

# Prototyping ideas and game design

An overview about tools and techniques, and  
why good game mechanics matter.

# Today

- Why do good game mechanics matter?
- A brief game analysis: **INTO THE BREACH**
- Let's do a game jam!
- Prototyping (Game-) Design
- Overview about tools and techniques for game prototyping (*focus on free/open source*)
  - Paper prototyping, mockups and conceptual walkthroughs
  - Game engines
  - Creative coding frameworks



# Why do good game mechanics matter?



[Halo, via Bungie.net](http://Bungie.net)

*"In Halo 1, there was maybe 30 seconds of fun that happened over and over and over and over again. And so, if you can get 30 seconds of fun, you can pretty much stretch that out to be an entire game."*

[Half-Minute Halo: An Interview with Jaime Griesemer](#)

# Why do good game mechanics matter?

Kirby: Star Allies  
(Nintendo)

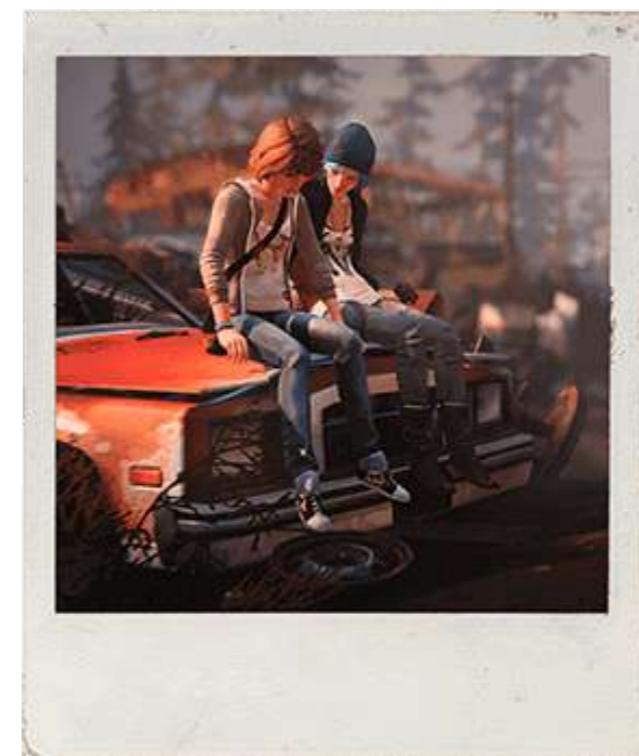
[kirby.nintendo.com/](http://kirby.nintendo.com/)



Dark Souls 3  
(From Software)  
[via GameSpot](http://www.gamespot.com)



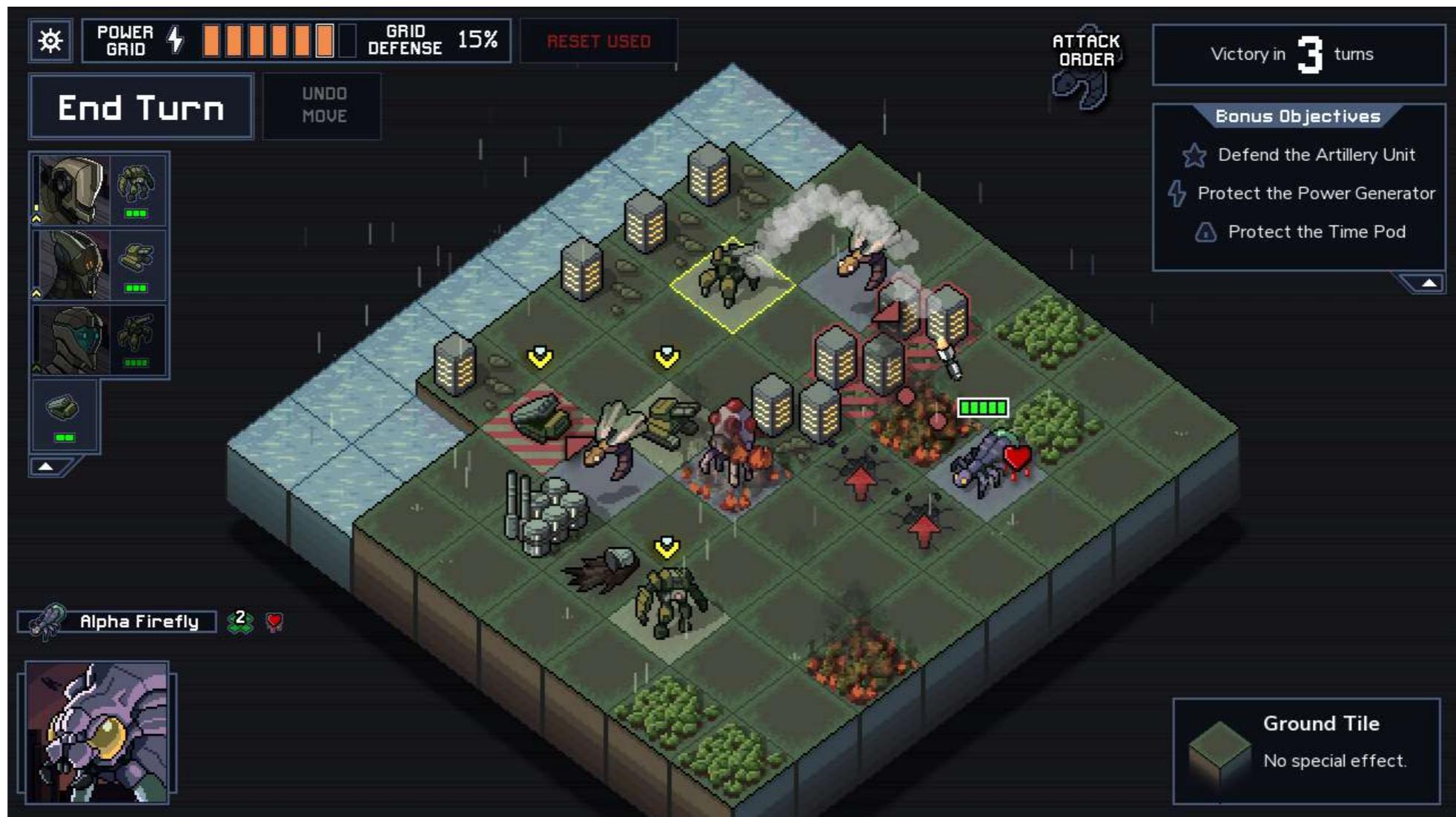
Journey  
(thatgamecompany)  
[thatgamecompany.com](http://thatgamecompany.com)



Life is Strange  
(Dontnod)  
[lifeisstrange.com](http://lifeisstrange.com)

# A brief game analysis: INTO THE BREACH

turn-based – strategy vs. puzzle – “telegraphed attacks” (i.e., all information are displayed, no surprises)



[Website](#) – [Trailer](#) – [GDC Talk: Into the Breach Design Postmortem](#)

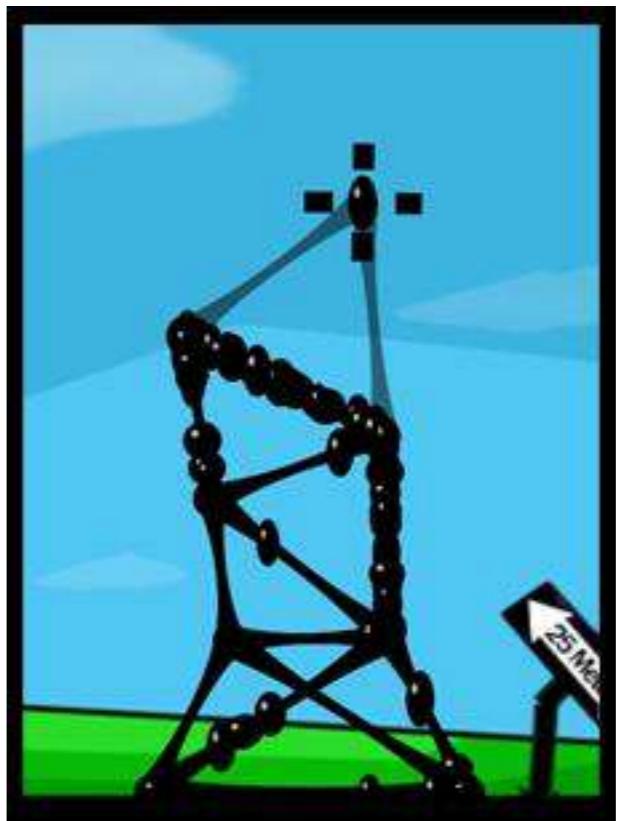
# Let's do a game jam!



