



Augmenting Automated Game Testing with Deep Reinforcement Learning

Re-Work Summit 29th January 2021

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Electronic Arts - EA



EA is a video game company

- ▶ Approx. 10000 employees ~30 game studios, ~300M players total
- ▶ Battlefield, Battlefront, FIFA, NHL, SIMS, Apex Legends, Titanfall, Anthem, Madden, etc. etc.



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Technical and creative research group within EA

- ▶ About 30 people in Europe and North America
- ▶ 4 pillars:



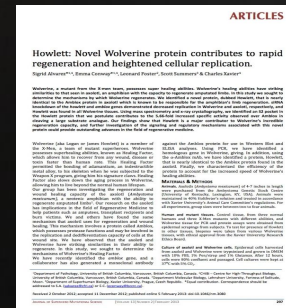
Close collaboration with studios



Open source



Talks and presentations



Publish and patents

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Overview

Examples of bugs/exploits;

- Player stuck
- Missing collision box -> Player walks through walls
- Imbalances (maps, characters, etc.)

Other use-cases:

- Map coverage: load test
- Difficulty assessment



Bug: stuck in mid-air



Exploit: walk on wall

Why Reinforcement Learning for testing?

Finding exploits without being “told”

- Core goal for RL is to maximize reward -> exploitation

Algorithm learns:

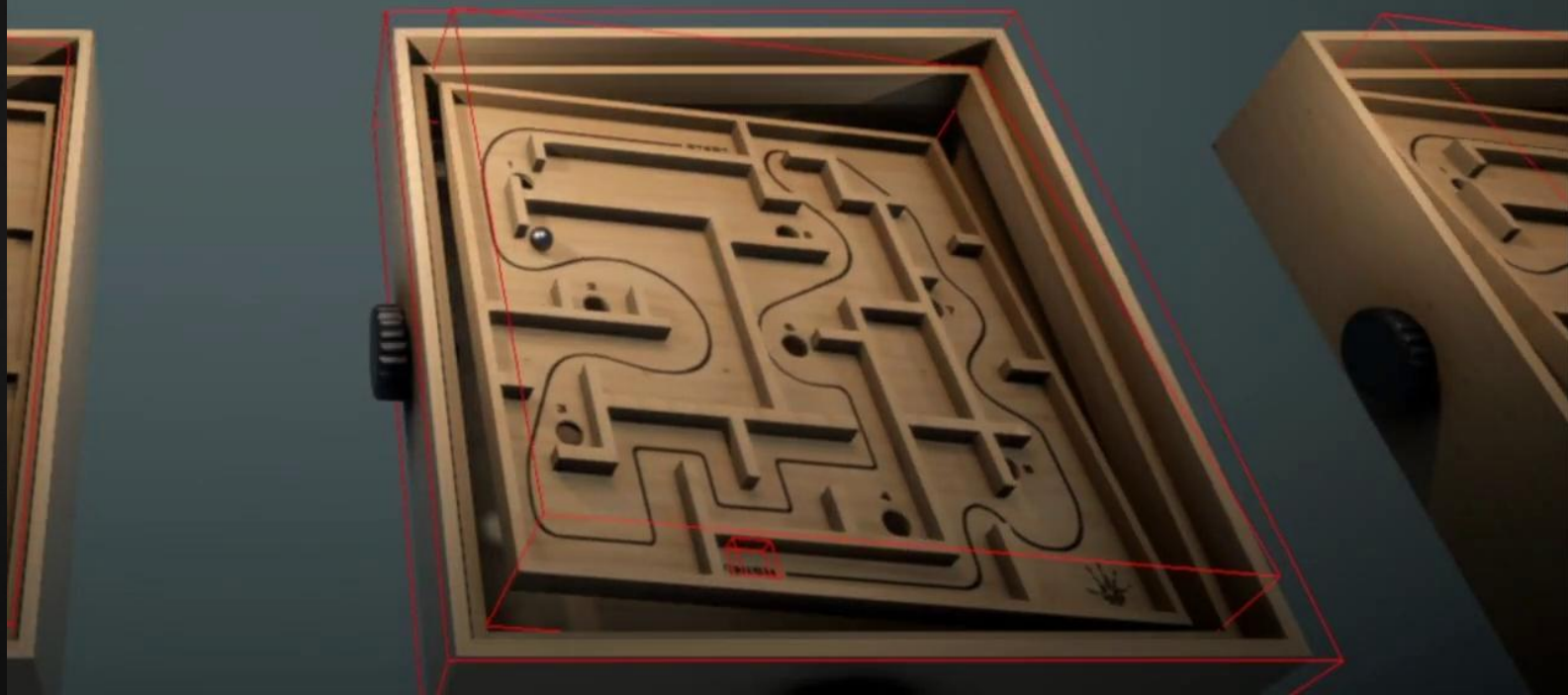
- No scripting required
- Retrain instead of rewriting scripts
- Unpredictable and teachable: more “human like” control
- Explorative: by figuring out how to play it covers more game states



