Player Emulation in Video Games using Artificial Intelligence

B.Sc. (HONS) Computing with Games Development

Supervisor: Robert Sheehy

Student Number: T00200674

Student: Ben Lenihan

Munster Technological University, Dromthacker, Tralee, Co. Kerry

# Abstract

1. Table of Contents

[1 Abstract 2](#_Toc85073849)

[1 Table of Contents 2](#_Toc85073850)

[2 Introduction 2](#_Toc85073851)

[3 Artificial Intelligence 2](#_Toc85073852)

[3.1 Introduction 2](#_Toc85073853)

[3.2 Machine Learning 2](#_Toc85073854)

[3.3 Deep Learning 3](#_Toc85073855)

[3.4 Reinforcement Learning 3](#_Toc85073856)

[4 Technologies 3](#_Toc85073857)

[5 Methodology 3](#_Toc85073858)

[6 Implementation 3](#_Toc85073859)

[7 Findings & Conclusions 3](#_Toc85073860)

[8 References 3](#_Toc85073861)

# Introduction

# Artificial Intelligence

## Introduction

Artificial Intelligence is a branch of computer science concerned with building programs that can perform tasks that would, under normal circumstances, require human intelligence. “It is the science and engineering of making especially intelligent computer systems.” (Mccarthy, 2004)

The idea of Artificial Intelligence can be traced back as far as the 1950’s with Alan Turing’s work “Computing Machinery and Intelligence”. In this paper Turing asks the question “Can machines think?”(Turing, 1950). He then establishes out the “Turing Test”. This is a test in which a human interrogator is supposedly able to distinguish between a machine and a human. Developments since then have already allowed Artificial Intelligence to surpass humans in some areas. In 2015 Google’s AI AlphaGo played the European Go champion Fan Hui.(Stanek, 2021)

Artificial Intelligence is utilized in many areas such as “assistants” in the form of Apple’s Siri, in games for non-player characters, self-driving cars and the AlphaGo AI that beat Fan Hui.(European Parliament, 2021)

## Machine Learning

Machine learning is a sub-branch of Artificial Intelligence focusing on the use of algorithms and data to replicate the way humans learn.

UC Berkeley describe a typical machine learning algorithm as follows:

1. **A decision process:** A recipe of calculations or other steps that takes in the data and returns a “guess” at the kind of pattern in the data your algorithm is looking to find.
2. **An error function:** A method of measuring how good the guess was by comparing it to known examples (when they are available).
3. **An updating or optimization process:** Where the algorithm looks at the miss and then updates how the decision process comes to the final decision so that the next time the miss won’t be as great.(Tamir, 2021)

## Decision Trees

A decision tree is an algorithm used for machine learning. A decision tree starts at one point (called a node) and branches into at least two directions, each branch offering different outcomes. Decision trees consist of three types of nodes.

* Decision nodes: These represent a decision to be made by the system.
* Chance nodes: These represent a probability of what will happen.
* End nodes: Representing an outcome.

These nodes are connected by branches. These nodes and branches are reusable and can be used in any number of combinations to create more complex trees. The first node is called the “root node”, while the final nodes are called the leaf nodes. The nodes between these are called internal nodes. Sometimes these trees can put too much emphasis on irrelevant data. In these instances, a process named pruning can be used. In this process unnecessary data is removed.(Hillier, 2021)

# Technologies

# Methodology

## Research Undertaken

## Research Question

## Proposed Project Implementation

## System Design

## Prototype

|  |  |  |
| --- | --- | --- |
| Prototype | Start Date | Finish Date |
| 1 |  |  |

|  |  |  |
| --- | --- | --- |
| Task Number | Details | Status |
|  |  |  |

# Implementation

## Sprints

### Sprint 1

|  |  |  |  |
| --- | --- | --- | --- |
| Sprint Number | Sprint Name | Start Date | Finish Date |
| 1 | Android Emulator Setup | 01/11/2021 | 08/11/2021 |

|  |  |  |
| --- | --- | --- |
| Task Number | Details | Status |
| 1 | Examine options for android emulation on a desktop computer | Complete |
| 2 | Test the emulator for use playing the chosen game | Complete |

### Sprint 2

|  |  |  |  |
| --- | --- | --- | --- |
| Sprint Number | Sprint Name | Start Date | Finish |
| 2 |  |  |  |

# Findings & Conclusions

# References

European Parliament, 2021. *What is artificial intelligence and how is it used? | News | European Parliament*. [online] Available at: <https://www.europarl.europa.eu/news/en/headlines/society/20200827STO85804/what-is-artificial-intelligence-and-how-is-it-used> [Accessed 18 Oct. 2021].

Hillier, W., 2021. *What Is a Decision Tree and How Is It Used?* [online] Available at: <https://careerfoundry.com/en/blog/data-analytics/what-is-a-decision-tree/> [Accessed 8 Nov. 2021].

Mccarthy, J., 2004. *WHAT IS ARTIFICIAL INTELLIGENCE?* [online] Available at: <http://www-formal.stanford.edu/jmc/>.

Stanek, M., 2021. *Understanding AlphaGo. How AI beat us in Go — game of profound… | by Mirek Stanek | Medium*. [online] Available at: <https://medium.com/@froger\_mcs/understanding-alphago-948607845bb1> [Accessed 13 Oct. 2021].

Tamir, M., 2021. *What Is Machine Learning? - I School Online*. [online] Available at: <https://ischoolonline.berkeley.edu/blog/what-is-machine-learning/> [Accessed 12 Oct. 2021].

Turing, A.M., 1950. *COMPUTING MACHINERY AND INTELLIGENCE*. *Computing Machinery and Intelligence. Mind*, .