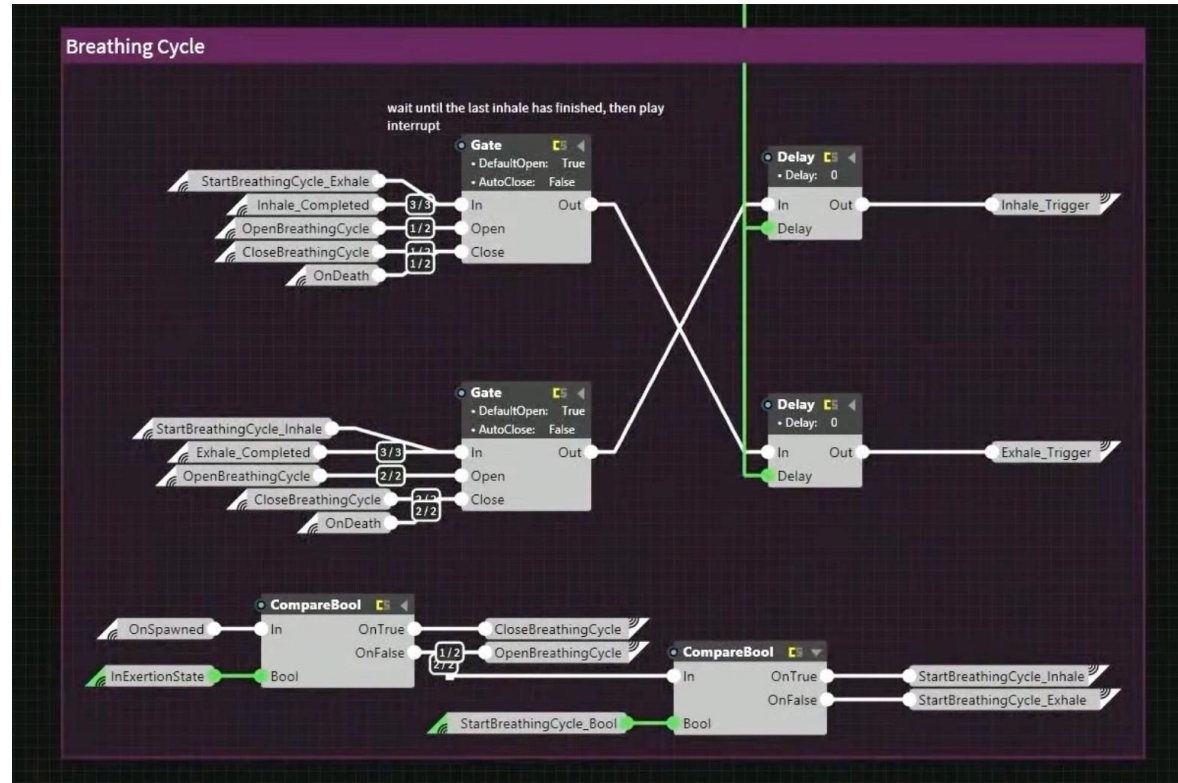
# Guerilla Games Visual Scripting

- Designed for *Killzone Shadow Fall*
- Presented at **GDC 2014**
- Built for performance