Exploit detector

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Trained RL Agent



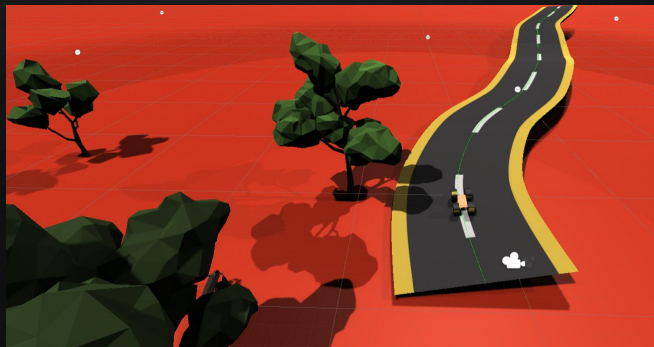
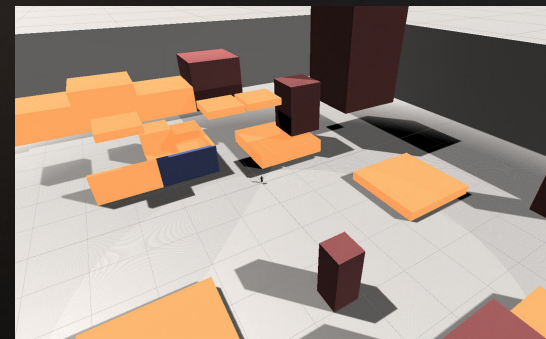
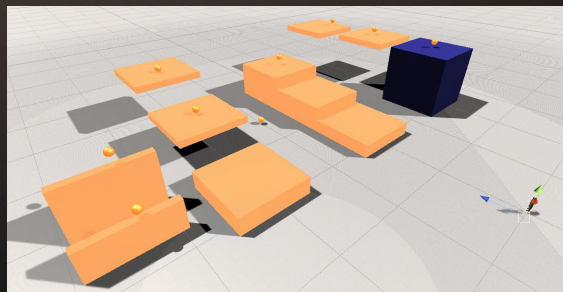
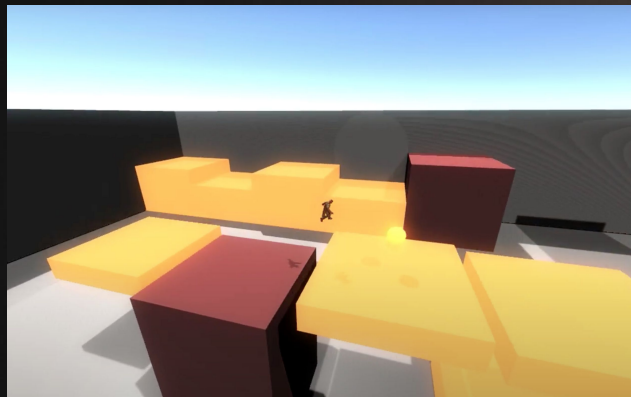
Proof-of-concept: Marble labyrinth



