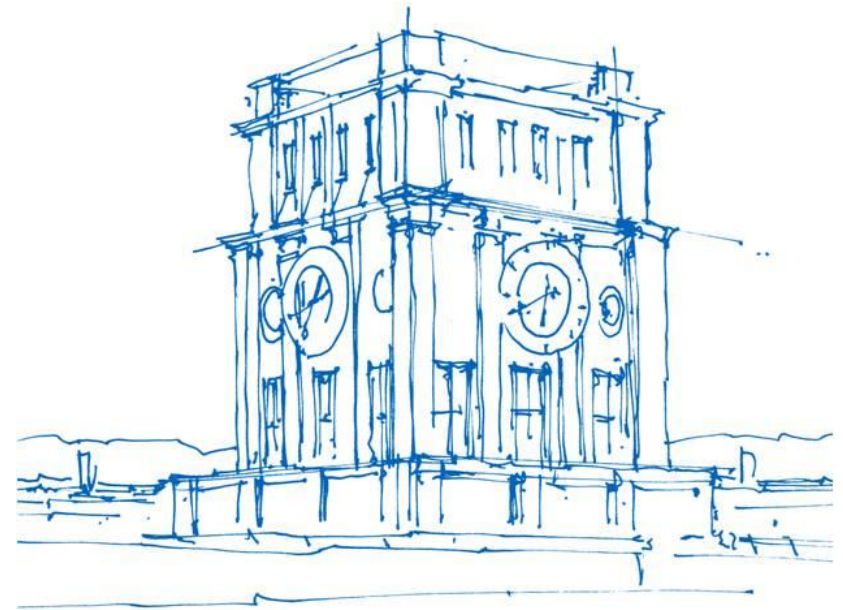# Simulating 2D Game Physics using dynamic Navigation Graphs.

Lars Hinnerk Grevsmühl

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Bachelorthesis

Garching, 07. November 2019

Initial Prototype

Game Jam Concept: *Huge & Cute*

Puzzle Platformer with two
simultaniously moving characters.
Puzzle Elements:

Characters
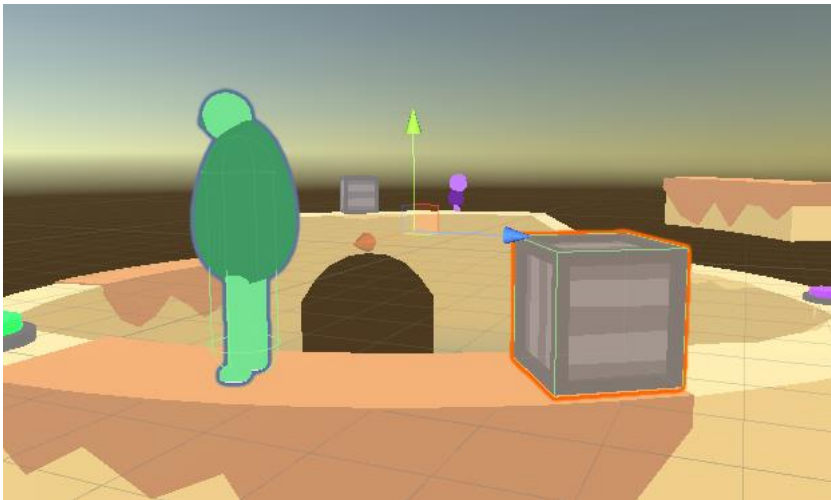Boxes
Moving Platforms
Buttons
etc

Traditional Methods

3D Physics

Using Unity 3D Physics for movement and collisions. Implemented in initial Portotype. Computationally intense and hard to extend.

2D Physics

Using two Unity Rigidbody 2D with constraints then remapping to 3D. Less computational intense, easier to extend.

