# GENERATIVE ART & DESIGN TOOLS

Leonhard Lass

depart.at

# Tools

— What exactly is the tool?

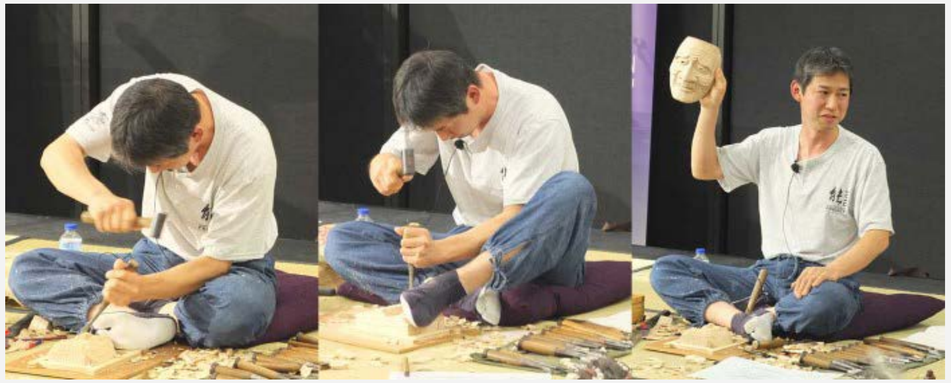
Computer, Programming Environment, or the generative System itself?

— Does the comparison of the computer as the paint brush of the digital artist really hold?

— Build your own tools!

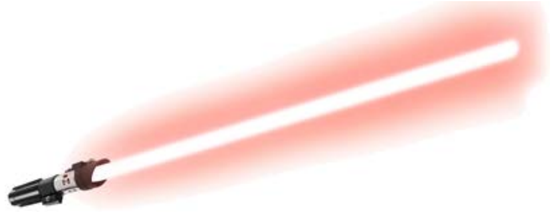
"An art form is defined by its tools.
The tools give an art form its grammar."

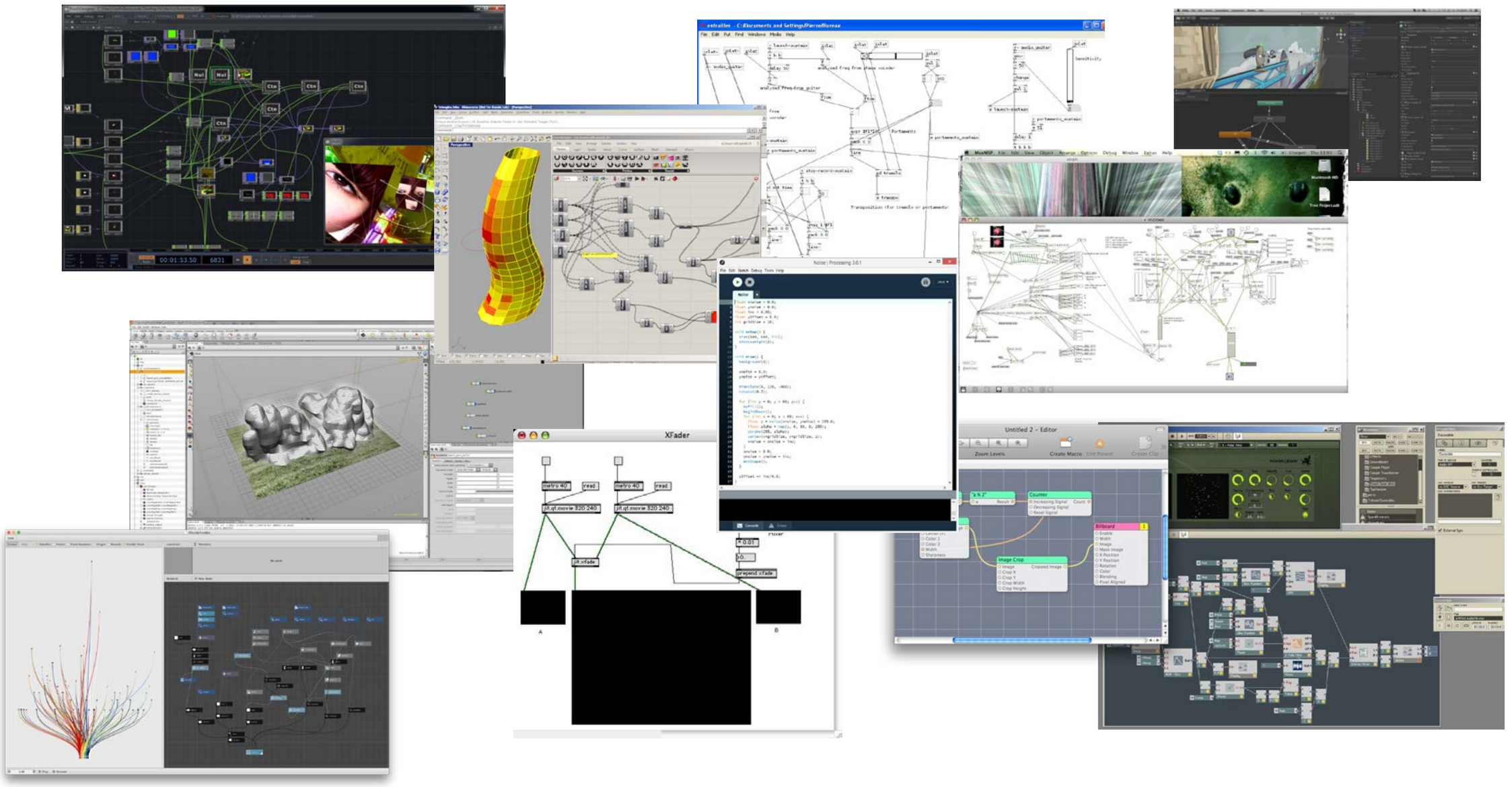
*Matt Pearson, Generative Art: A practical guide using processing*