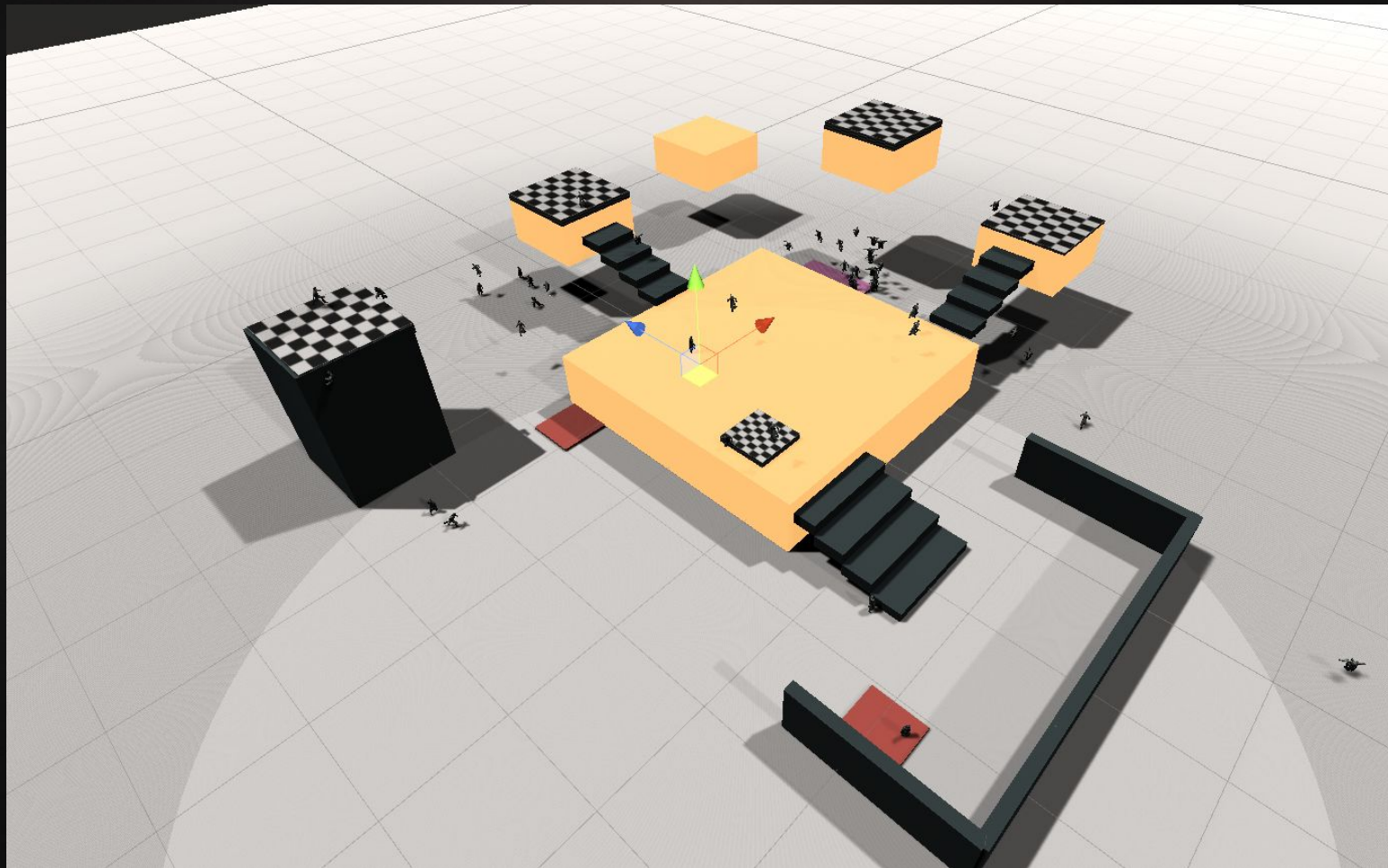
Current Research

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