CS39440 – MAJOR PROJECT – 2016/17

REQUIREMENTS SPECIFICATION

for

COMPUTATIONAL INTELLIGENCE IN GAMES (AI BIRDS)

by

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Version History

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1.   INTRODUCTION

1.1   Purpose of This Document

This document describes the requirements for the Computational Intelligence in Games (AI Birds) project for students studying in Aberystwyth University on module CS39440 – Major Project (2016-17). It should be read in the context of the Major Project module project specification and the content of the Angry Birds AI Competition website [1] plus a variety of academic papers used as sources for information on this competition [2] [3].

1.2   Scope

This Requirements Specification describes the functions of the software to complete unseen levels of the Angry Birds game and the associated interfaces. It also describes the requirements for the process of constructing the system.

1.3   Objectives

The objectives of this document are:

- To describe the background of the Computational Intelligence in Games (AI Birds) project
- To provide details of the criteria that the project must meet
- To describe the functions that the system must support

2.   **GENERAL DESCRIPTION**

2.1   **Product Perspective**

The Computational Intelligence in Games (AI Birds) project is the development of a neural network based Artificial Intelligence (AI) program designed to automatically complete levels in the game Angry Birds. A heuristic-based agent will be created to help gather training data for this project. A user interface for running the agents, customising the neural network and displaying gathered data will also be created.

2.2   **Product Functions**

The product will provide the following features:

- A heuristic-based agent to complete levels and gather information on successful shots.
    - This will include:
        - Storing the data gathered on these shots
        - An agent capable of completing some levels successfully
        - Some feature extraction to help generate a heuristic
- A neural network based agent capable of completing levels successfully in a reasonable amount of time.
- A user interface which:
    - Displays information about the neural network
    - Allows the running of agents without the use of the command line
    - Provides a means to customise the neural network

2.3   **User Characteristics**

The system will mainly be used for research purposes into the use of AI to solve problems in a dynamic environment and will, therefore, be used primarily by experts in the field of Artificial Intelligence who will be familiar with specialist computer interfaces.

3.   SPECIFIC REQUIREMENTS

3.1   Functional Requirements

3.1.1   Heuristic Agent

FR1 - Feature Extraction

The heuristic-based agent should perform some feature extraction about the current level to determine the heuristic value for a shot. This may include features such as number of objects above impact location, estimated damage etc.

FR2 - A Working Heuristic Agent

The heuristic-based agent should use greedy search to determine which shot is the best available shot. It will then use this 'best available shot' in order to successfully complete levels.

FR3 - Store the Data

The heuristic-based agent should extract and store the information gathered from successful shots in order to train the neural network agent.

3.1.2   Neural Network

FR4 - Implement a Neural Network

The neural network should be capable of determining whether or not a shot is a 'good' shot. This will be based upon some features extracted from the current level.

3.1.3   User Interface

FR5 - A User Interface to Run the Agents

The user interface should allow clear and simple running of either the heuristic-based agent or the neural network agent.

FR6 - Gather and Display Data

Information on how the neural network is performing should be gathered and displayed graphically in an easy-to-read way, using graphs and other available mediums.

FR7 - Customisable User Interface

The user interface should permit customisation of the neural network.

3.2   External Interface Requirements

EIR1 - Appearance of the Interface

The interface should be intuitive to experts in the field of machine learning

3.3   Performance Requirements

PR1 - Time to Run the Agent

The neural network based agent should run in a reasonable amount of time, i.e. it should train within 10 minutes

ANNOTATED BIBLIOGRPAHY

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