[GDC Train Jam](#)



[Nordic Game Jam](#)



[How to Prototype a Game in Under 7 Days](#)

# Let's do a game jam!



MARCH 3 - MARCH 11, 2017

[itch.io/jam/resistjam](https://itch.io/jam/resistjam)

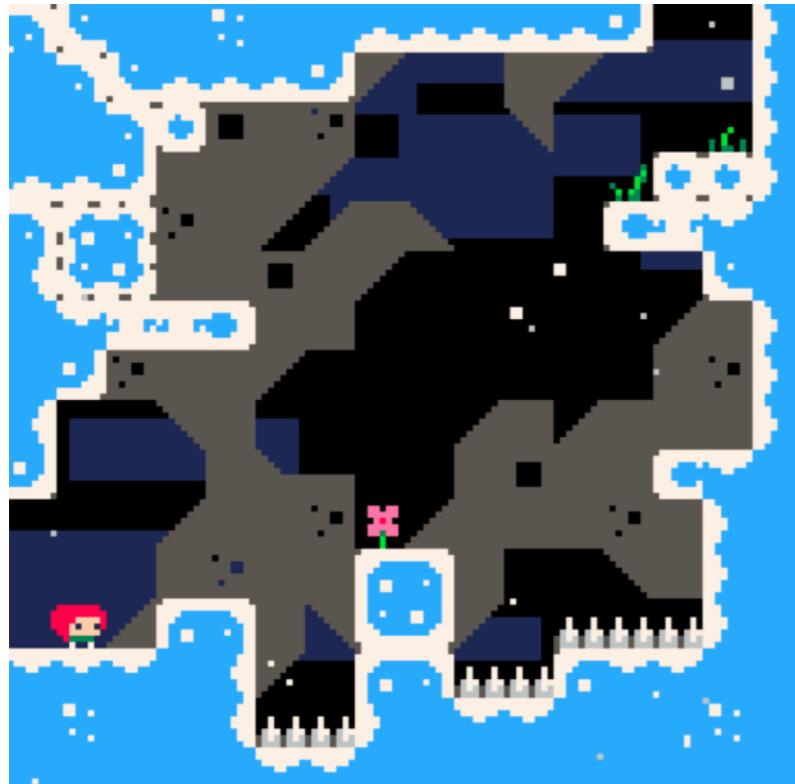


[itch.io/jam/gmtk-2019](https://itch.io/jam/gmtk-2019)

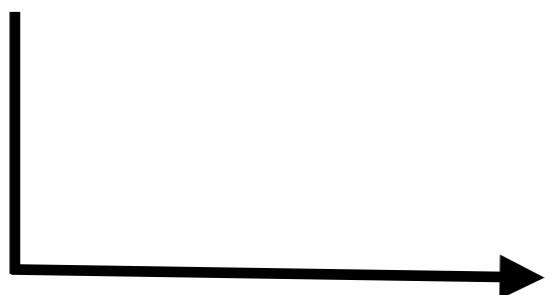
Let's do a game jam!

4ME308-VT20  
Prototyping ideas and game design

# Let's do a game jam!



Game Jam prototype



Full Game release

# Prototyping (Game-) Design



# Wheel lifecycle for UX engineering

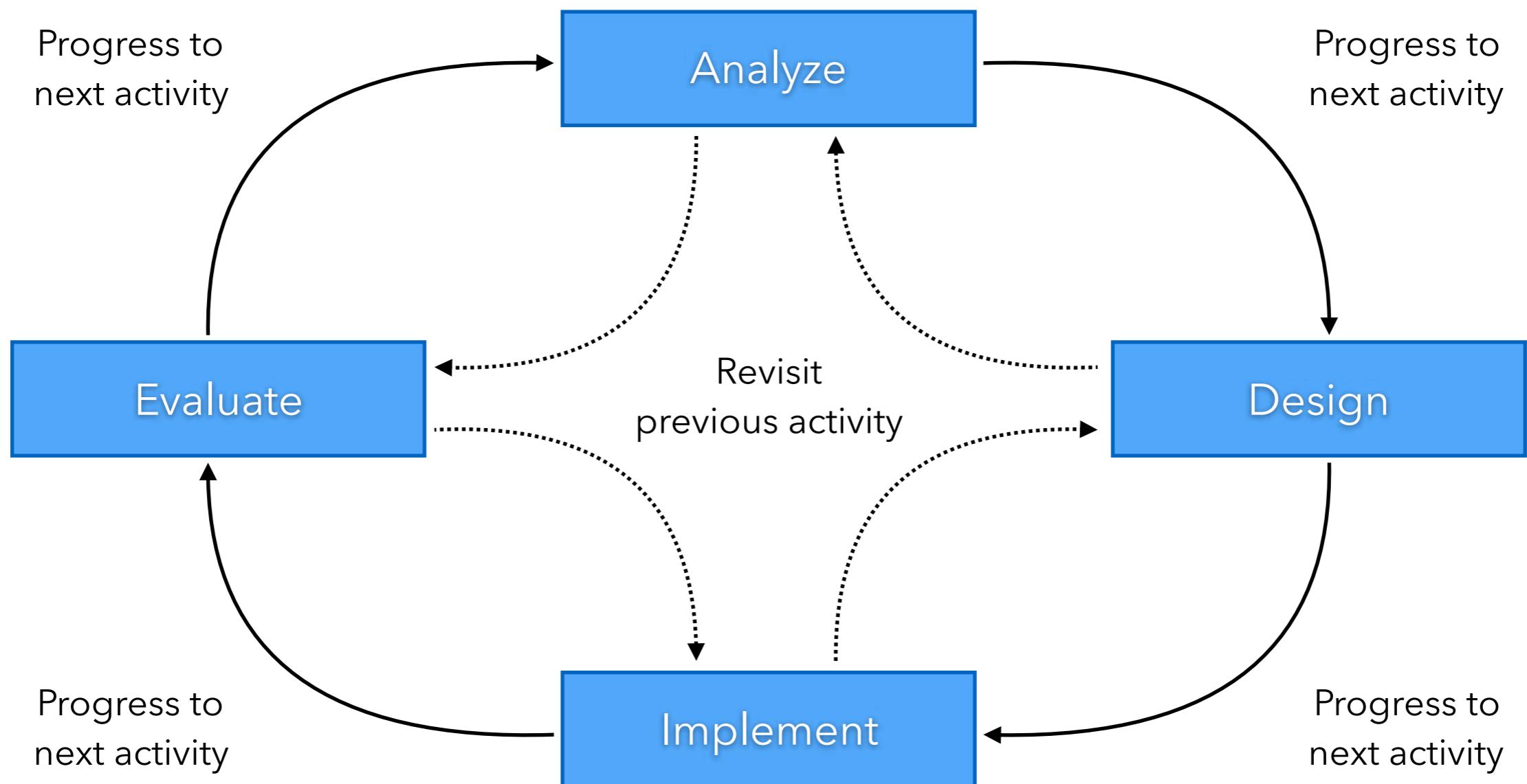


Illustration of the wheel lifecycle process and its opportunities for iteration  
(via [3D User Interfaces. 2nd edition. pp. 109-110](#))