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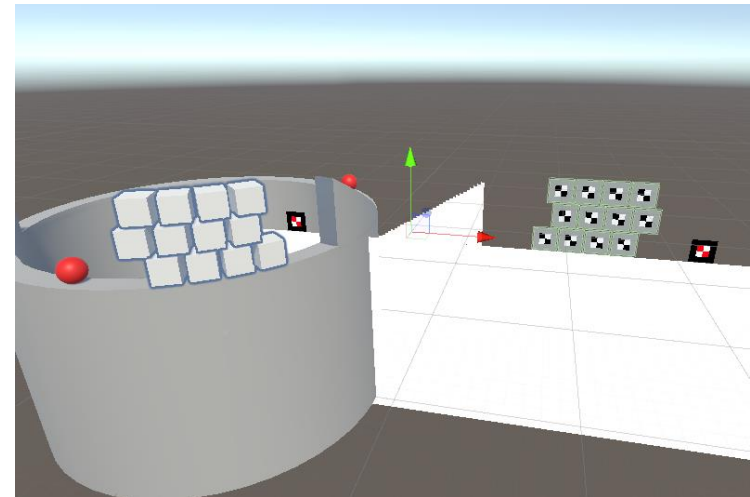
New Method

Precomputing a Navigation Graph for the scene using its colliders. Each actor is represented by two points with continous position on the edges.
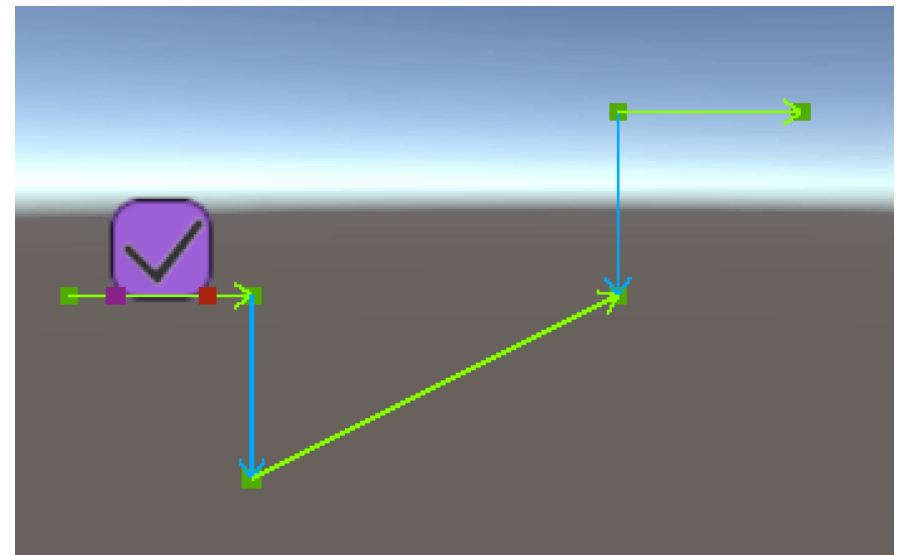
Uses the advantage that rigidbodys can only be in a small subset of states that a full physics simulation would support.

