CEng 491 -- Project KickOff Document Template

"MasteRookie Player" KickOff Document

Description

"MasteRookie Player" project has been proposed to create an AI to play 2d games which have partially or fully observable deterministic, dynamic, episodic, single-agent environments . Generally, these kind of products are based on a predefined logic when choosing the correct moves in the game. In contrast, our product will minimize this and will learn to play itself. The product could serve as an automation for time-consuming tasks for people or for experimentation with games.

Work Packages (Master feature list)

# WP	Term	WP Title	Estimated # of man-months
1	491	Research on ML basics, implementations, literature search and tool and specifying game types to work on.	4
2	491	Supervised learning algorithm implementations,neural networks and deep learning on selected game types.	4
3	491	First comprehensive player agent for (pacman,flappy bird,mario etc.) implemented with supervised learning algorithms for mid-term and final demo.	8
4	492	Research on Reinforcement learning, Deep Reinforcement learning and implementations.	4
5	492	Integrating supervised learning and reinforcement learning and implementation on a selected game.	4
6	492	Improving and integrating proper learning algorithms, environment and APIs for the final product.	4
7	492	Final game agent development and testing on 1-2 games.	8
Bonus	492	Agent for strategy game(s).	
Bonus	492	Agent for multi-agent game(s).	

Detailed Descriptions of High-Level Work packages

WP1 - (Research on ML basics, implementations, literature search and tool and specifying game types to work on.**)**

In this work package, the following functionalities / features / work items will be implemented

1. To be aware of what will be done in background, basic ML concepts and algorithms will be reviewed and implemented.
2. To get the idea and algorithm analysis, similar projects and papers will be examined.
3. The basic tools, frameworks and languages will be learned, investigated and specified according to the project properties and criterion.
4. These information will be used in a simple game to learn the basics and start implementing code.

WP2 - (Supervised learning implementations on selected game types.**)**

In this work package, the following functionalities / features / work items will be implemented

1. According to the needs, games which have different AIs, properties and different environments will be selected for prototyping.
2. Data sets for training the agent will be generated and if necessary, automations that generate specific types of outputs will be coded.
3. Supervised learning algorithms starting from neural networks will be implemented according to the moves in selected games and first prototypes will be created in this stage. Algorithms in these prototypes will be evaluated and successful ones will be used in further iterations of the project.

WP3 - (First comprehensive game agent for a specified game will be implemented with supervised learning algorithms for mid-term demo.**)**

In this work package, the following functionalities / features / work items will be implemented

1. A comprehensive game will be selected and a good interface or API to get and send data will be implemented.
2. A proper deep neural network with helper algorithms like feature selection will be implemented and trained with the big data set which will be retrieved from the game beforehand.
3. The product will be prepared to be ready to be presented.

WP4 - (Research on Reinforcement learning, Deep Reinforcement learning and implementations.**)**

In this work package, the following functionalities / features / work items will be implemented

1. To improve the performance and optimization, different reinforcement and deep reinforcement learning algorithms will be examined and implemented on sample data sets.
2. Games that have already been investigated environments will be chosen as prototypes and algorithms will be tried in different games and environments.

WP5 - (Defining game environments to agent which will use for reinforcement learning algorithms.**)**

In this work package, the following functionalities / features / work items will be implemented

1. The tools and techniques will be found to get frames from the game and process them to introduce the environment to the reinforcement learning algorithms that will be implemented.
2. The final game will be chosen and examined in detail (with source code etc.)

WP6 - (Improving and integrating proper learning algorithms, environment and APIs for the final product.**)**

In this work package, the following functionalities / features / work items will be implemented

1. In this stage, different tools and algorithms used and selected will be integrated to the final game according to the needs and if necessary, datasets will be generated.
2. A sample GUI or a set of plots will be generated to evaluate the algorithm performance visually.

WP7 - (Final game agent development and testing.**)**

In this work package, the following functionalities / features / work items will be implemented

1. The final product will be examined and tested with different agents, bots or by hand.
2. The source code will be examined and refactored if necessary.
3. The final product will be tried, new visual properties will be added and the product will be prepared to be ready for final demo.

Risk Assessment

Risk #	Description	Possible Solution(s)
1	Some work to be done in limited time can be delayed.	With declaration in backlog reports, these works can be shifted to following sprints.
2	The selected tools can become insufficient after a time.	The current tool or library could be changed with a proper one.
3	Some selected games can be much complex to get data or to train an agent that was implemented a selected kind of algorithm.	In this situation, the game could be changed.
4	There is a possibility that the algorithms mentioned in the work-packages can't match with the task.	Some modifications and changes in the algorithms are possible.
5	Final product type is flexible, it can be an agent that may adjust to a few games or an agent that learns to play a specific comprehensive game	The decision domain is restricted so the type of agent can be decided or changed according to the improvements and circumstances.