## Prototype

- early representation of the design built to model, evaluate, and iterate on the design of a product

## Benefits

- provide concrete representation of a design that can be communicated to others
- allow "test-driving" and evaluation
- provide visibility
- help in transition from an old system to the new one

## Drawbacks

- stakeholder may associate limited functionality with poor design
- stakeholders may assume "magic"

## Breadth

- of a prototype concerns how many features are implemented

## Depth

- of a prototype represents how much functionality the features provide

## Horizontal prototype

- prototype very broad in features but with less depth in functionality
- great for evaluating how users will navigate a design

## Vertical prototype

- prototype contains as much depth of functionality as possible for one feature
- beneficial for exploring the design of a particular feature in detail

## T prototype

- realizes much of the design at a shallow level but covers one or a few features in depth

## Local prototype

- limited in breadth and depth that is focused on a particular isolated feature of the design
- used to evaluate design alternatives for specific portions of the UI

## **Prototype fidelity**

- how completely and closely a prototype represents the intended design

**low-fidelity**

- impressions of the intended design with little to no functionality

**medium-fidelity**

- look and feel of the intended design with rudimentary functionality

**high-fidelity**

- closely resembles the final product
- aesthetics nearly identical to the final product
- should have most, if not all, features fleshed out with full functionality

## Prototype interactivity

- degree to which interactions are realized

## 4 common levels of interactivity

- animated prototypes
- scripted prototypes
- fully programmed prototype
- Wizard of Oz prototype

## Wizard of Oz prototype

- deceptively high levels of interactivity with little functionality actually implemented
- hidden UX team member observes user's actions and then causes the interface to respond appropriately

**Tools and techniques:**  
**Paper prototyping, mockups and**  
**conceptual walkthroughs**



# Paper prototyping

- think creative / imaginative
- feel close to what you are creating
- easy to change / rearrange things
- often a collaborative / cooperative process with multiple participants
- positive feedback loop by building upon each other's ideas



[The Skeptic's Guide To Low-Fidelity Prototyping](#)

## Basic prototyping tools:

- pens, paper (white and colored), cardboard boxes, scissors, sticky notes, tape, glue

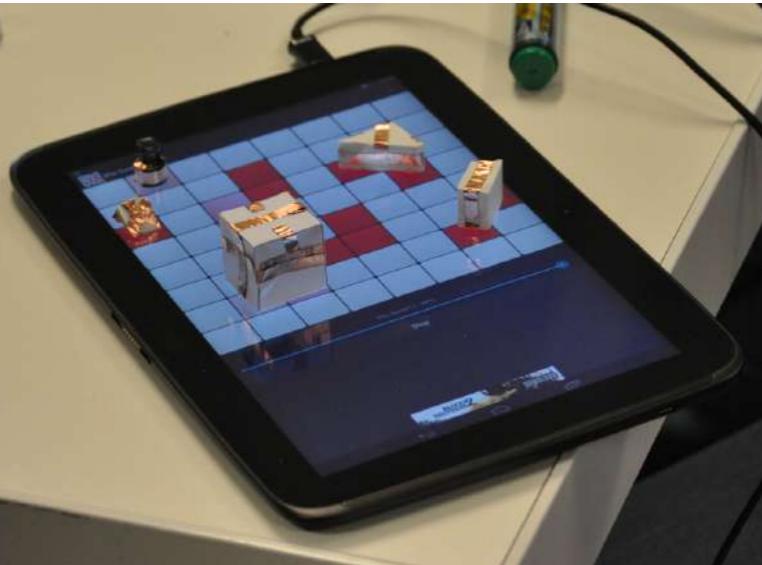
## Advanced prototyping tools:

- conductive ink / tape, 3D printer, clear/transparent film

## Utilising existing artefacts:

- board games (figures, dices, items), card games

# Paper prototyping



[Prototyping TUI: Conductive tape/ink.](#)

[Business origami.](#)



[A Browser Made For A Gaming Console.](#)



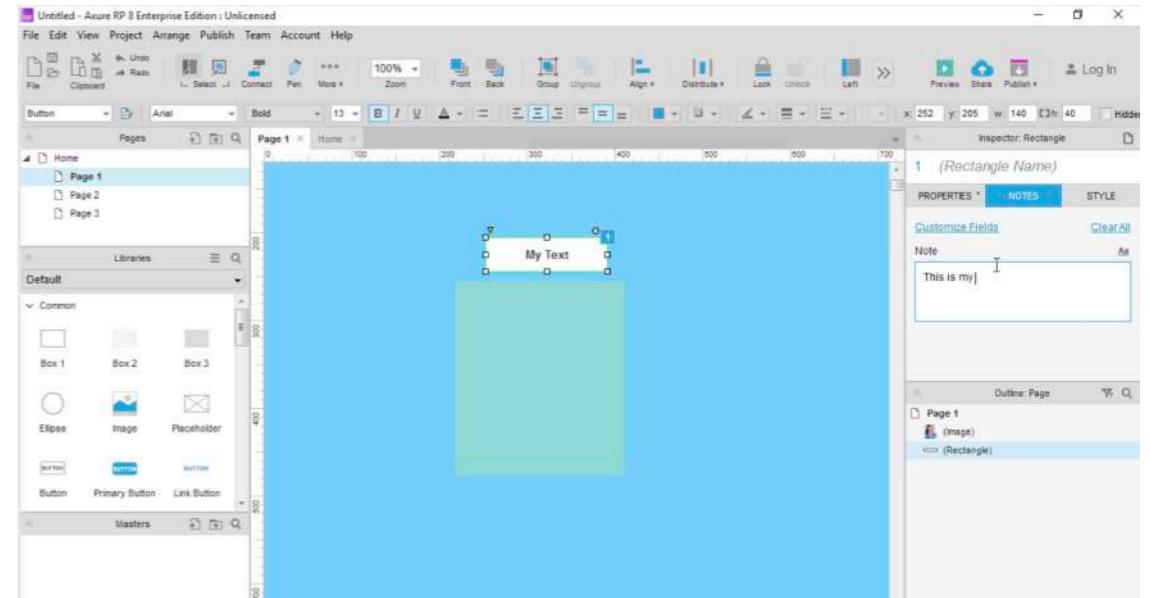
[Game Design Prototype Creation.](#)



# Axure

## Infobox

Name: Axure  
URL: [axure.com](http://axure.com)  
Docs: [axure.com/learn](http://axure.com/learn)  
Language: none (visual programming)  
Level: beginner  
Platforms: Windows, OS X  
Availability: free for students ([edu licence](#))



[Getting started with Axure RP.](#)

## What is Axure?

- prototyping websites and app interfaces without coding
- great tool for creating interface design mockups
- advanced features: not just static, but also interactive (design logic and links, let your mockup appear as it might be a real product)
- the (interactive) mockup can be exported in HTML format, which makes it easy to deploy over the Internet and accessible to others