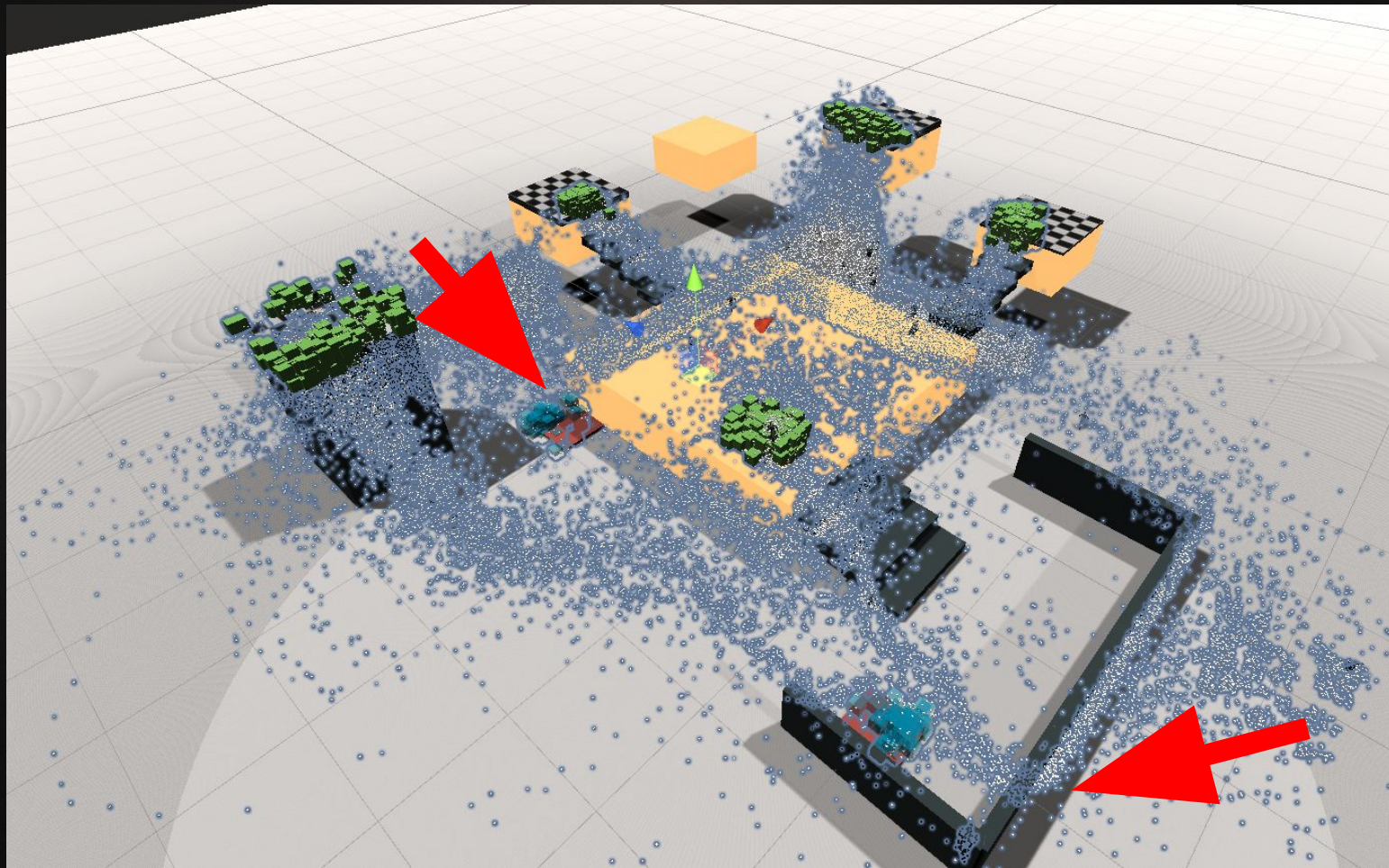
Test ranges for RL game testers