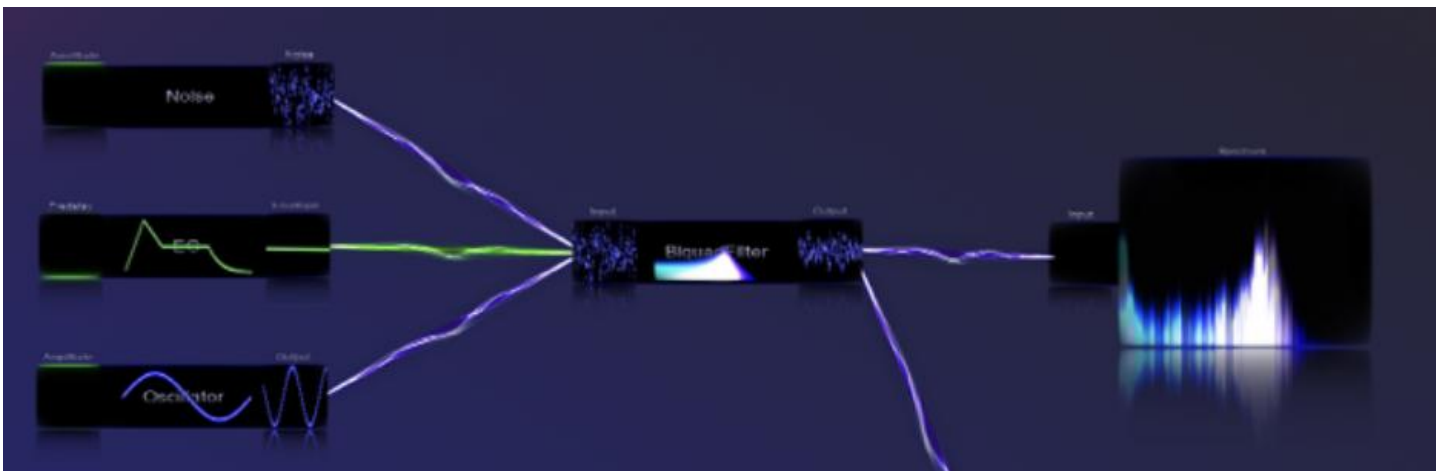
# Frostbite

- EA's *Dead Space* + more



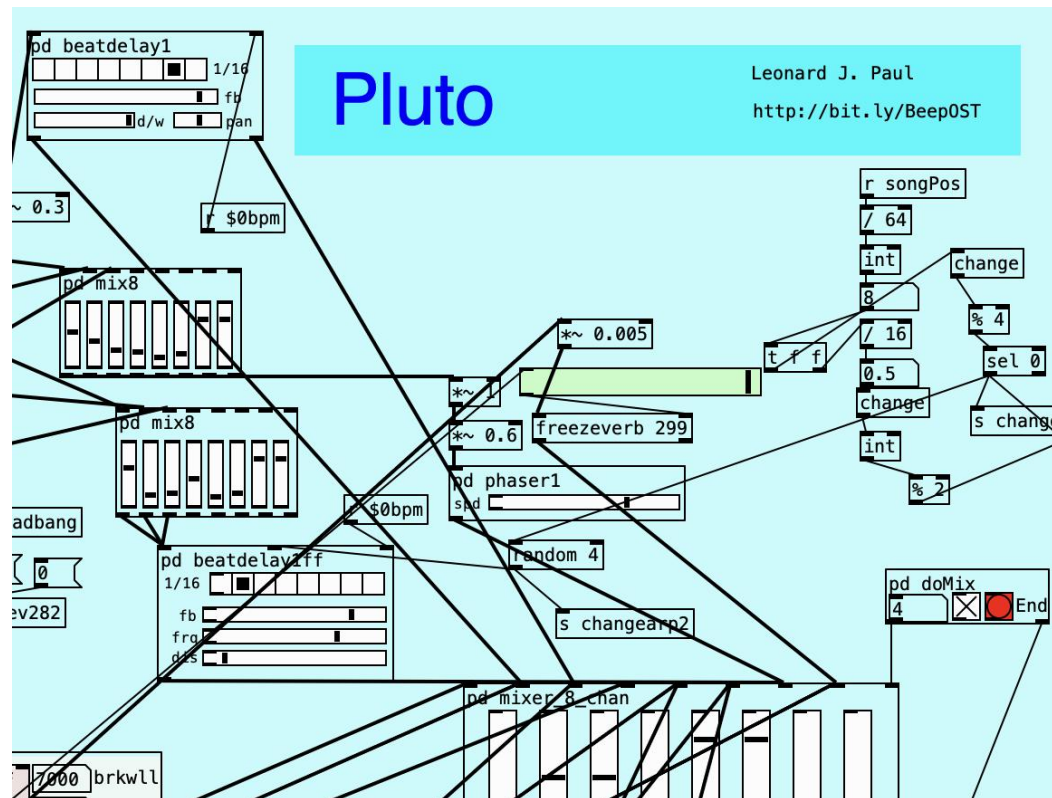
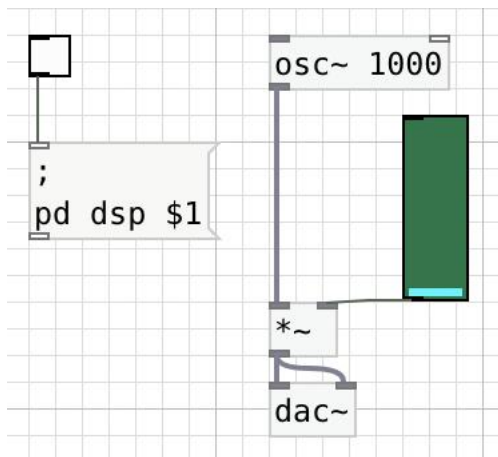
# Rockstar's AMP

- Used by Rockstar Games for *GTA 5* game audio & more
- High number of *GTA 5* sounds used synthesis with AMP