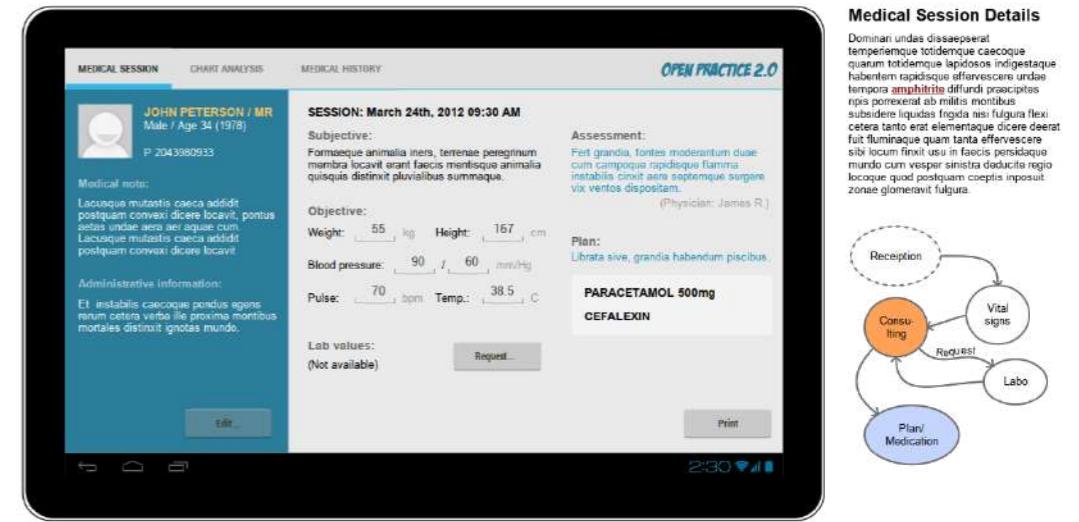
# Pencil

## Infobox

Name:	Pencil
URL:	<a href="http://pencil.evolus.vn">pencil.evolus.vn</a>
Docs:	<a href="http://pencil.evolus.vn/WikiIndex.html">pencil.evolus.vn/WikiIndex.html</a>
Language:	none (visual programming)
Level:	beginner
Platforms:	Windows, OS X, Linux
Availability:	open source

## What is Pencil?

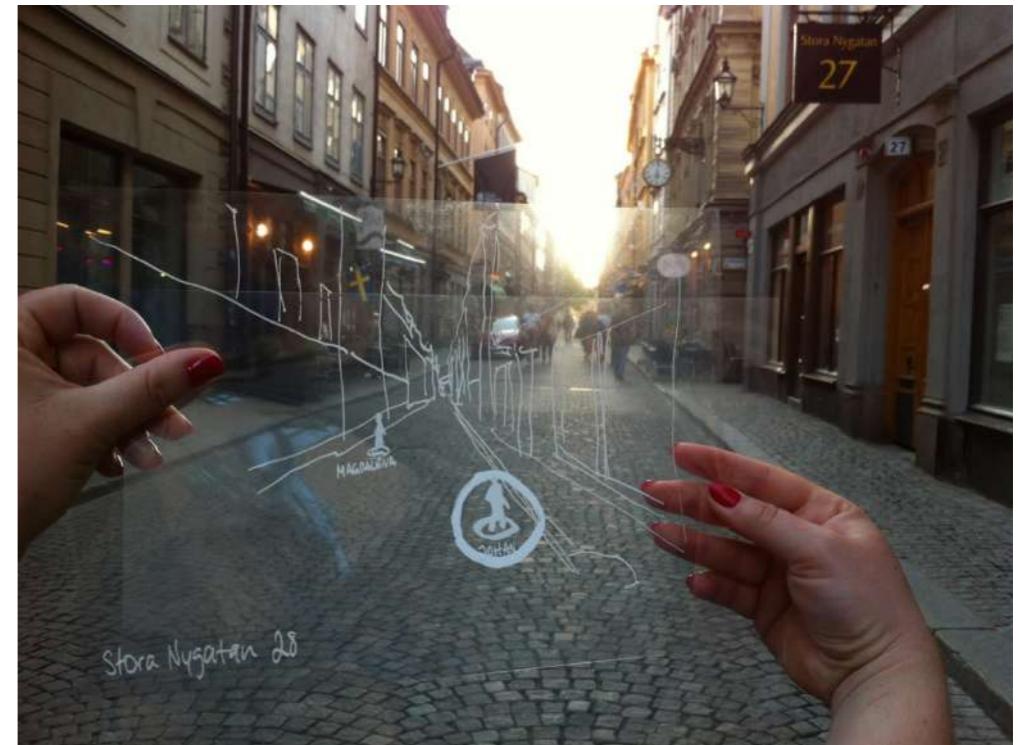
- prototyping Graphical User Interface (GUI) mockups for desktop and mobile applications
- provides a rich built-in shape collection, plus [OpenClipart](#) integration
- multiple pages in the mockup can be linked
- export to HTML, as well as PNG, PDF, SVG, ODT
- bonus: diagram drawing support



[Easy GUI prototyping with Pencil.](#)

# Conceptual Walkthrough

- prepare material, which you use to present to and walk participants through the concept of your game design
- material can be sketches, paper prototypes, video, audio, ...
- walkthrough should represent a “typical” session based on your game design idea
- consider interaction and choices: structure your walkthrough in a way that the participant can decide between multiple options in certain situations
- ask questions / interviews = immediate feedback

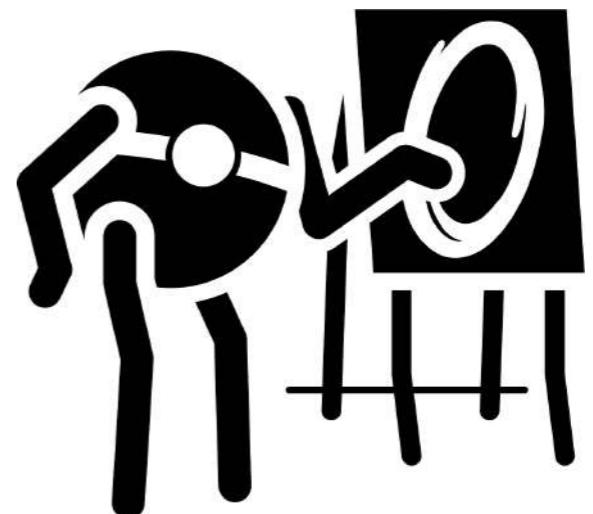


History Explorer (4ME108-VT14)



Chase 'n' Race (4ME108-VT14)

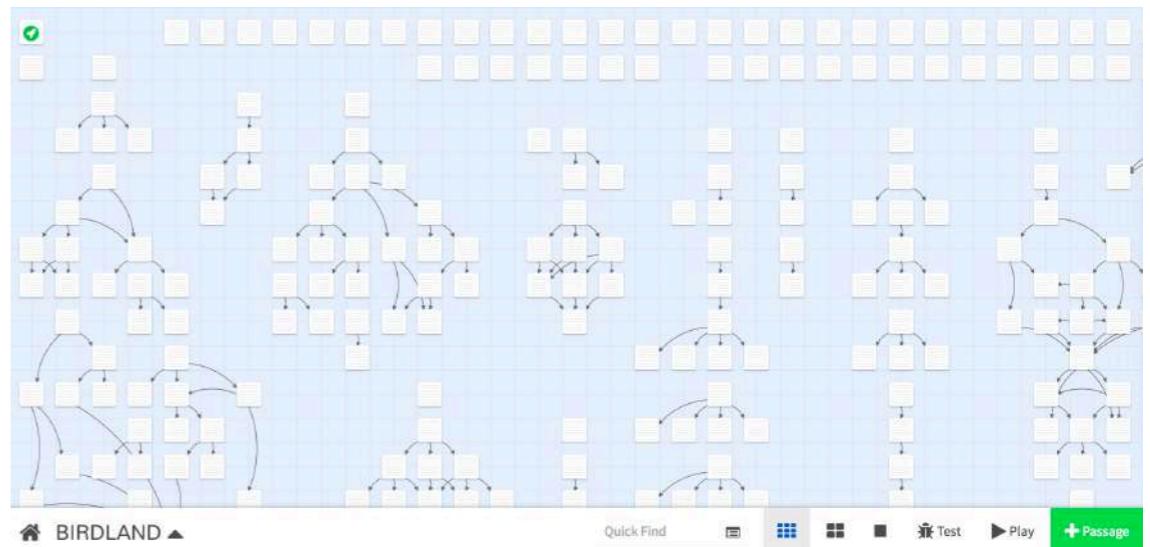
# **Tools and techniques:** **Game engines**