# GENERATIVE FRAMEWORKS

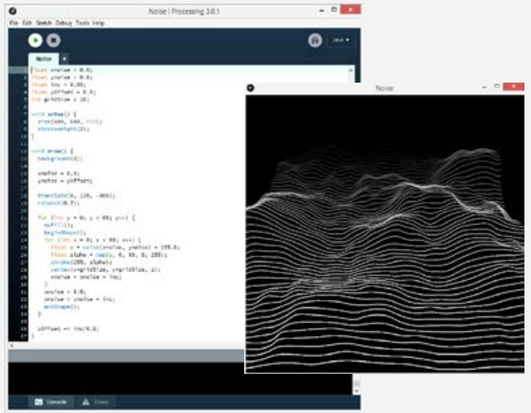
Choose your weapon






Node Based Environments

# Processing



- Open Source, free
- Text-based Programming
- Java, OpenGL
- memory management (garbage collection)
- Publish for Mac/Win/Linux via Java Runtime

- minimal IDE (PDE), or use Eclipse
- Java, JS, Android, Python Modes

- super easy to set up
- beginner to professional
- huge userbase, tutorials, documentation, books,...
- large & active community

use for projects, where speed and complex 3D is not a priority. eg generative design, digital fabbing, non-realtime tools, android apps, JS/Web apps,...

https://processing.org/

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# Open Frameworks

- Processing`s nerdy brother
- Open Source
- Text-based Programming
- C++ / OpenGL
- no own IDE, choose Xcode, VS,...
- intermediate to professional
- Publish native for Win/Mac/iOs/Android

- requires some knowledge to set up
- good userbase
- active, growing community

- use for projects if you are familiar with C++, when speed and crossplatform is an issue

http://openframeworks.cc/

# OpenRNDR

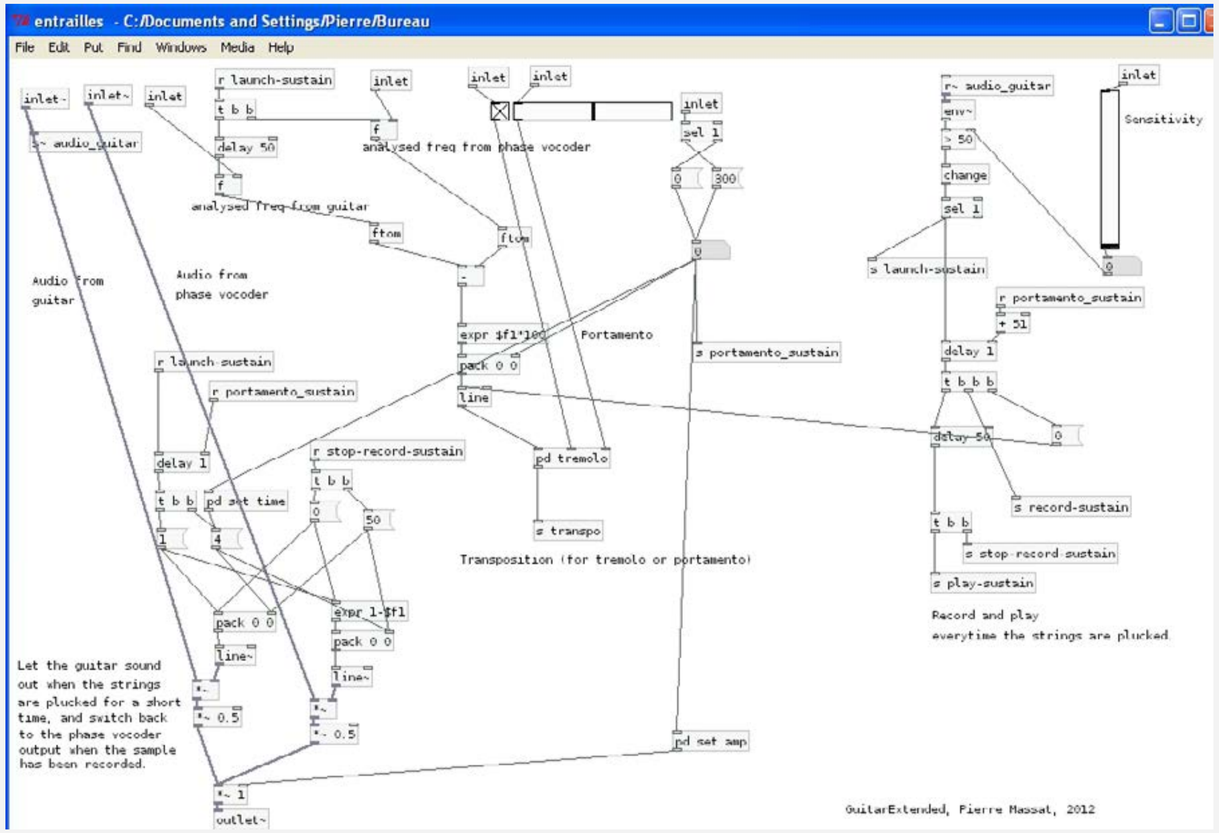
- quite new
- application framework and a library
- free & open source
- written in Kotlin (running on JVM)
- macOS, Windows and Linux
- OpenGL
- uses IntelliJ Idea as IDE