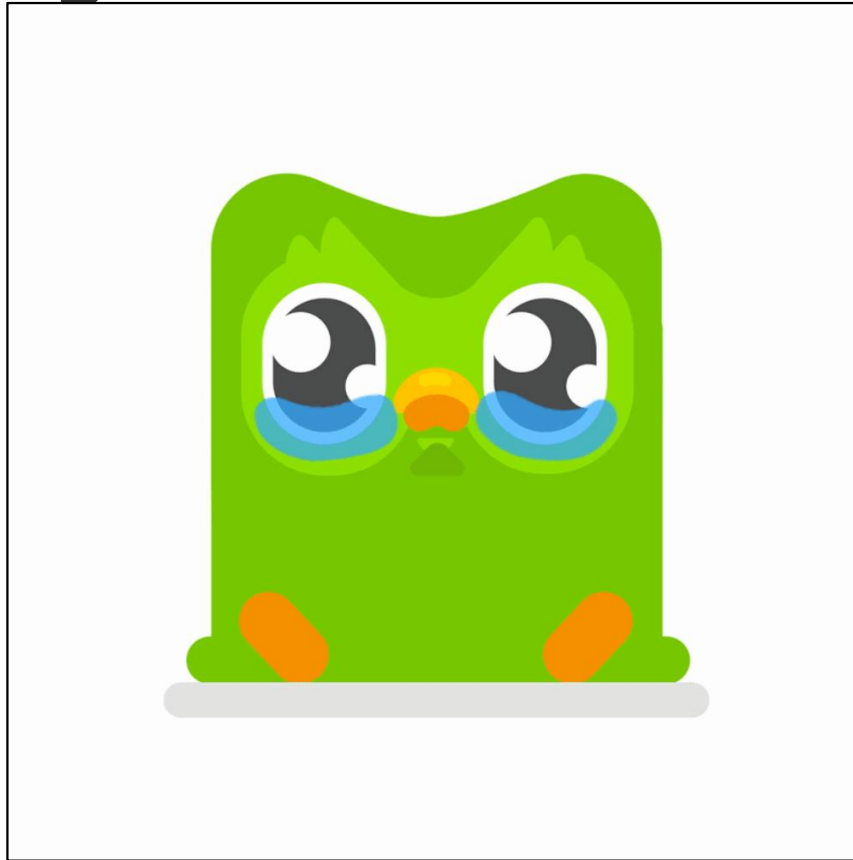


# Pd Music Demo

- Basic “Hello World” in audio
- Complex *Pluto* song

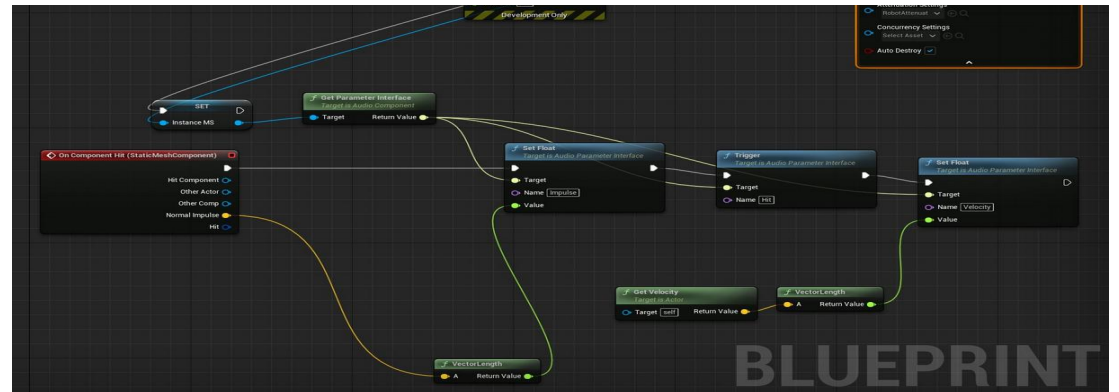
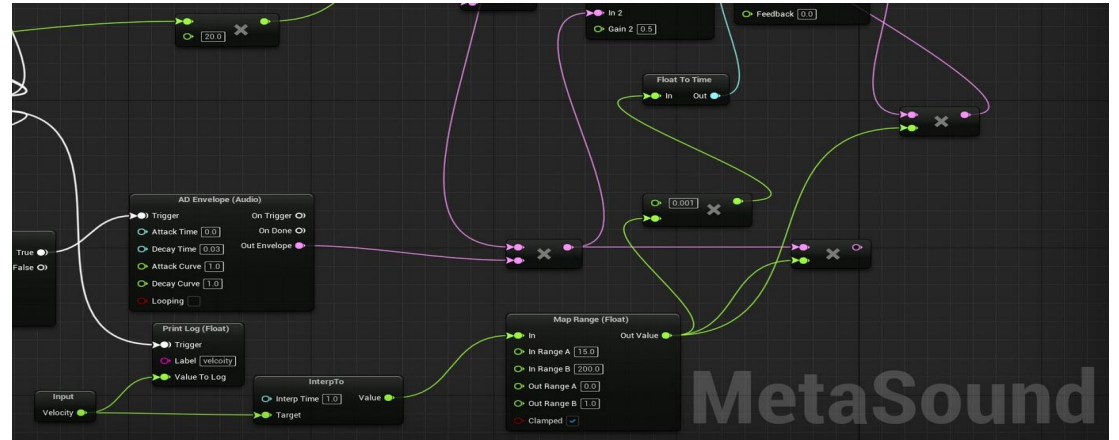


# No Duolingo for Visual Coding



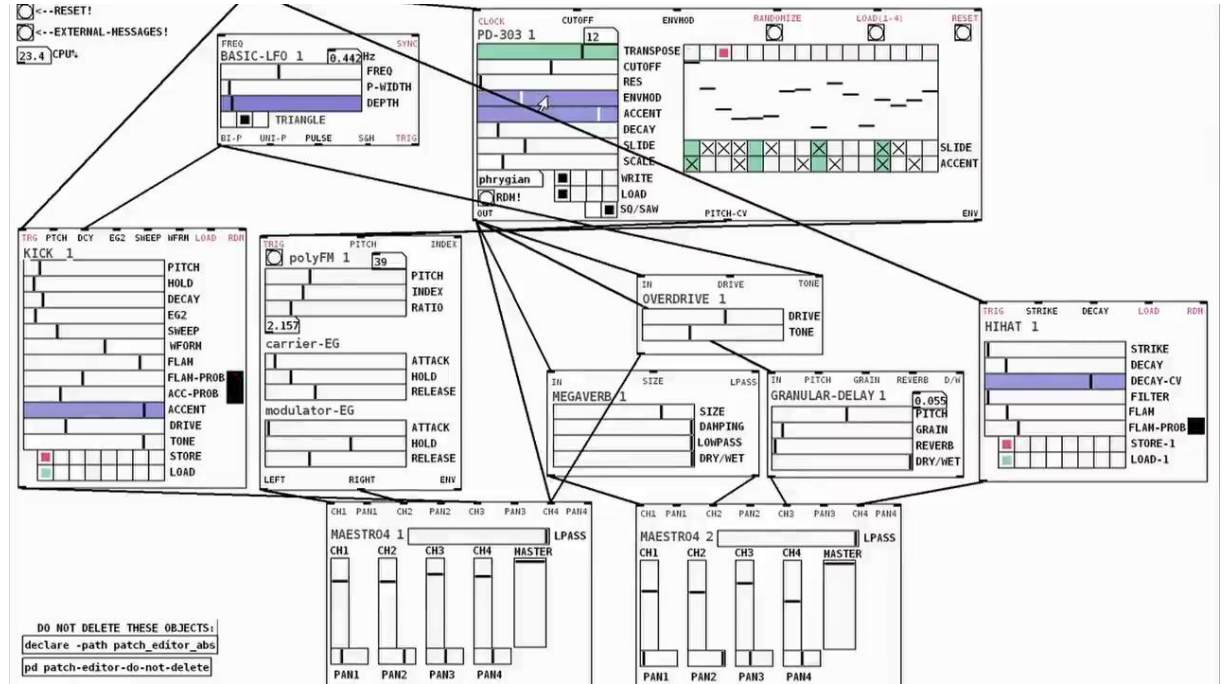
# DSP Graph vs. Visual Scripting

- Metasounds
  - DSP graph
  - Audio signal chain
- Blueprints
  - Behaviours
  - Visual scripting