# Twine

## Infobox

Name: Twine  
URL: [twinery.org](http://twinery.org)  
Docs: [twinery.org/wiki/](http://twinery.org/wiki/)  
Language: none (visual programming)  
Level: beginner  
Platforms: Windows, OS X, Linux, web  
Availability: open source



[Editing a story in Twine 2.0.](#)

## What is Twine?

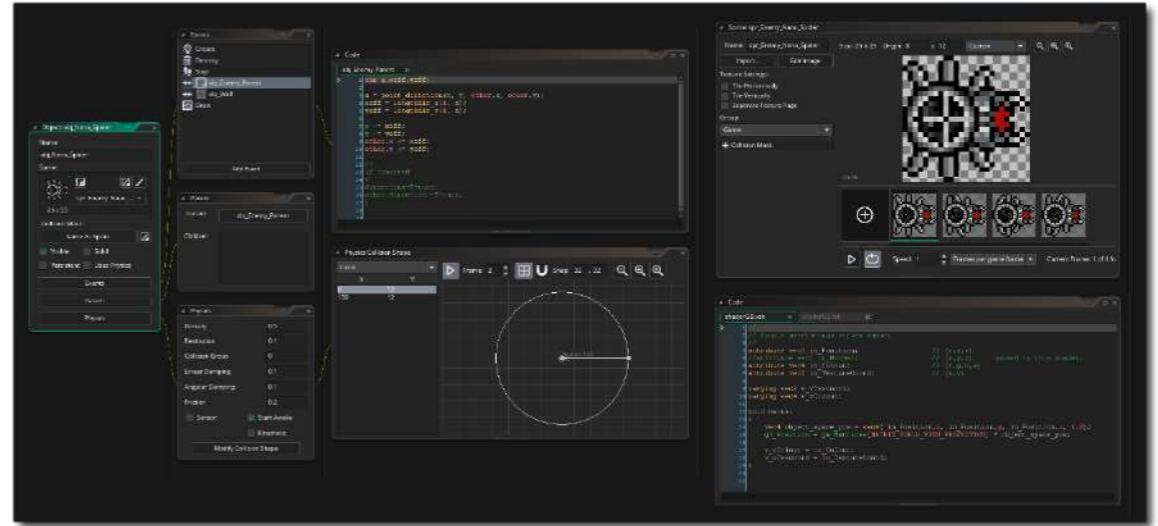
- tool for non-linear, interactive story telling
- stories are made out of *Passages*
- Passages are linked by using special syntax directly in the text  
(similar to e.g. Markdown or HTML)
- more features: images, styling through CSS, variables, expressions
- a story can be exported in HTML format, which makes it easy  
to deploy over the Internet and accessible to others
- possibility to integrate with other web technologies (e.g., p5.js, D3.js, ...)



# GameMaker Studio 2

## Infobox

Name: GameMaker: Studio  
URL: [yoyogames.com/gamemaker](http://yoyogames.com/gamemaker)  
Docs: [docs2.yoyogames.com](http://docs2.yoyogames.com)  
Language: visual programming + [GML](#)  
Level: [intermediate](#)  
Platforms: Windows, OS X  
Availability: trial ([Licence details](#))



[GameMaker Studio 2 Quick Start.](#)

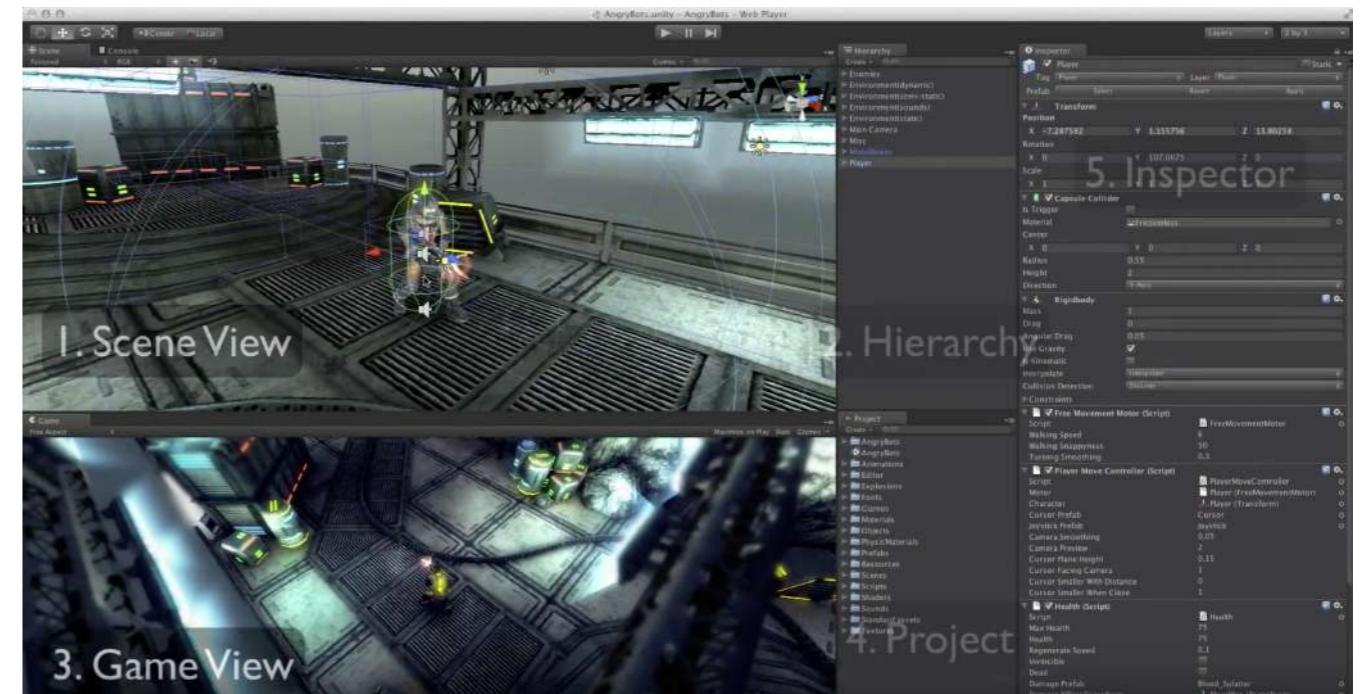
## What is GameMaker: Studio?