https://openrndr.org

# PD (Pure Data)

- Open Source, free
- Node Based / Data Flow
- mainly for audio & logic
- GEM for visual (OpenGL) output, outdated
- Mac / PC / Linux

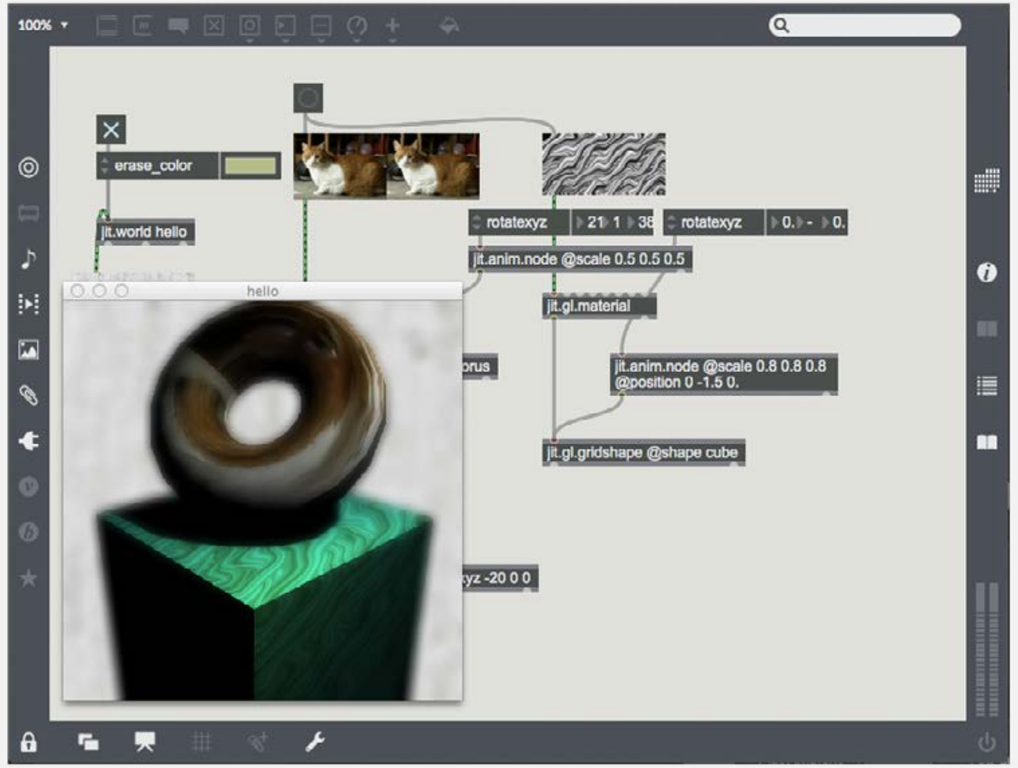
- Use if you mainly need to work with audio or patch data flows. Not really useful for advanced visual projects




https://puredata.info

# Max/MSP & Jitter

- commercial
- Node Based / Data Flow
- sophisticated GUI/IDE
- popular in academics & sound
- extensive Library for Audio Processing
- integrates into Ableton Live (Max for Live)
- Jitter for visuals (OpenGL & Matrix)
- Mac/PC
- compiles into standalone apps