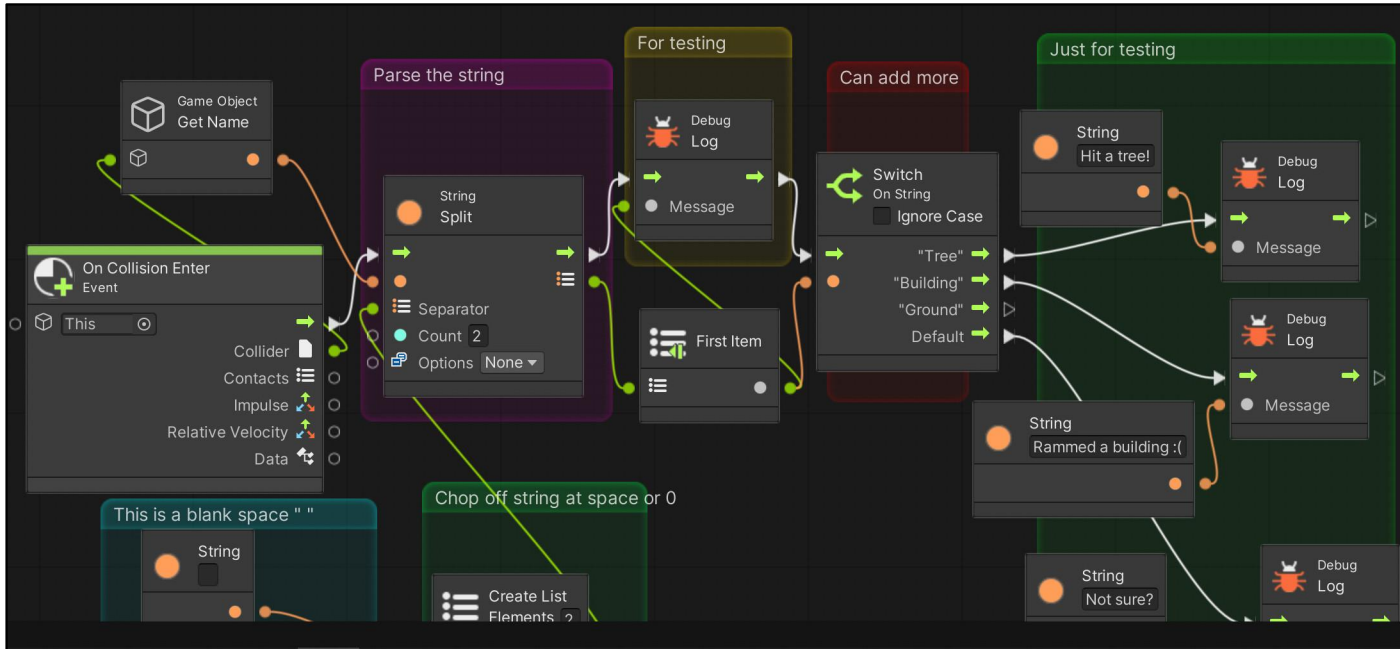
# Pd Software Examples

- Prebuilt nodes
- Automatism - Demo
- Context?
- ELSE library
- Martin Brinkmann



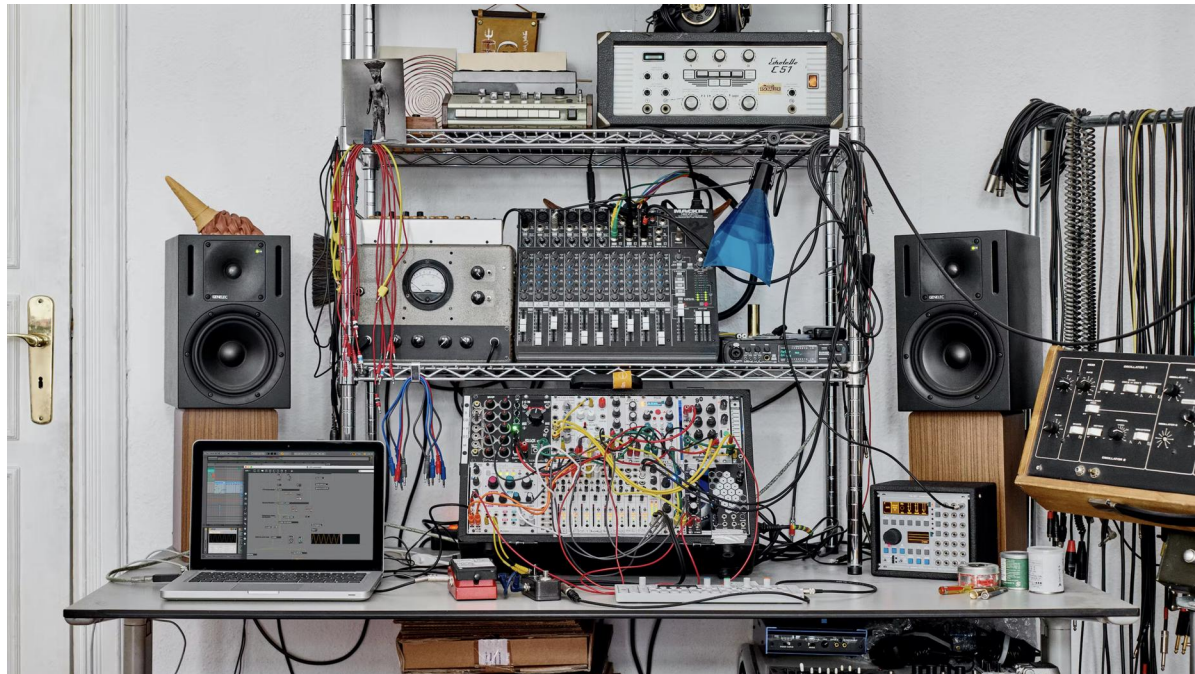
# Unity Visual Scripting

- Relatively new



# Max4Live

- Revenue possibilities
- Nice graphics
- Easy implementation
- User can update
- Large library





# Implementation Hierarchy

- Interface – Nice graphics interface
- Light Coding - High-level visual scripting
- Low Level implementation - Complex visual scripting
- Nodes - C/C++ (optimized code)
- Sound driver - Base level is often C/C++