Estimated Advantages:
- Low computational cost
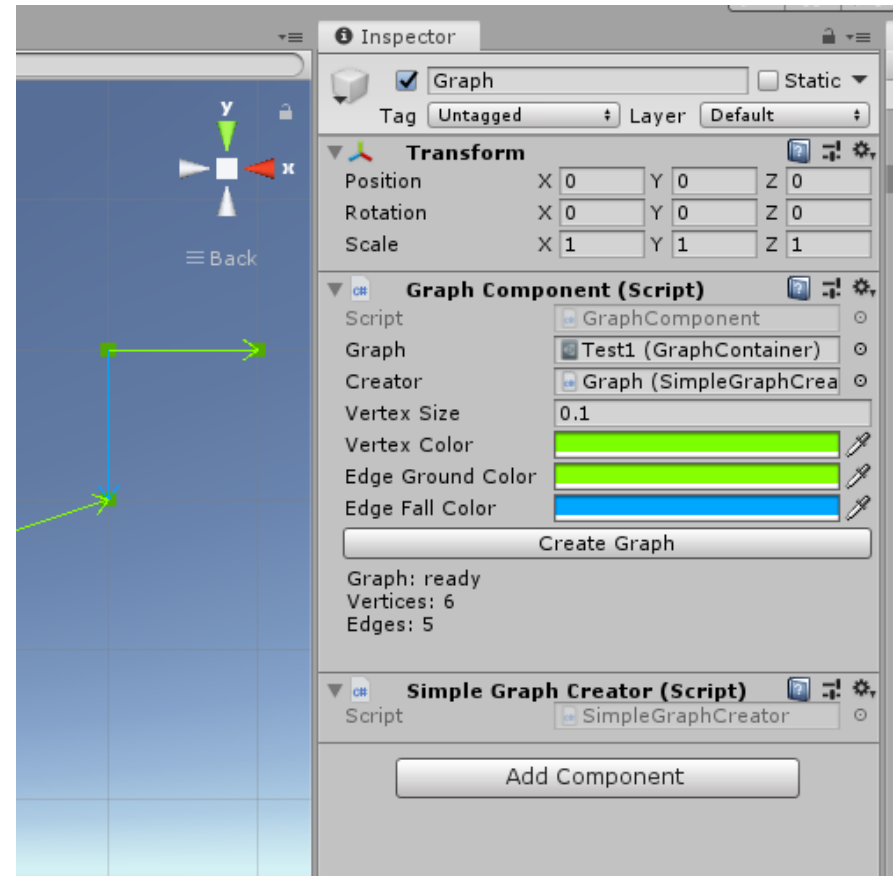- Very predictable

Estimated Disadvantages:
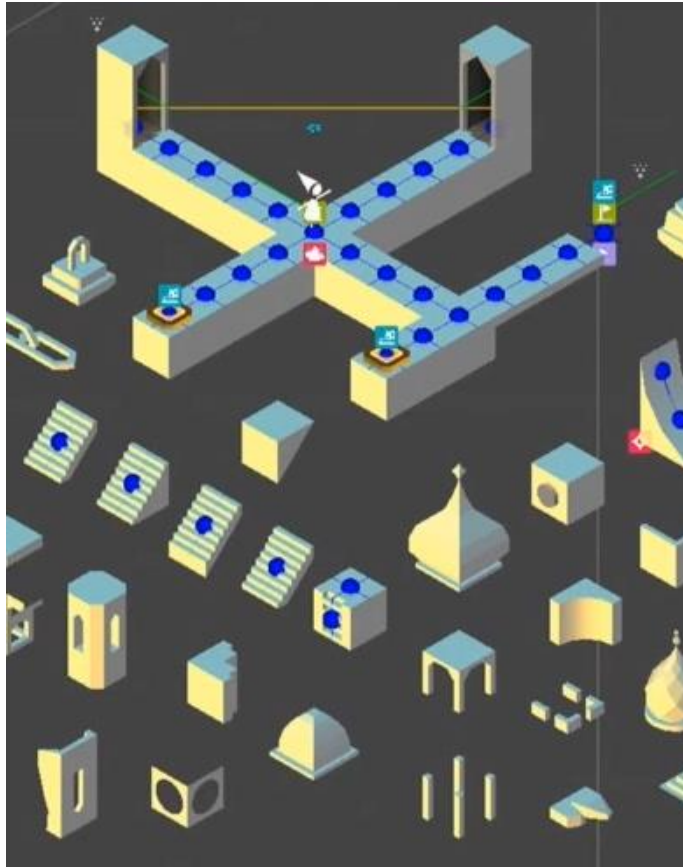- Difficult extensibility

Components

The Implementation can be split
into several smaller components:

- **Generating**
  using colliders for intuitive
  scene building
- **Storing**
  in Scriptable Objects
- **Simulating**
  using Actors and a physics
  controller