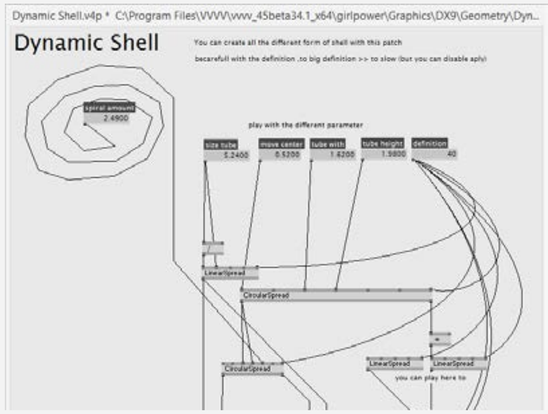



https://cycling74.com

# VVVV

- free for non-commercial use
- closed core, but many Open Source Libraries and easily extendable with C# /.Net
- Node Based / Data Flow
- doesn`t compile into standalone app
- Windows only
- DirectX (DX9/DX11)
- fast & efficient development
- proprietary GUI
- active and nice community

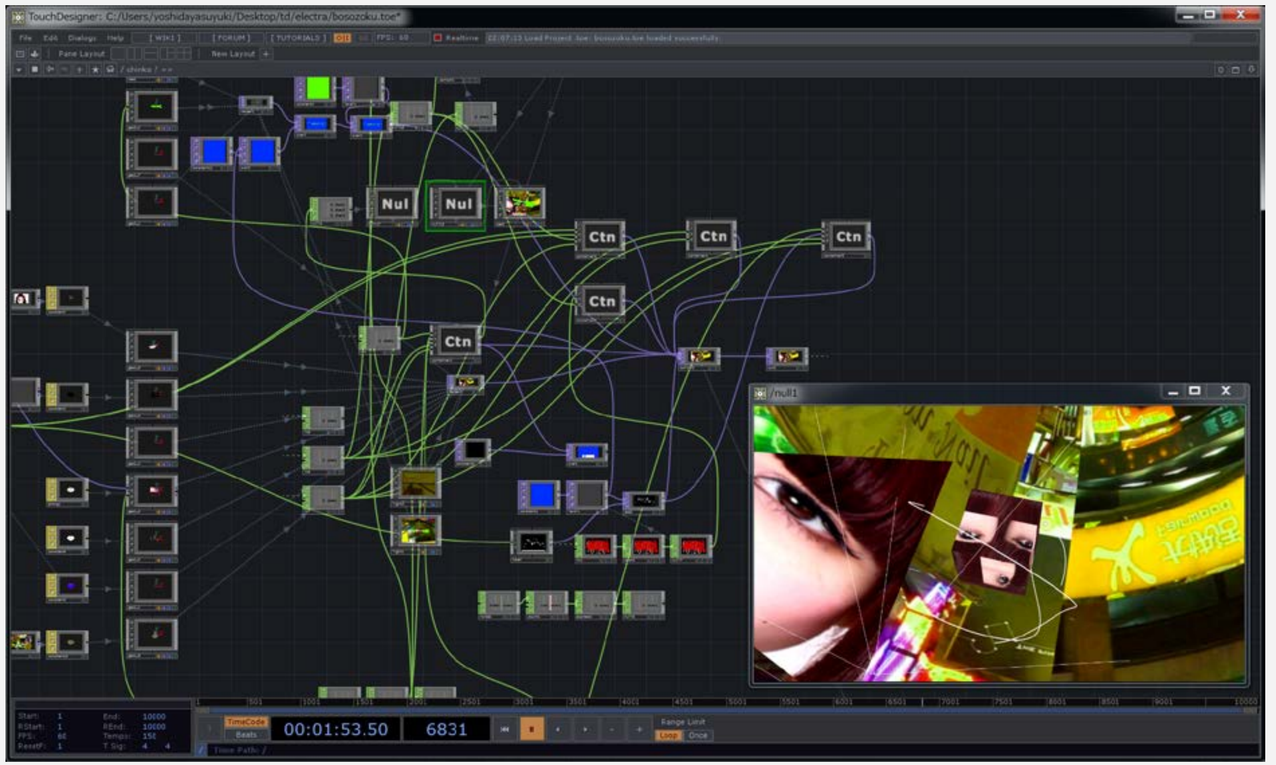
- use for large scale media installation, realtime 3D, multiscreen scenarios, where crossplatform is not relavant
- not ideal for audio processing
- new version using a new pardigm (VL)