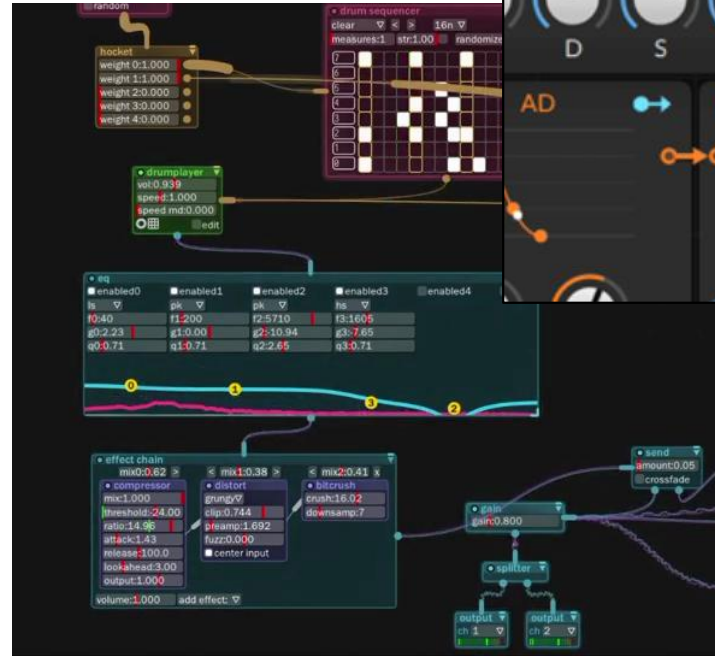


```
187
188
189
190
191
192
```

```
FMOD.Studio.EventInstance e = FMODUnit
e.set3DAttributes(FMODUnity.RuntimeUt
// SoVGA.com - can set parameters dire
e.setParameterValue("Wood", m_Wood);
e.setParameterValue("Dirt", m_Dirt);
```

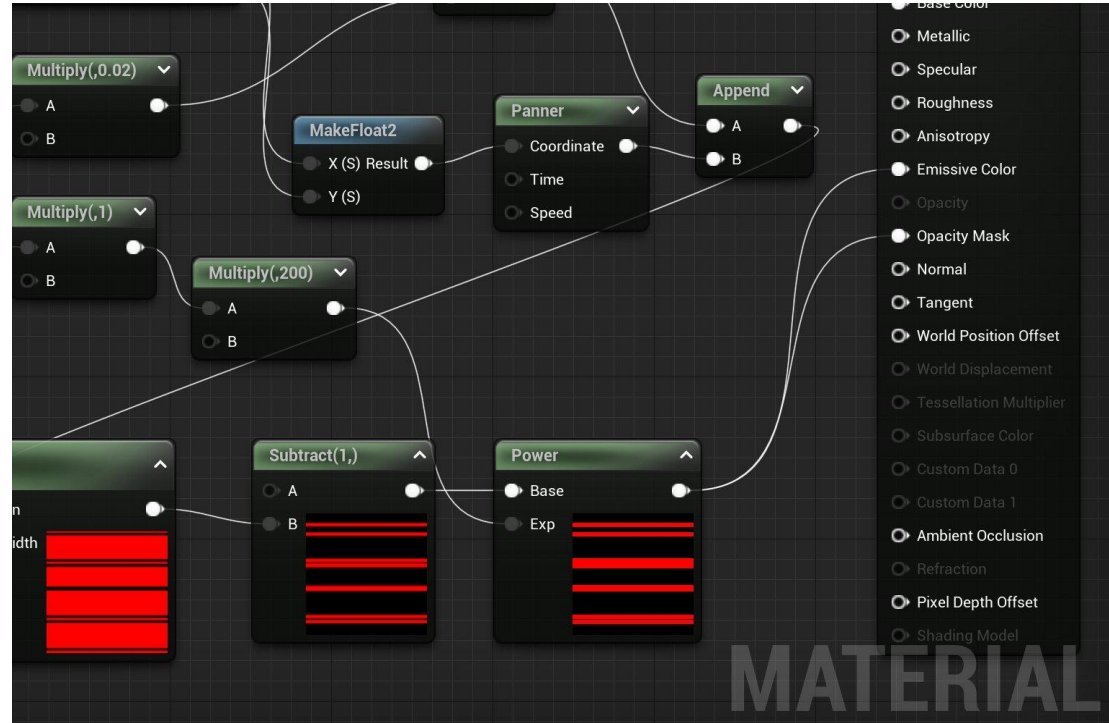
# Visual Scripting DAWs

- Could inform visual scripting to become nicer to use
- Bitwig Grid
- Bespoke
  - Reactive
  - Beauty



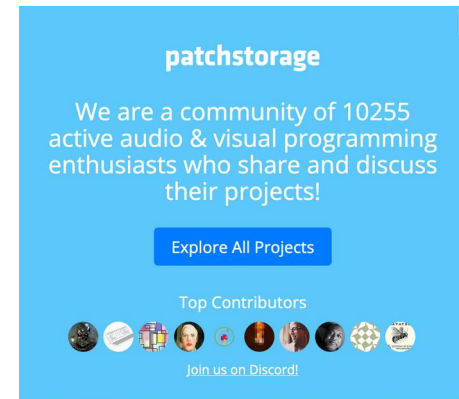
# Visual Shaders

- Interactive node visuals
- Artists can code visually
- Compiled like text



# Libraries

- Store and organize existing patches or nodes
- Curate user patches into “official” patches
- Allow ease of use similar to Github
- Blueprint/metasound [repository](#) is a good start
- [Reaktor User/Factor](#) library
- Tsugi Studio [GameSynth](#) library
- Pd Extended, [Patchstorage](#)



## Orac

99 Patches • 161 Followers

Orac is a virtual modular based on Pure Data and created by Mark Harris. Its is designed to be easy to use on lightweight computing platforms, and provides features such as Presets and Midi Learn. Being flexible for users, Orac lets you create your own modules, and thus extend the Orac ecosystem.