Similar Games
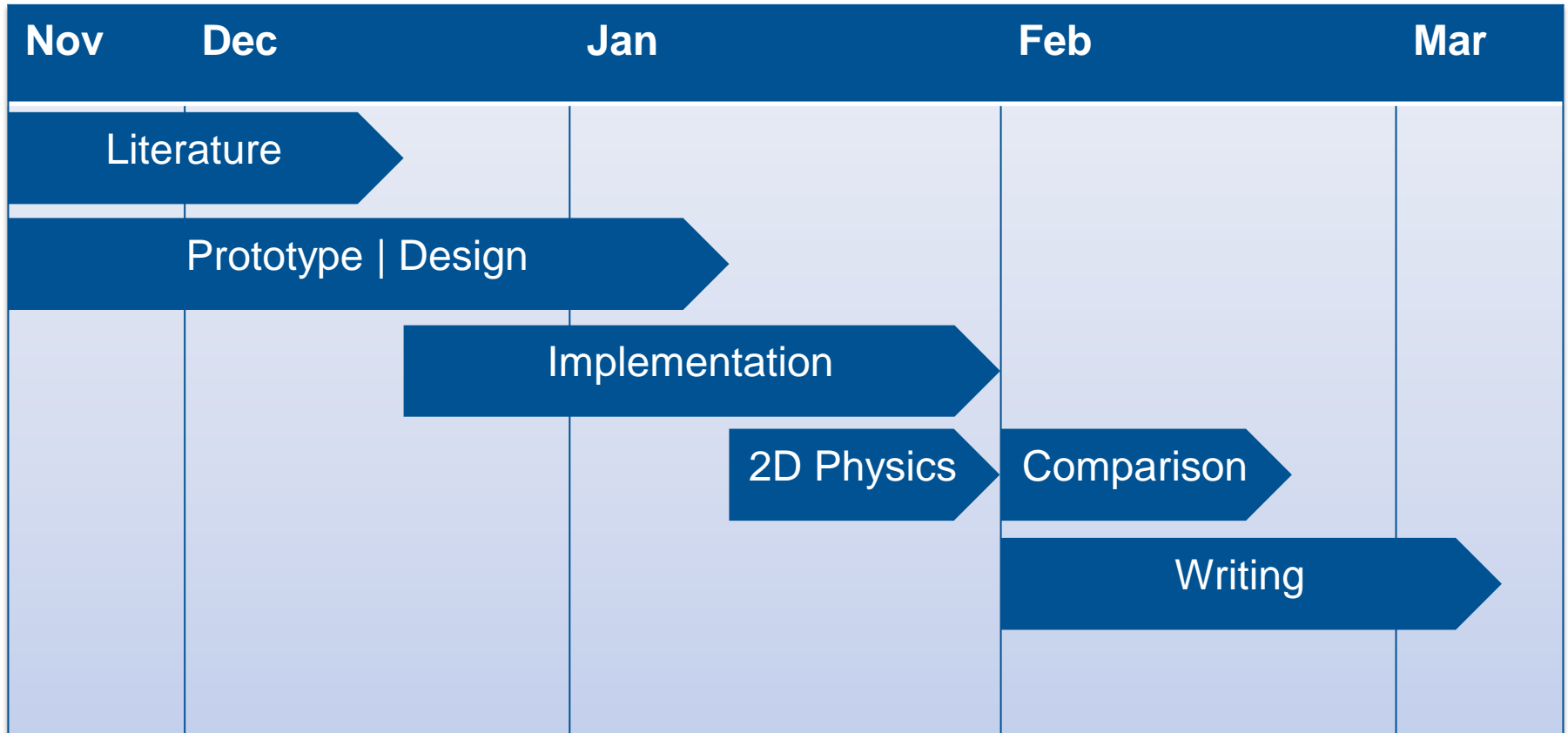

Monument Valley, 2014, Ustwo Games

Similar Games

Deponia, Daedelic Entertainment, 2012

Similar Games

Old Man's Journey, Broken Rules, 2017

Timeline

Nov	Dec	Jan	Feb	Mar
Literature				
Prototype | Design				
		Implementation		
		2D Physics	Comparison	
			Writing	

Questions

Any Questions?