http://vvvv.org/

# Touchdesigner

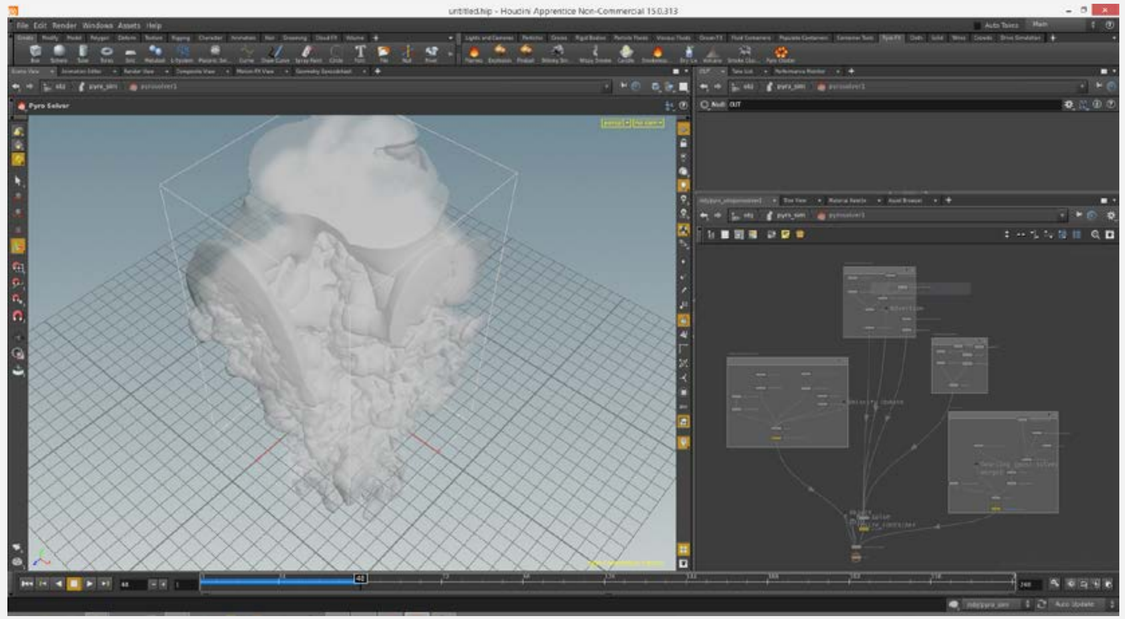
- Houdini`s sporty brother
- commercial (limited free version)
- Node Based / Dataflow & Python Scripting
- extendable with C++
- Windows only
- commercial, large scale installations




https://www.derivative.ca

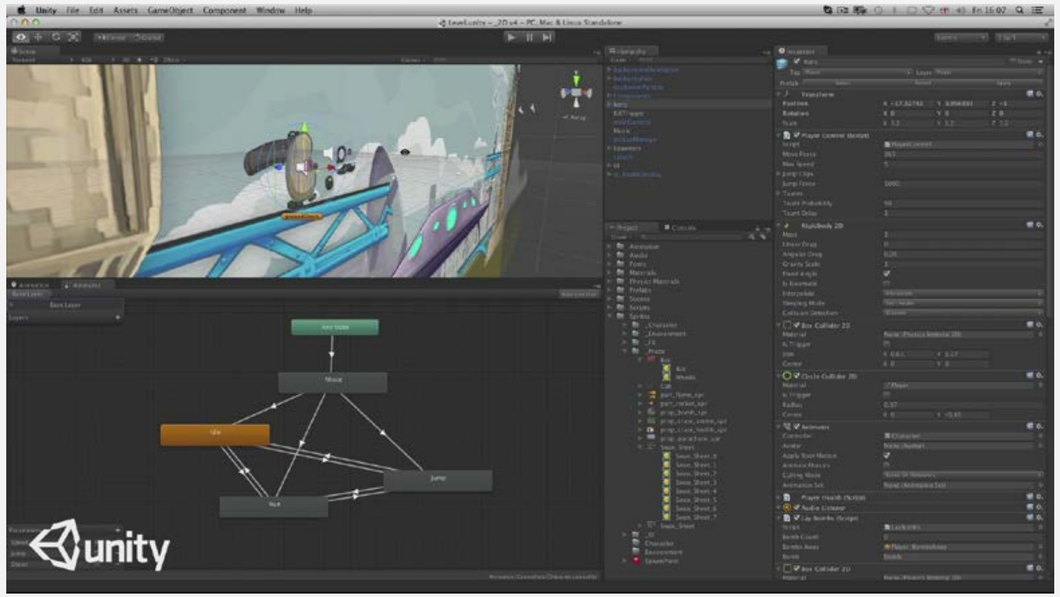
# SideFX Houdini

- limited free version,
- high-end commercial 3D Tool
- VFX and simulation, computational 3D
- sophisticated GUI
- integrates well into 3D production workflows
- not for real-time use



# Unity

- free for non-commercial projects
- AAA Game Engine
- integrates well into production workflows
- Mac/Win/iOs/Android/XBox/Webplayer/WebGL
- scriptable in C#
- getting popular for installations as well
- sophisticated, state-of-the art real time rendering & lightning
- VR ready