- very visual (GUI) game creation approach, with setting parameters
- advanced: create own scripts based on GameMaker Language (GML)
- levels consist of *rooms* and *objects* placed in these rooms
- primarily meant for making 2D and isometric games,  
although some 3D functionalities are available
- paid licences available for additional features, such as export to Windows, OS X, Linux, iOS, Android, HTML5 and more



## Infobox

Name:	Unity
URL:	<a href="http://unity3d.com">unity3d.com</a>
Docs:	<a href="http://docs.unity3d.com">docs.unity3d.com</a>
Language:	C#, JavaScript
Level:	intermediate
Platforms:	Windows, OSX
Availability:	free (personal edition)



[Learn with Unity.](#)

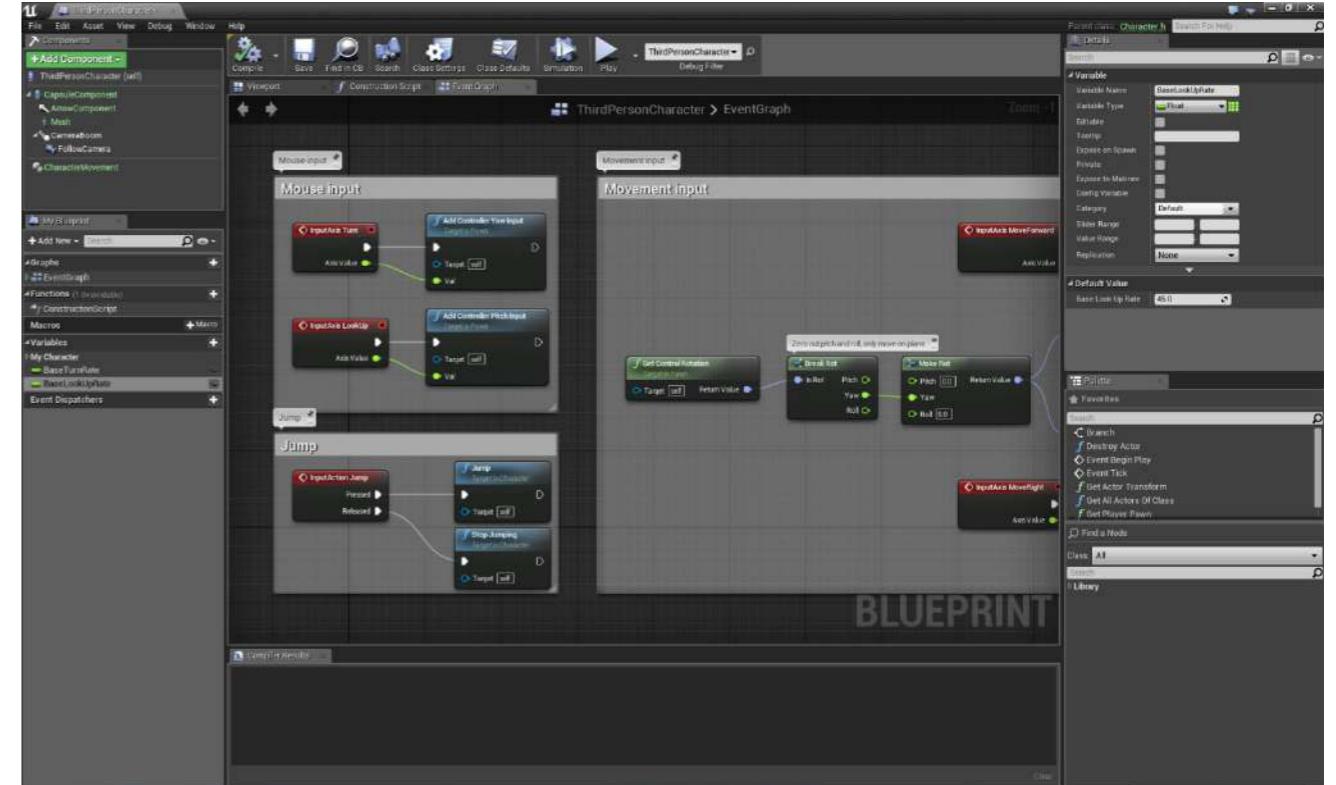
## What is Unity?

- powerful game engine, featuring a mixture of Graphical User Interface (GUI) and coding scripts for game development
- optional: user is knowledgeable about basic programming concepts
- levels are structured in *Scenes*, containing *GameObjects* with various *Components* attached, such as *Scripts*
- cross-platform game export to Windows, OS X, Linux, iOS, Android, WebGL and more

# Unreal Engine

## Infobox

Name:	Unreal Engine
URL:	<a href="http://unrealengine.com">unrealengine.com</a>
Docs:	<a href="http://docs.unrealengine.com">docs.unrealengine.com</a>
Language:	C++, <a href="#">Visual Scripting</a>
Level:	intermediate
Platforms:	Windows, OS X
Availability:	free



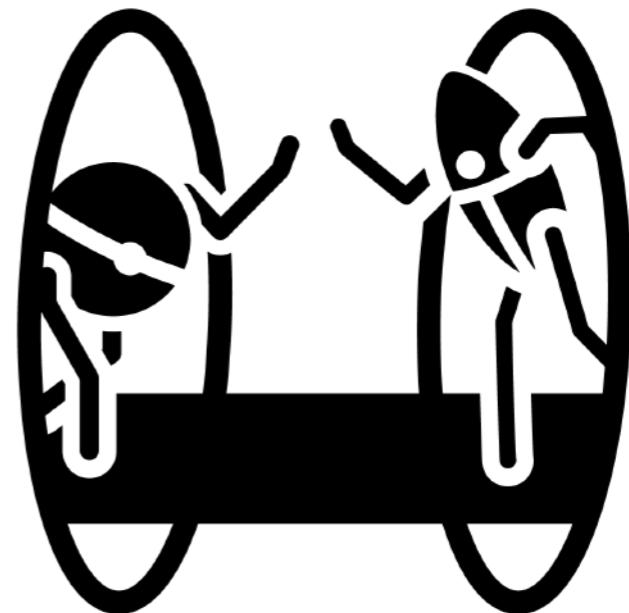
[Introduction to Blueprints.](#)

## What is Unity?

- powerful game engine, featuring a mixture of Graphical User Interface (GUI) and coding scripts for game development
- special [Blueprint Visual Scripting](#) enables the user to rapidly prototype and build games, simulations and visualizations, no programming required
- cross-platform game export to Windows, OS X, Linux, iOS, Android, WebGL, PlayStation, Xbox and more

# **Tools and techniques:**

# **Creative coding frameworks**



# p5\* p5.js + p5.play

## Infobox

Name: p5.js

URL: [p5js.org](https://p5js.org)

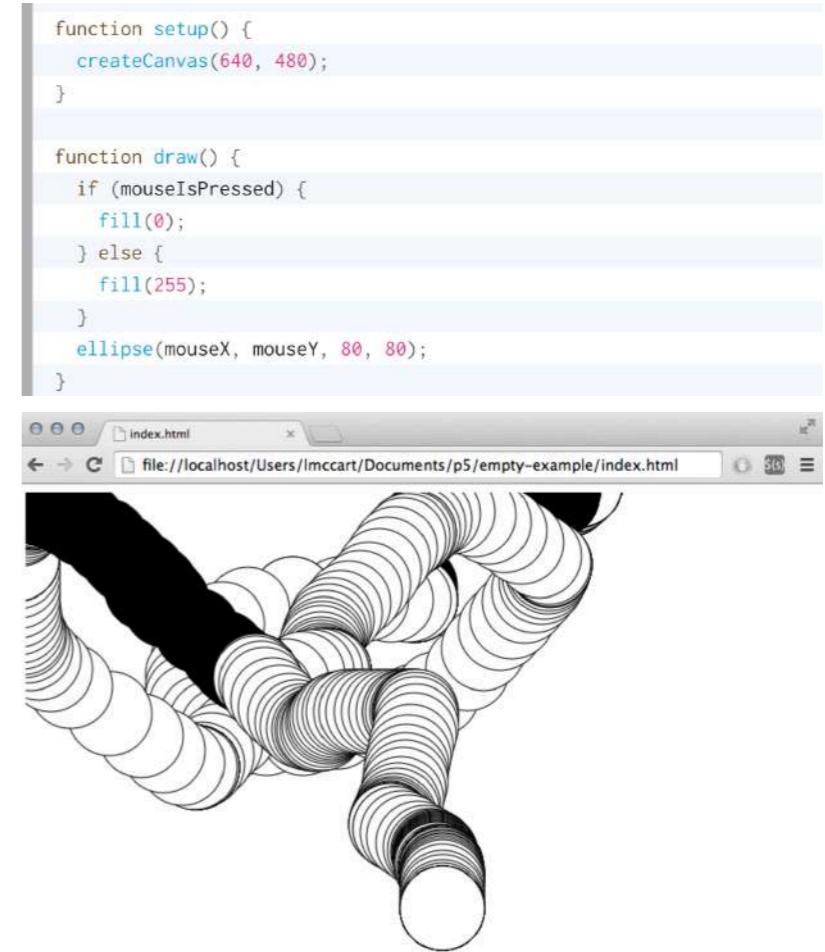
Docs: [p5js.org/reference/](https://p5js.org/reference/) and [p5play.molleindustria.org](https://p5play.molleindustria.org)