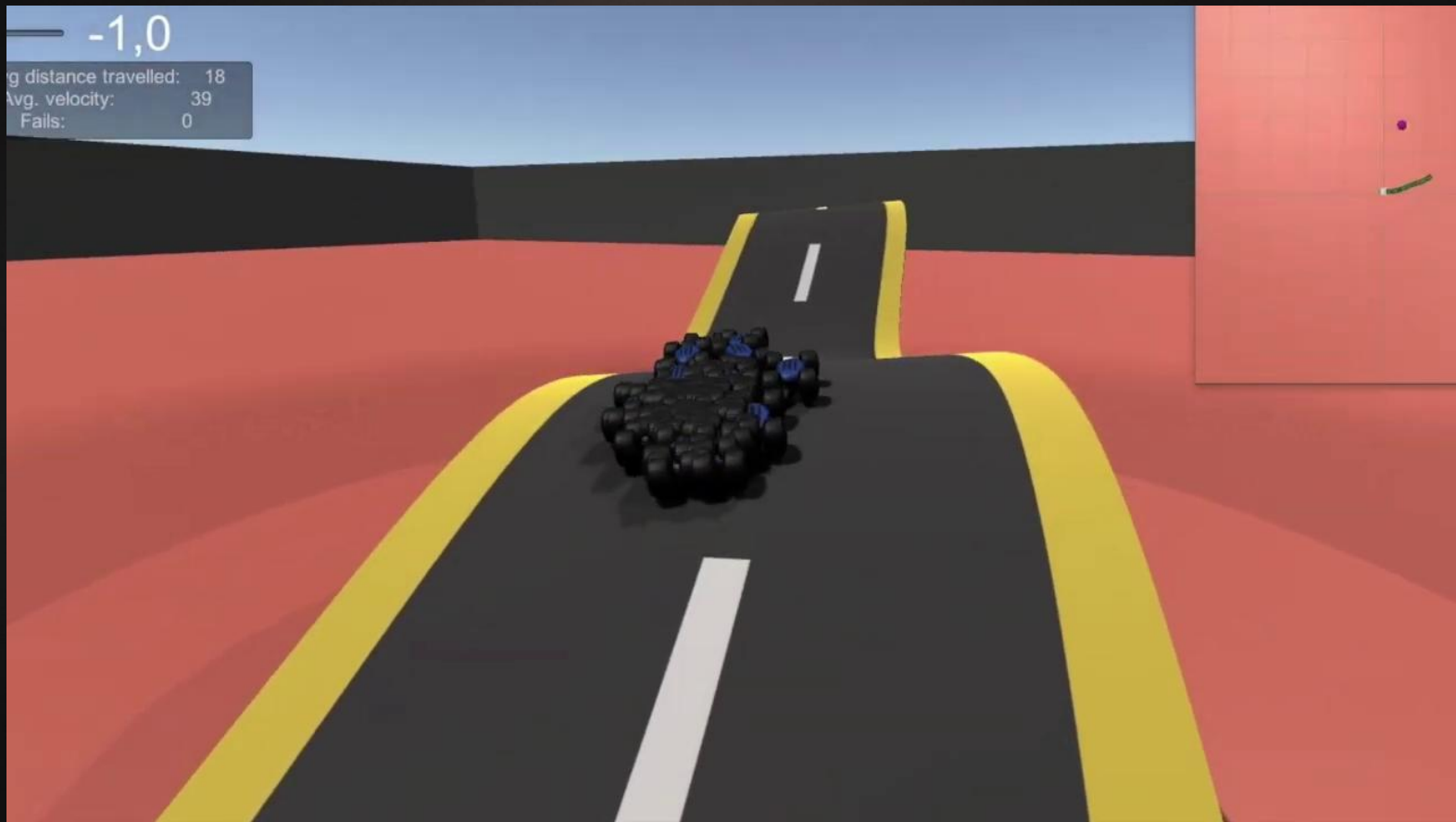
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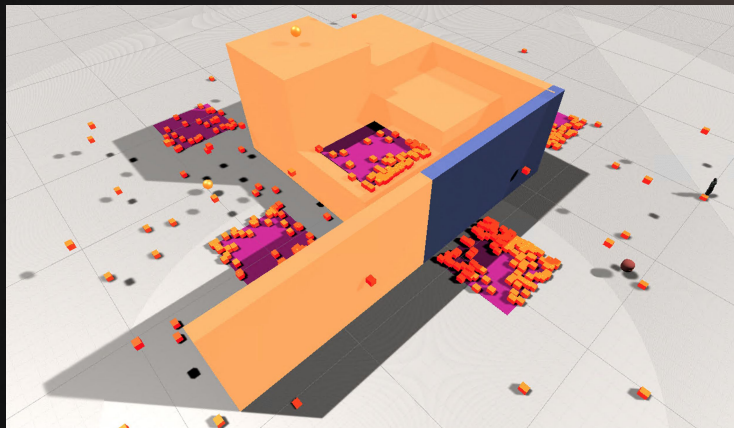


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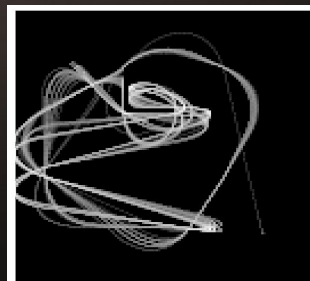


RL for automated testing

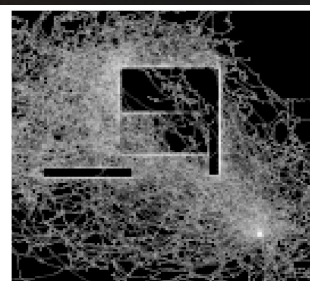
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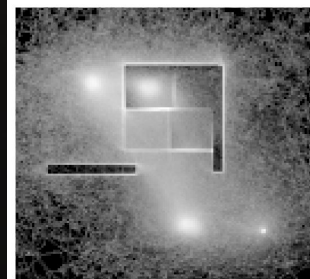
Main findings: RL may be used for e.g. navigation with better result in test coverage, and to detect exploits and bugs.