https://unity3d.com/

# WEB BASED

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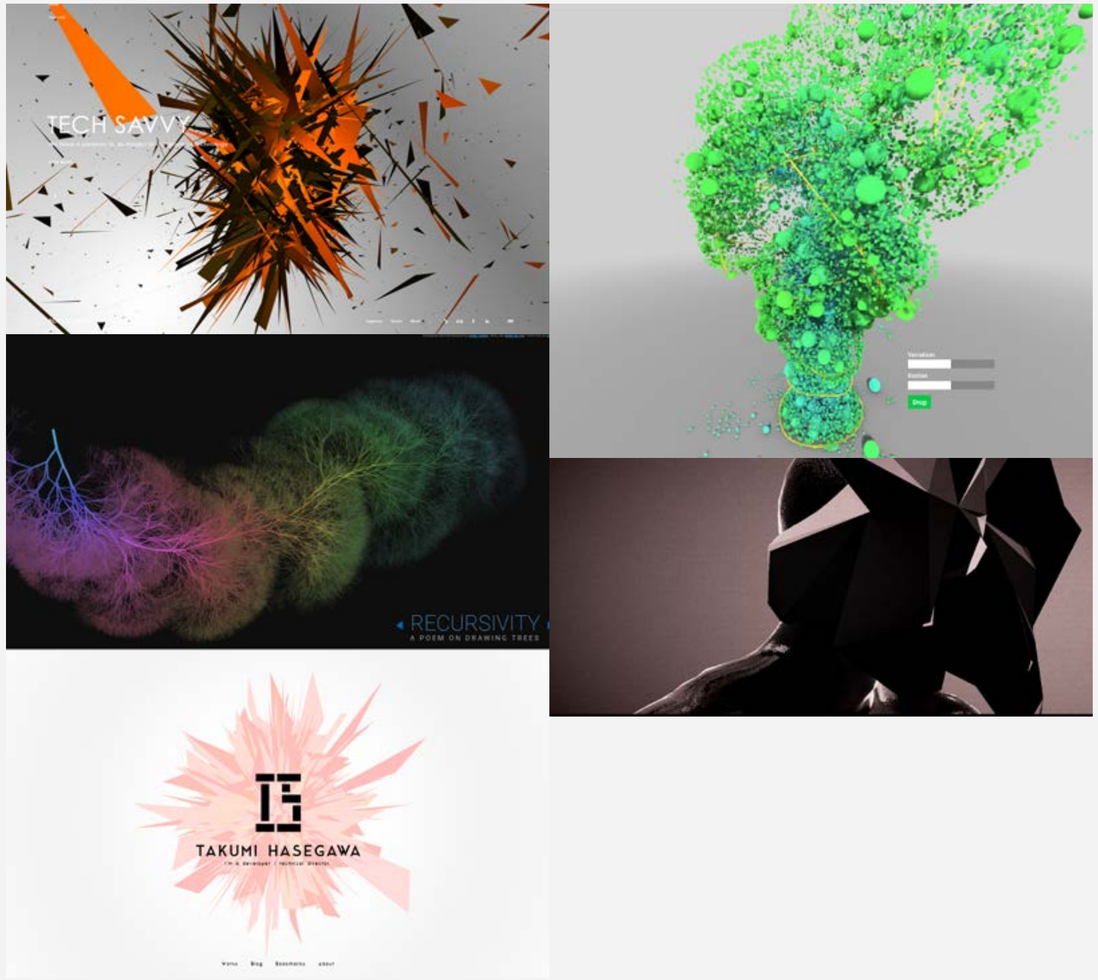
# Three.js

- open source lightweight cross-browser JavaScript library/API
- WebGL (Hardware supported)

- use for the web/browser based works that require 3D graphics



# P5.js

— processing inspired JavaScript library

— for browser based works

— has its own IDE

— good for beginners, artists, designers

— https://p5js.org/

Note: There is also processing.js which emulates processing on the web by converting processing javacode to Javascript. There are obviously some drawbacks. P5js is not a port but a native new interpretation but is not that fully featured.

# more

— as browser capabilities improve, this is getting increasingly more popular

— D3.js (Data Visualisation)

— Paper.js (Vector Graphics, Canvas)

— Matter.js, physijs, ammo.js (Physics)

— sketch.js,...

— aframe.io - (A web framework for building virtual reality experiences)

— https://www.chromeexperiments.com/

# even more.

— Any scriptable 3D Package

Rhino (Rhinoscript, Python, Grasshopper), Maya (MEL & Python), Blender (Python),...

— Illustrator/InDesign/Photoshop/...

(JS, Apple Script, VBScript)

http://basiljs.ch/ (Generative Design with InDesign)

— and of course any programming language

— Quartz Composer (part of Mac OSX / xcode)

— ...