Language: JavaScript

Level: beginner

Platforms: web

Availability: open source



[Get started with p5.js.](#)

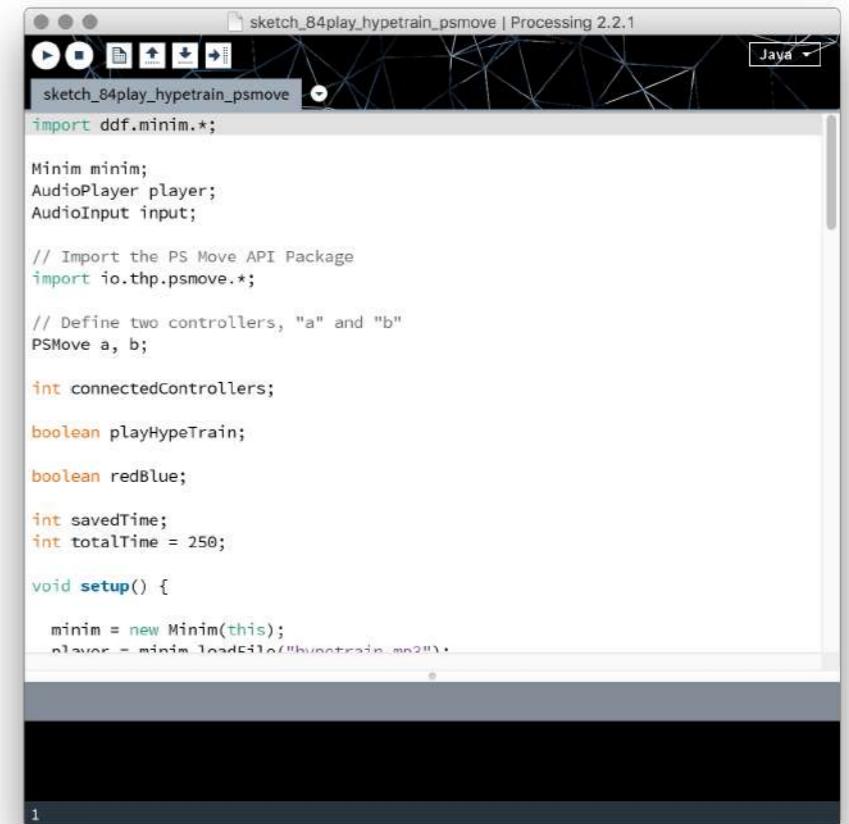
## What is p5.js?

- creative coding toolkit originated from the Processing project
- easy and quick to program interactive visual output
- can be mixed with other JavaScript libraries / web technologies
- extending library p5.play further supports the creation of game-like sketches
- sketches are deployed in HTML format over the web, which makes it easy to deploy and accessible to others

# Processing

## Infobox

Name: Processing  
URL: [processing.org](http://processing.org)  
Docs: [processing.org/reference/](http://processing.org/reference/)  
Language: Java  
Level: beginner  
Platforms: Windows, OSX, Linux  
Availability: open source



```
sketch_84play_hypetrain_psmove | Processing 2.2.1
import ddf.minim.*;
Minim minim;
AudioPlayer player;
AudioInput input;

// Import the PS Move API Package
import io.thp.psmove.*;

// Define two controllers, "a" and "b"
PSMove a, b;

int connectedControllers;
boolean playHypeTrain;
boolean redBlue;
int savedTime;
int totalTime = 250;

void setup() {
    minim = new Minim(this);
    player = minim.loadFile("huntretrain.mp3");
}
```

[Processing: Examples.](#)

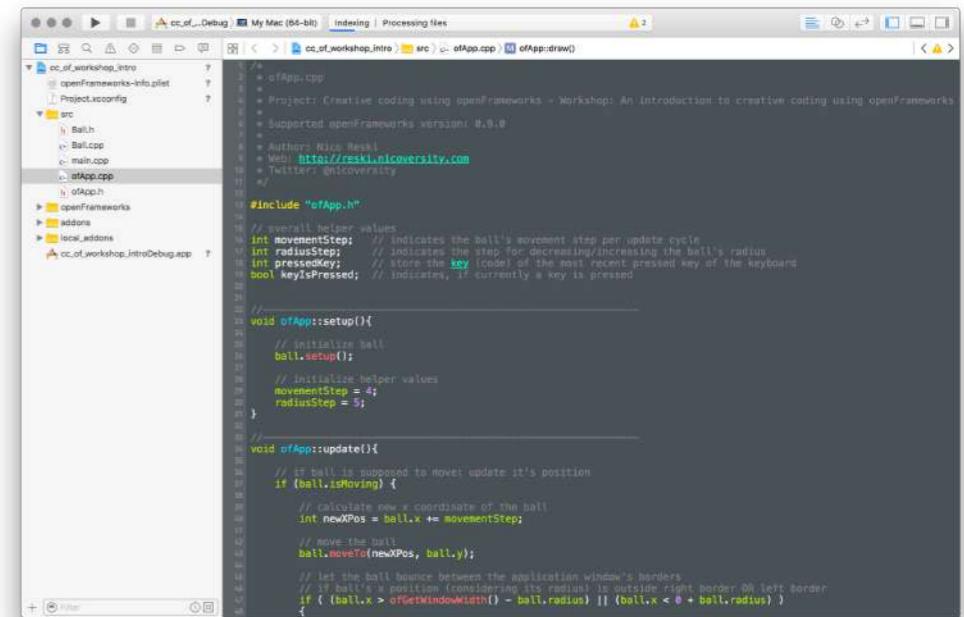
## What is Processing?

- Java based software sketchbook with the aim to make learning how to code / program easy and accessible
- very good at programming visual and audio output
- capable of both 2D and 3D output (OpenGL)
- strong [community](#), lots of additional libraries and plugins
- some functionalities to work with additional hardware

# OF openFrameworks

## Infobox

Name:	openFrameworks
URL:	<a href="http://openframeworks.cc">openframeworks.cc</a>
Docs:	<a href="http://openframeworks.cc/documentation/">openframeworks.cc/documentation/</a>
Language:	C++
Level:	intermediate
Platforms:	Windows, OSX, Linux, iOS, Android
Availability:	open source

A screenshot of the Xcode IDE on OS X. The project navigation sidebar shows a file tree for 'cc\_of\_workshop\_intro' with files like ofApp.h, ofApp.cpp, Ball.h, Ball.cpp, main.cpp, and ofApp.h. The main code editor window displays C++ code for a ball's movement logic. The code includes comments explaining variables like 'movementStep' and 'radiusStep'. It defines classes 'ofApp' and 'Ball' with their respective methods like 'setup()' and 'update()'. The code handles ball movement within window boundaries and manages key presses.