## Orca

47 Patches • 64 Followers

Orca is a visual programming playground. It is designed to control other applications, create

# Compiling Visual Scripts

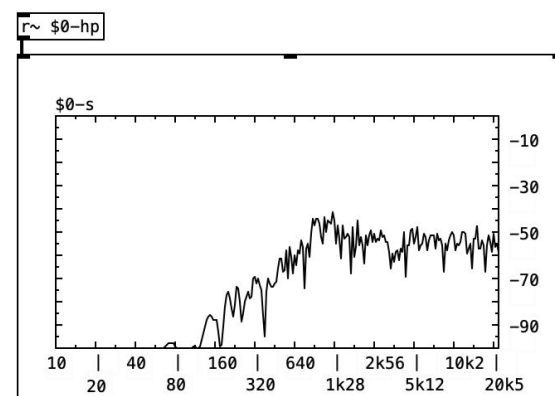
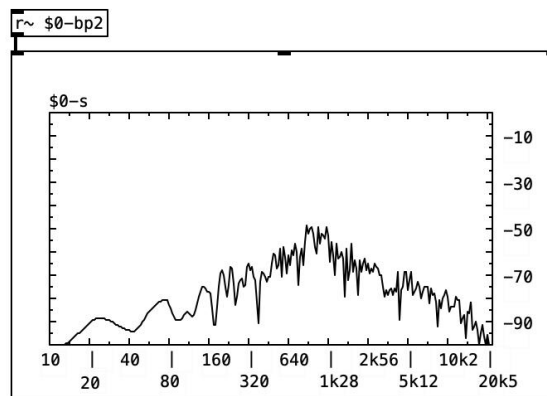
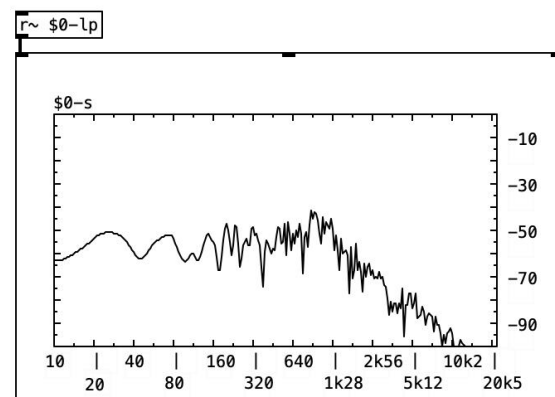
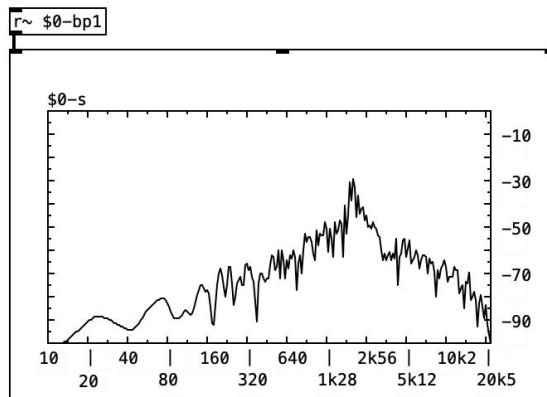
- Blueprint compilation automatic
- Unity scripting compiler
- **Heavy compiler**



HEAVY AUDIO TOOLS

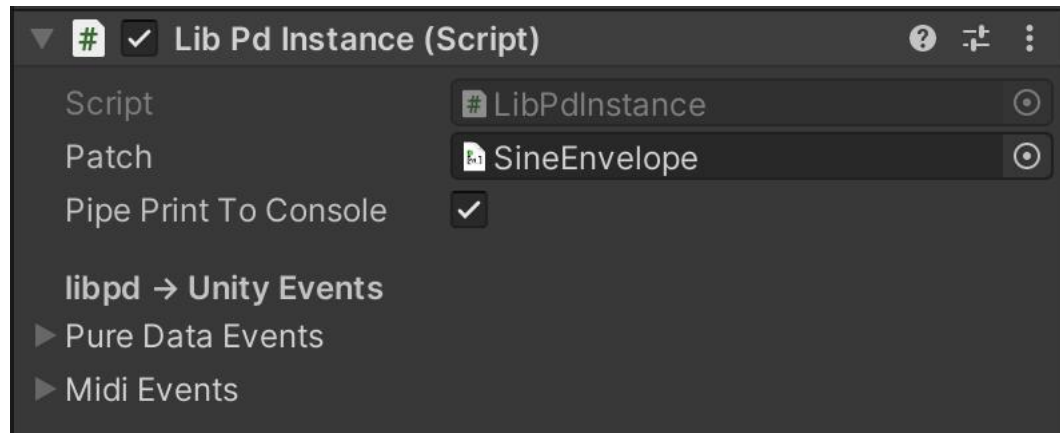
# Heavy

- Compile Pd into C
- Can be integrated into [Wwise](#), [Unity](#), etc.
- Tricky toolchain