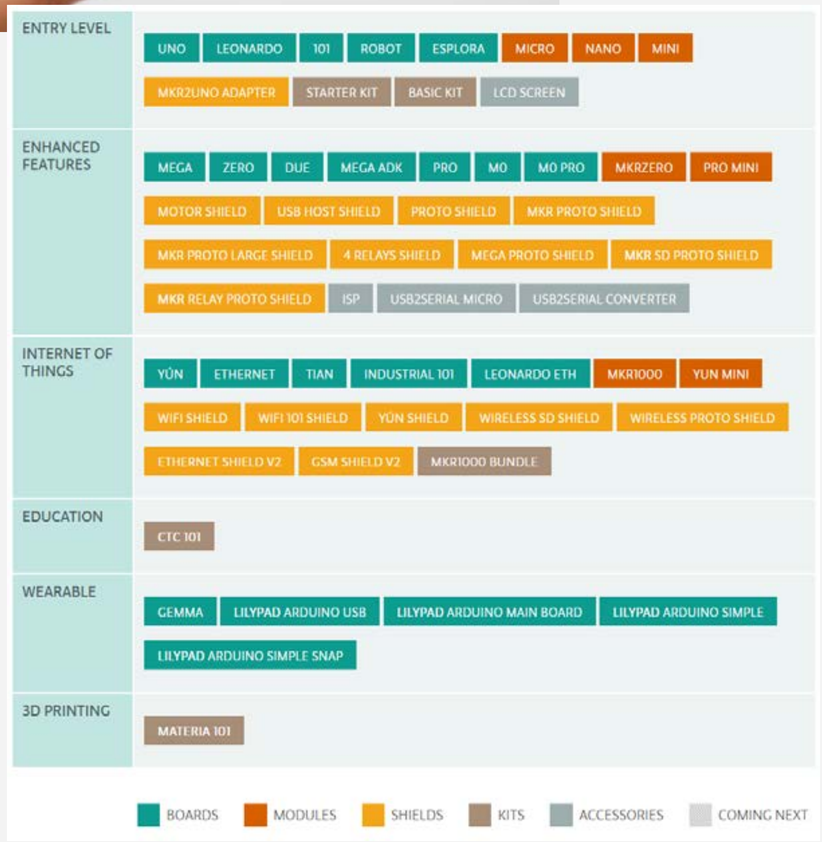
# PHYSICAL

# Arduino


Arduino is an open-source electronics platform based on easy-to-use hardware and software. It`s intended for anyone making interactive projects.

- open source
- small, low power, portable/wearable
- lot`s of modules, sensors

- for standalone devices, that don`t require a lot of computing power (sensors, robotics, IoT, wearables,...)

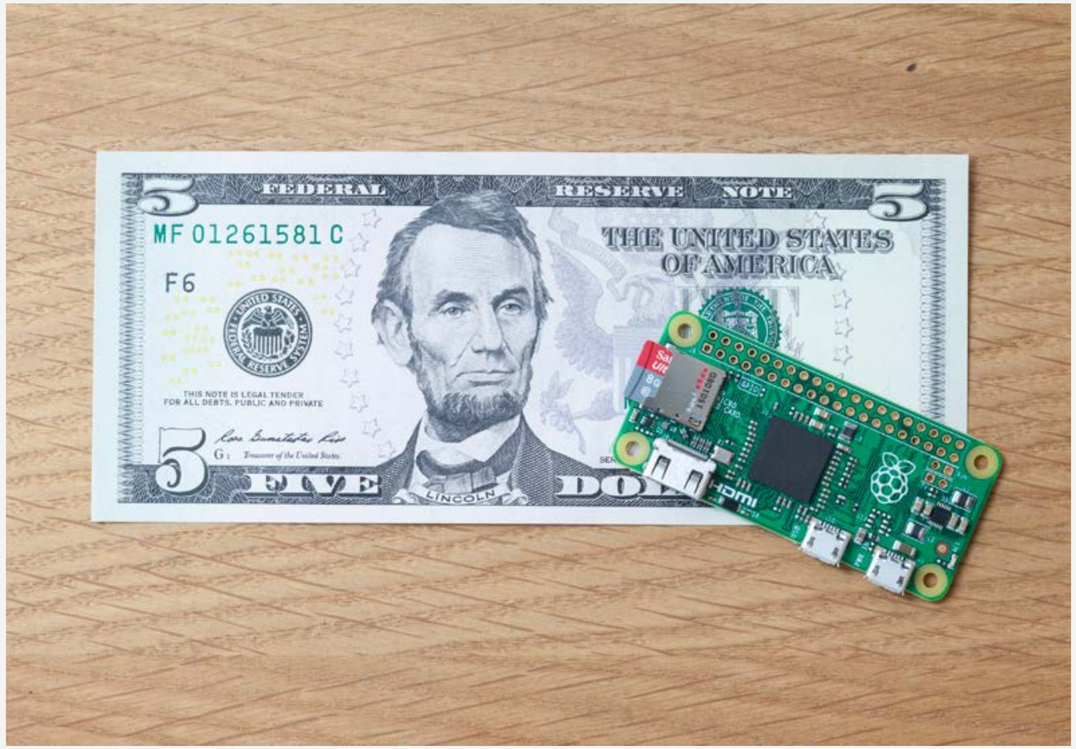


# Raspberry Pi

— tiny single board computer

— cheap

— has graphic capabilities (eg can play fullHD video)



# Kinect


- motion sensing input devices by Microsoft
- natural interface
- depth, skeleton and expression tracking
- broad support in most frameworks

~150€ (Sensor + PC Adapter)

Kinect Azure (399$)