[Editing OF code in Xcode \(OS X\).](#)

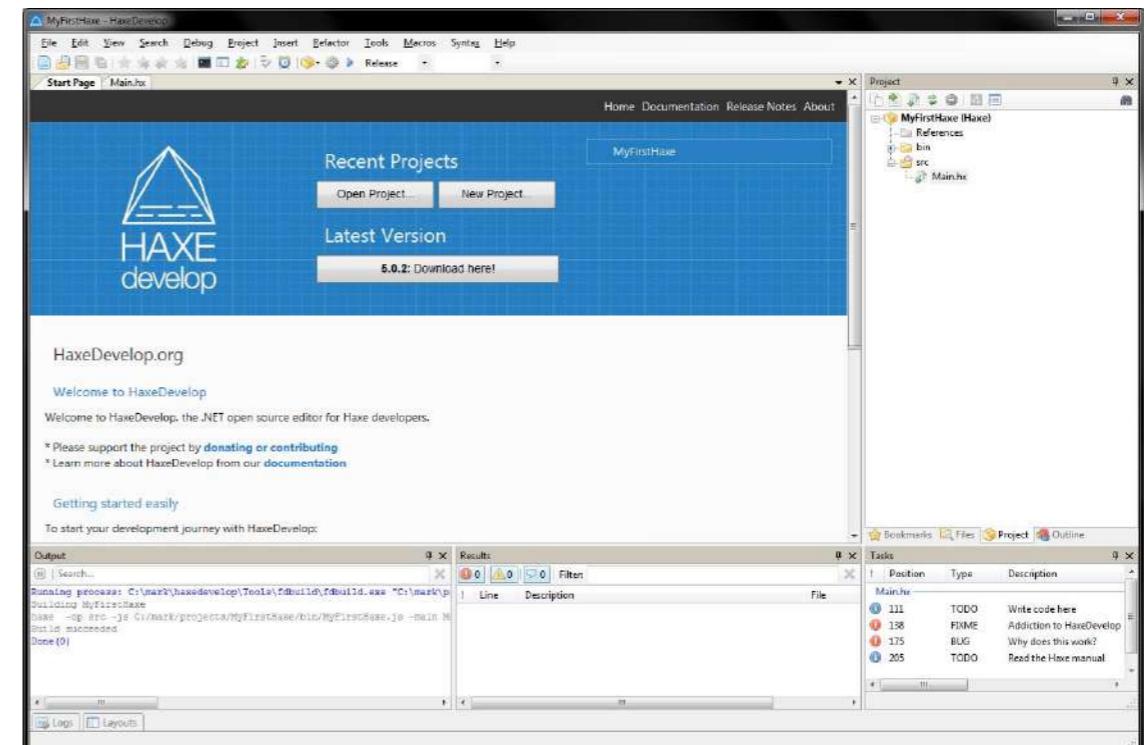
## What is openFrameworks?

- creative coding toolkit to provide a simple and intuitive framework for experimentation
- great at linking / combining lots of different technologies and libraries (graphics, audio, video, computer vision, 3D)
- generally good at drawing and producing visual output
- strong [community](#) with lots of add ons ([ofxAddons](#))



## Infobox

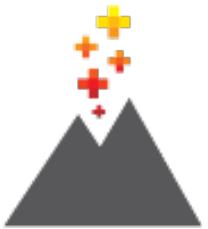
Name:	Haxe
URL:	<a href="http://haxe.org">haxe.org</a>
Docs:	<a href="http://api.haxe.org">api.haxe.org</a>
Language:	Haxe programming language
Level:	intermediate
Platforms:	Windows, OSX, Linux
Availability:	open source



[HaxeDevelop IDE.](#)

## What is Haxe?

- toolkit to build cross-platform tools and frameworks
- target your tools to iOS, Android, HTML5, Node.js, Python, Java and more
- great at accessing native features of different platforms
- one code basis, while deploying to lots of different platforms
- can be used for development of [games](#), web and mobile apps, desktop applications, command line tools or cross-platform APIs



# Cinder

## Infobox

Name: Cinder  
URL: [libcinder.org](http://libcinder.org)  
Docs: [libcinder.org/docs/](http://libcinder.org/docs/)  
Language: C++  
Level: advanced  
Platforms: Windows, OSX, iOS  
Availability: open source

```
void BasicApp::draw()
{
    gl::clear();
    gl::enableDepthRead();
    gl::enableDepthWrite();

    CameraPersp cam;
    cam.lookAt( vec3( 5, 2, 5 ), vec3( 0, 1, 0 ) );
    gl::setMatrices( cam );

    auto lambert = gl::ShaderDef().lambert().color();
    auto shader = gl::getStockShader( lambert );
    shader->bind();

    int numSpheres = 64;
    float maxAngle = M_PI * 7;
```

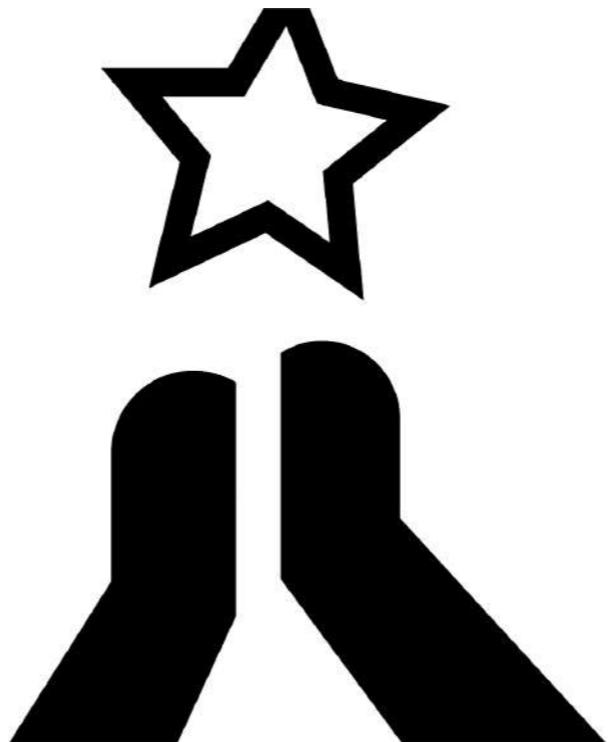


[Cinder guide: The Third Dimension.](#)

## What is Cinder?

- open source library for professional-quality creative coding in C++
- capable of 2D, but strong focus on 3D with OpenGL
- low-level hardware / sensor access
- advanced library, best be used with existing knowledge about the concepts of computer graphics and OpenGL
- powerful once mastered

# Congratulations!



- You learned why good game design matters.
- You learned about characteristics and aspects of prototypes.
- You are aware of different tools and techniques to start prototyping / developing games.

## Contact Nico Reski

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PGP Fingerprint: E826 C9FF 1701 0BAC  
CA98 308C 6772 4499 B061 D75B)

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VRxAR Labs



Department of Computer Science  
and Media Technology (CM)  
Faculty of Technology  
Linnaeus University, Växjö



- [The Coding Train](#)  
by Danial Shiffman (via YouTube)
- [GDC Vault](#)  
by Game Developers Conference (via YouTube)
- [Creative coding using openFrameworks - Workshop: An introduction to creative coding using openFrameworks](#)  
by Nico Reski
- [Creative coding using p5.js - Workshop: An introduction to creative coding using p5.js](#)  
by Nico Reski
- [Creative coding using Processing - Workshop: An introduction to creative coding using Processing.](#)  
by Nico Reski (via GitHub; [Processing language intro](#))
- Augmented Reality using Unity3D and Vuforia ([Part 1](#) / [Part 2](#))  
by Nico Reski (via GitHub)

Portal icons in the presentation available via  
[bit.ly/portaliconpack](https://bit.ly/portaliconpack)