DEVELOPMENT OF A 2D PLATFORMER GAME AND MACHINE LEARNING MODEL

by

MATHEW MICHAEL DAWSON
URN: 6743842

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Department of Computer Science
University of Surrey
Guildford GU2 7XH

Supervised by: Daniel Gardham

I declare that this dissertation is my own work and that the work of others is acknowledged and indicated by explicit references.

Mathew Michael Dawson
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Abstract

This dissertation explores deep reinforcement learning in video games by developing a Deep Q-Network (DQN) agent for a custom 2D platformer game built with Godot Engine. The research implements a DQN architecture combining convolutional neural networks with reinforcement learning to develop game-playing policies without human intervention. A custom game with randomised maps was developed to test the agent's ability to generalise. The model was evaluated based on the time it takes to reach the end of a given map. Experimental results show the DQN agent successfully learned effective strategies, achieving times comparable to human players. The agent's performance improved with training, demonstrating the potential of deep reinforcement learning in video games.

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Abbreviations

AI	Artificial Intelligence
DQN	Deep Q Network
ML	Machine Learning
RL	Reinforcement Learning
DRL	Deep Reinforcement Learning
NPC	Non-Player Character
FSM	Finite State Machine

Chapter 1

Introduction

In the area of video games, Artificial Intelligence (AI) has been used for many years to create non-player characters (NPCs) that can interact with players in a believable way. This is often done using finite state machines (FSMs) or behaviour trees, which allow NPCs to react to player actions in a way that seems intelligent. However, these methods are by definition deterministic, meaning that the same input will always produce the same output, which can lead to predictable and uninteresting gameplay. Additionally, these methods require a lot of manual tuning and design work to create interesting behaviours, which can be time-consuming and expensive, epecially for large or procedurally generated worlds. In recent years, there has been a growing interest in using machine learning (ML) techniques to create more dynamic and adaptive NPCs. One of the most promising approaches to this is deep reinforcement learning (DRL), which combines deep learning with reinforcement learning (RL) to create agents that can learn to play games by interacting with their environment. This approach has been used successfully in a number of different games, including Atari games and board games like Go.

1.1 Background

Background text

1.2 Aims and Objectives

Aims and objectives text

Chapter 2

Literature Review

2.1 Paper

this is some lit review

2.2 Paper 2

this is some more lit review