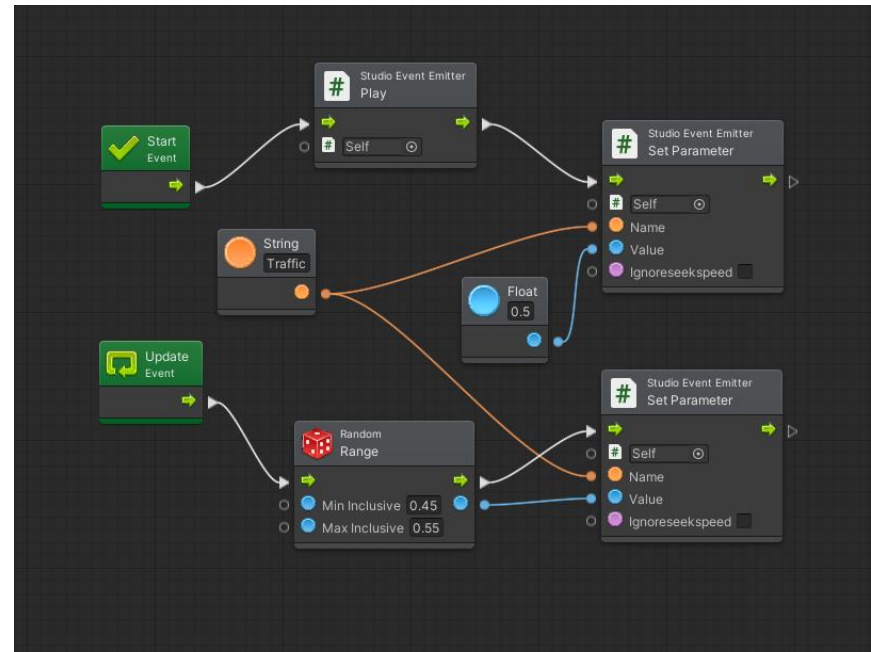
# Unity LibPd Integration: Overview

- LibPd + Unity
- Interpreted/slow
- Spatialization
- Supports Vanilla Pd



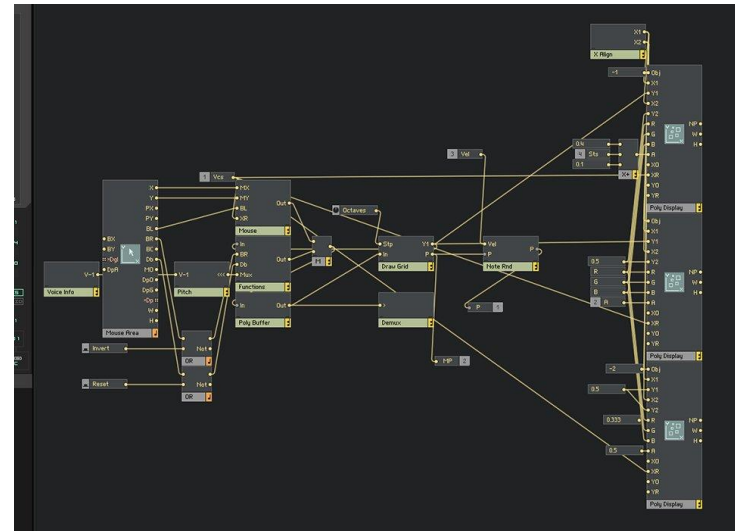
# Advantages

- “Non-coders” can implement
- Real-time
- Hide complexity into layers
- Future proof is possible
- Syntax errors are reduced, producing less frustration
- When open source, allows for learning from others, collaboration



# Challenges

- Complex, concepts are still programming
- Visual spaghetti
- RSI of patching
- Slow unless compiled
- Difficult to “diff” patches and merge changes
- No GitHub for visual scripting yet
- Still coding, artists can easily break implementation