- Alternatives: Intel RealSense, Orbbec Astra Pro, Stereolabs ZED, e-con Tara

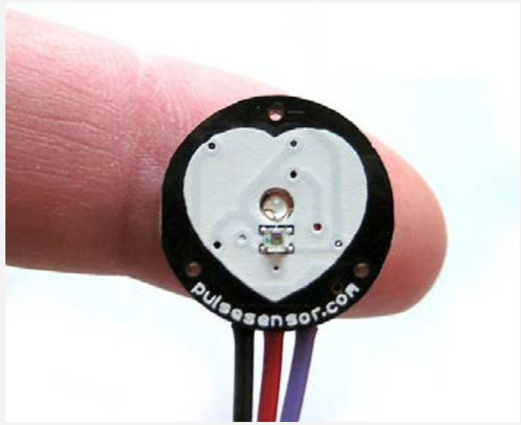
# Leap

- accurate hand tracker
- limited range
- mount for VR Headsets

# VR Headsets


# more input...


Brainwave Sensor (NeuroSky)

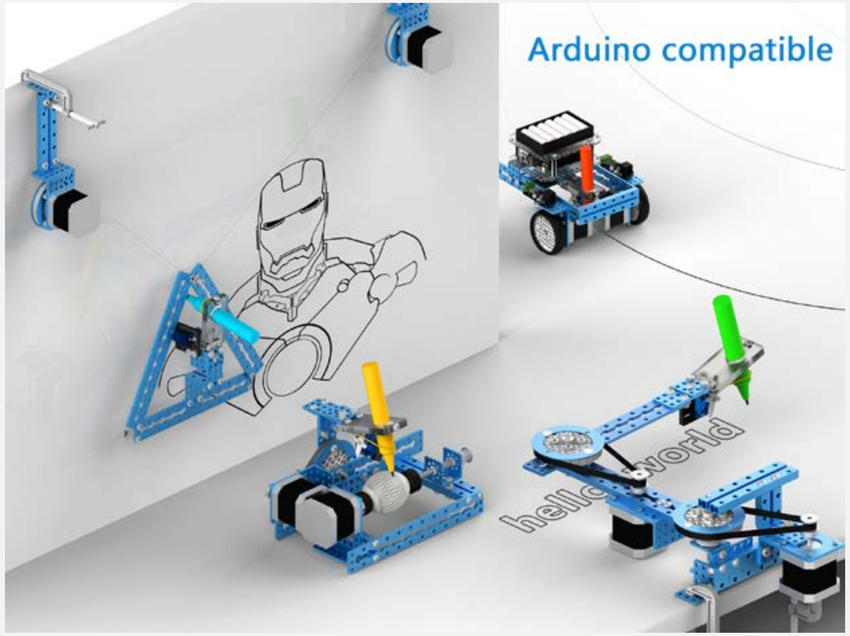


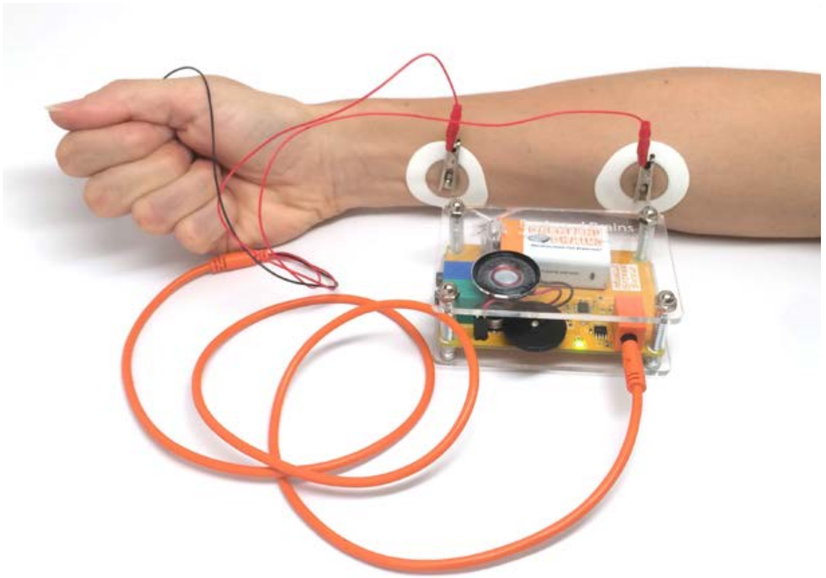

Heartrate Sensor

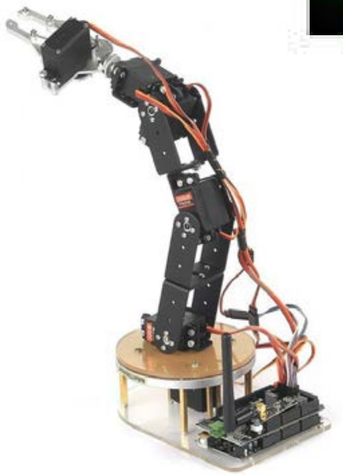

Eye Tracker (Tobii)

# and more output

Robot Kits (makeblock / mBots)





# Last but not least

## The Sensors in your pocket

- GPS
- Compass / Magnetometer
- Gyroscope (3 axis)
- Accelerometer (3 axis)
- Proximity sensor
- ambient light sensor
- Camera(s)
- (Fingerprint Sensor)
- (Heartrate sensor)
- (Barometer)