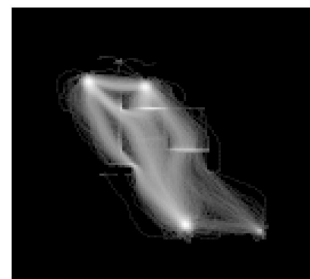
(a) Scripted NavMesh agent.



(b) RL agent after 5 M steps.

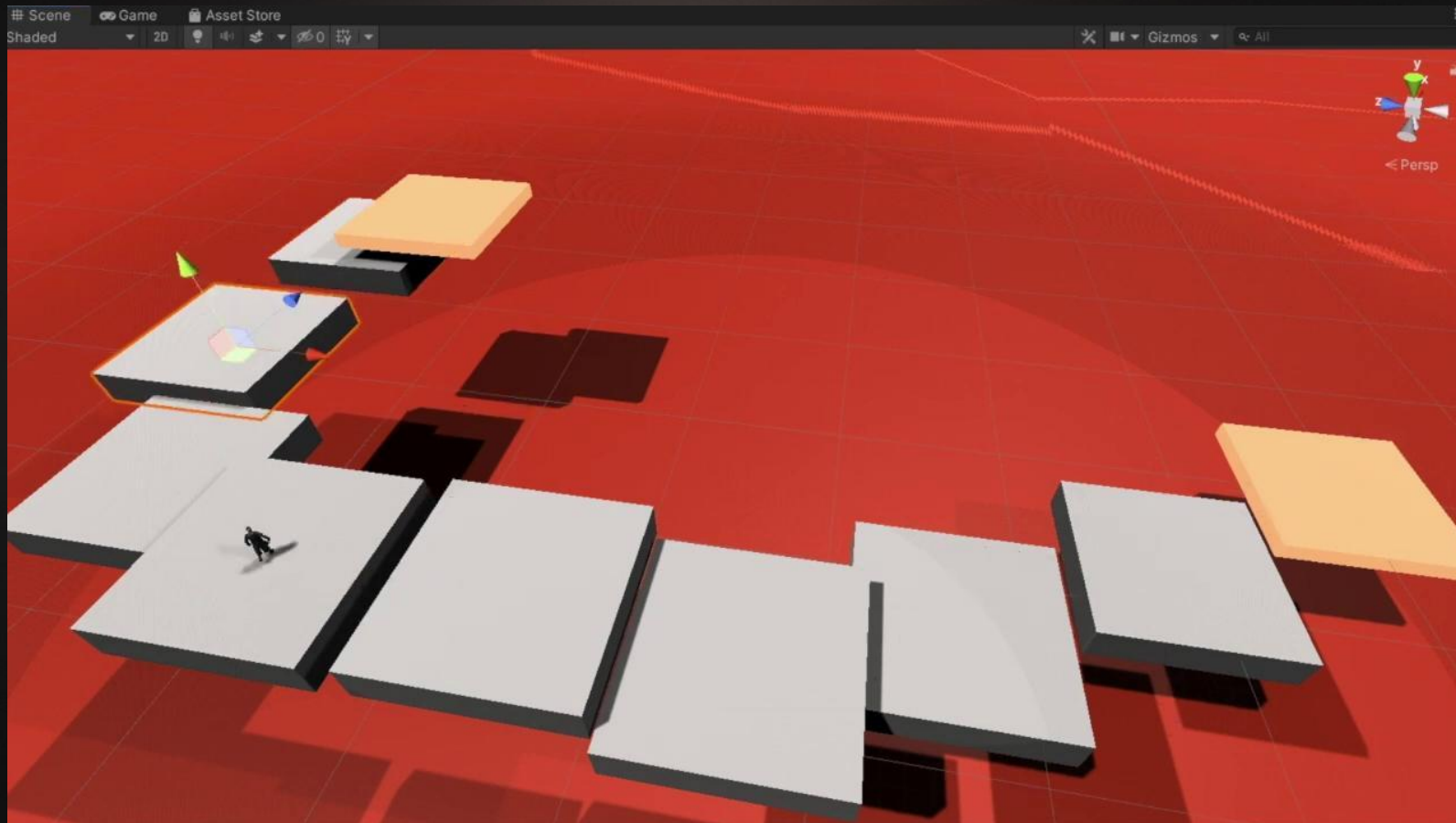


(c) RL agent after 30 M steps.



(d) RL agent fully trained.

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RL as game dev tool: online testing





Research Directions to Improve and use
Automated Testing

Challenges

- Generalization 

- Interpretation: Analytics 

- Control and human like behaviour 

- Fine tuning of behaviour 

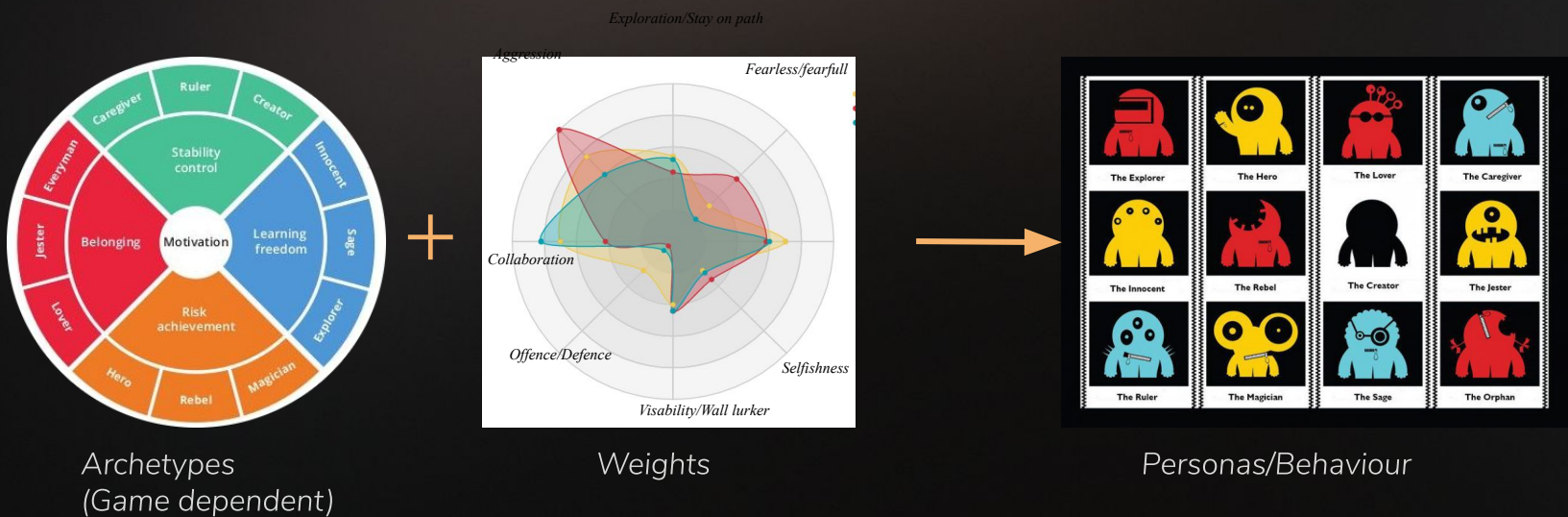
- Skill level 

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Using archetypes to control behaviors

Agent personas for better test coverage

Master thesis student, starting Spring 2021



Combining different motivation fundamentals (archetypes) into Personas using Reinforcement learning and reward shaping (or similar method).

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Game-AI from testing agents

A trained RL agent could potentially be used as a game AI for

- Collaborative AI
- Opponent AI
- NPCs
- “Wild life”



Collaborative AI



Wild life



NPCs



Opponent AI

Summary

- Reinforcement Learning has the potential to improve automated testing
- So far we have only explored a small part of what's possible using RL for testing.
- Machine learning has the potential to radically change the way that we make games especially when testing.
- Thank you for your attention!