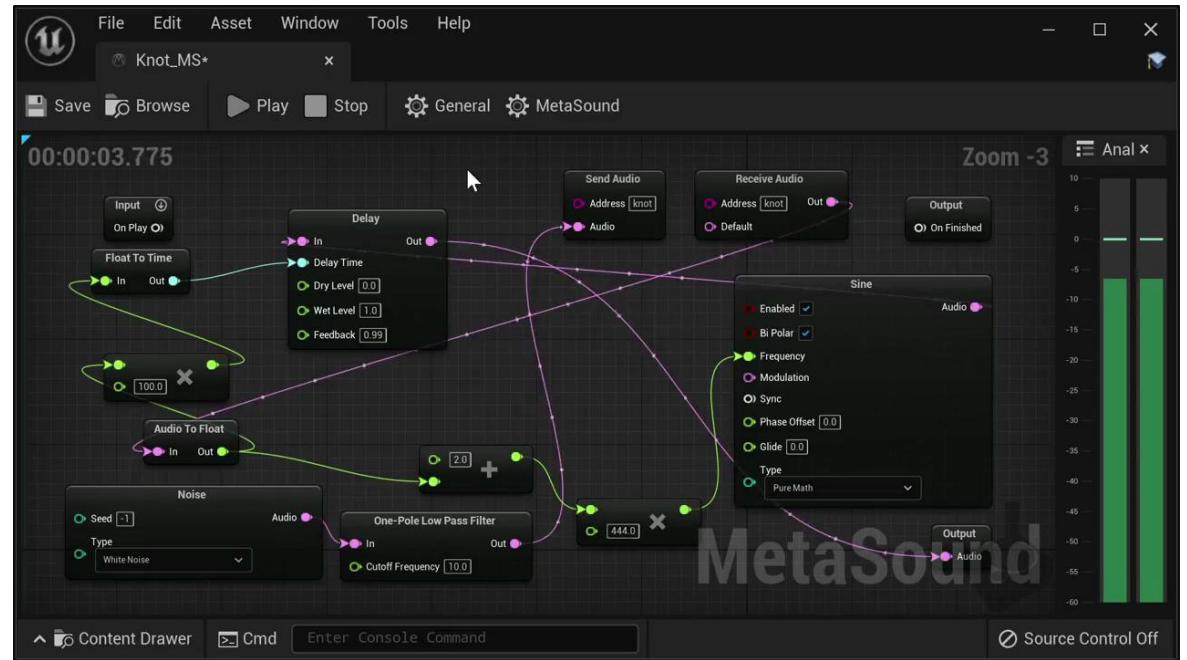
# Unreal Blueprints: Overview

- 303 Generative Music



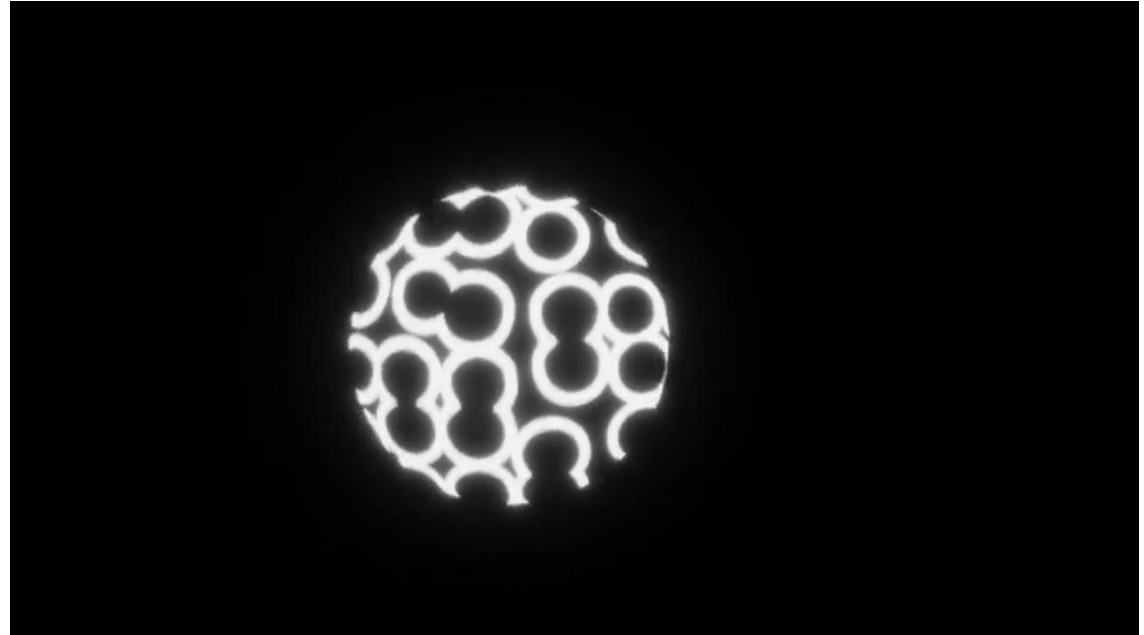
# Unreal MetaSounds: Video

- Feedback MetaSound



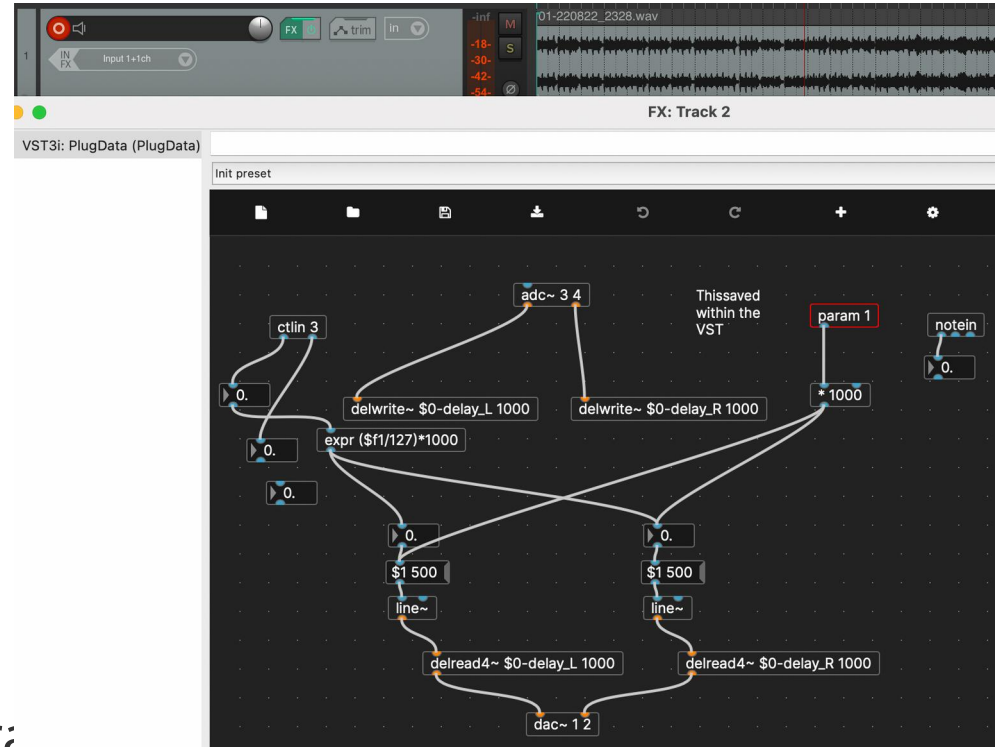
# Unreal Blueprints: Demo

- Bouncing ball



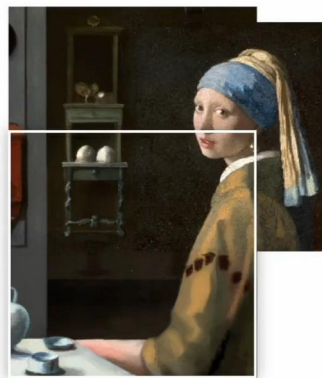
# Future: Near

- Add PlugData ([video](#)) to FMOD Studio, etc.
- VR visual scripting
- Combine visual scripting with text scripting modules
- Bend to be more human/natural.

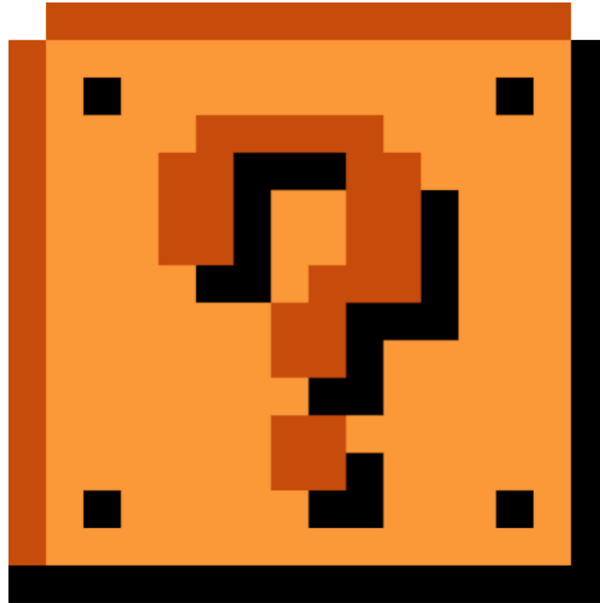


# Future: Further

- Visual scripting translation from other coding languages
- **Autocomplete** by referencing library



# Questions



# Contact :)

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  - [@SchoolGameAudio](https://twitter.com/SchoolGameAudio)
- Personal:
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