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

[Abstract 2](#_Toc88083142)

[1 Table of Contents 2](#_Toc88083143)

[1 Introduction 3](#_Toc88083144)

[2 Artificial Intelligence 3](#_Toc88083145)

[2.1 Introduction 3](#_Toc88083146)

[2.2 Machine Learning 3](#_Toc88083147)

[3 Algorithms 4](#_Toc88083148)

[3.1 Decision Trees 4](#_Toc88083149)

[4 Technologies 5](#_Toc88083150)

[4.1 Android Emulators 5](#_Toc88083151)

[4.1.1 Bluestacks 5](#_Toc88083152)

[4.1.2 LDPlayer 5](#_Toc88083153)

[4.1.3 Nox 5](#_Toc88083154)

[4.2 Programming Languages 5](#_Toc88083155)

[5 Methodology 6](#_Toc88083156)

[5.1 Research Undertaken 6](#_Toc88083157)

[5.2 Research Question 6](#_Toc88083158)

[5.3 Proposed Project Implementation 6](#_Toc88083159)

[5.4 System Design 6](#_Toc88083160)

[5.5 Prototype 6](#_Toc88083161)

[6 Implementation 6](#_Toc88083162)

[6.1 Sprints 6](#_Toc88083163)

[6.1.1 Sprint 1 6](#_Toc88083164)

[7 Findings & Conclusions 7](#_Toc88083165)

[8 References 7](#_Toc88083166)

# 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)

# Algorithms

## 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” this, while the final nodes, representing outcomes, are called the leaf nodes. The nodes between these are called internal nodes, these represent decisions or chances depending on the tree’s purpose. 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)

Diagram

Description automatically generated

Figure 3.. - Simple Decision Tree using chance nodes(Hillier, 2021)

# Technologies

## Android Emulators

### Bluestacks

Bluestacks is among the most popular Android emulators, claiming more than 500 million users. It features a large library of compatible Android games and is constantly growing its library. It contains many features such as keyboard control and cloud-based platform usage alongside its more traditional desktop application(Bluestacks, 2021)

### LDPlayer

LDPlayer is a popular Android emulator with more than 4 million daily users. It claims to support more than 1 million games. It supports features custom keyboard controls and multi-instance allowing the same app to be opened and used at the same time.(LDPlayer, 2021)

### Nox

## Programming Languages

* Python – A general-purpose object-oriented programming language (chosen)
* C# - Object-oriented language created by Microsoft

# Methodology

## Research Undertaken

## Research Question

## Proposed Project Implementation

## System Design

## Prototype

|  |  |  |
| --- | --- | --- |
| Prototype | Start Date | Finish Date |
| 1 | 12/11/2021 |  |

|  |  |  |
| --- | --- | --- |
| Task Number | Details | Status |
| 1 | Setup Android emulator | Complete |
| 2 | Create Fate/Grand Order profile |  |

# Implementation

## Sprints

### Sprint 1

|  |  |  |  |
| --- | --- | --- | --- |
| Sprint Number | Sprint Name | Start Date | Finish Date |
| 1 |  |  |  |

|  |  |  |
| --- | --- | --- |
| Task Number | Details | Status |
| 1 |  |  |

# Findings & Conclusions

# References

Bluestacks, 2021. *What is Bluestacks?* [online] Available at: <https://www.bluestacks.com/about-us.html> [Accessed 9 Nov. 2021].

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].

LDPlayer, 2021. *LDPlayer - Lightweight & Fast Android Emulator for PC*. [online] Available at: <https://www.ldplayer.net/> [Accessed 17 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*, .