User Manual
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Snake reinforcement learning agent with interactive user front-end

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Table of contents

1. Overview

The aim of the game, Snake, is to eat as many food items as possible and grow while avoiding running into any obstacles that may arise in the game. The player manoeuvres the growing snake, eating the food items randomly displayed on the screen. The obstacles in the game include walls in the middle of the game field and walls on the border of the game field. If the snake runs into either one of these obstacles it dies and the game is over. Once the game is over players are given the option to play again. The highest score of your games will be recorded and displayed on the top of the game screen.

2. Loading The Game

To run the game, the user should download the executable file. They then click into the src folder and run the application called main. After this the game window is displayed.

3. Main Menu

The main menu is divided into 3 sections, each one serving as a button.
Player - Allows the user to play the game
Agent - Allows the user to watch the agent play the game
Quit - Ends the game session and exits the game field.

4. Player

The player button allows the player to play the game. The player controls the snake by pressing the four key arrows on the keyboard. The snake is allowed to move in three directions at any given time: straight, right or left.

When this button is pressed it brings the user to an options page where they can change the environment variables of the game. The options displayed are walls, borders and growth. The walls option, if enabled, adds walls to the game. These walls increase the difficulty of the game. The walls are represented by the black lines on the game field.
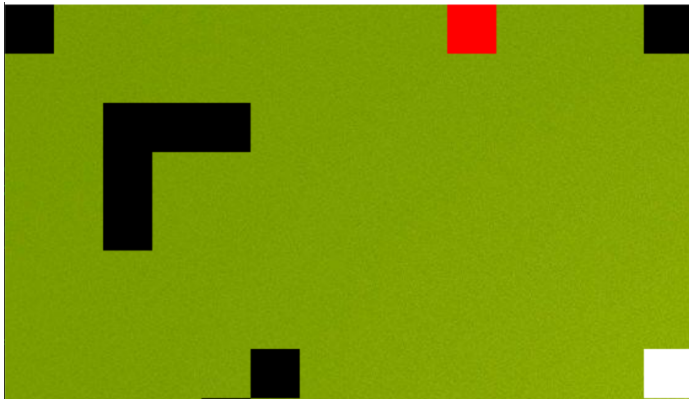
The borders option, if enabled, removes the borders from the game, allowing the snake to exit one side of the game field and emerge from the opposite side. If this option is disabled the snake dies if it touches the borders.

The last option of the player function is growth. With this option the user can choose whether the snake grows from the front or the back. Allowing the snake to grow from the back increases the difficulty and intensity of the game.

The arrow in the bottom left corner allows the user to go back to the main menu while the menu in the bottom right corner starts the game with the environment variables the user chose.

5. Agent

The AI agent is one of the main features of the game. This agent has the ability to gradually learn how to play the game and improve its performances over time. The user has the option to watch the agent train.

When the Agent button is pressed, an options page similar to the player options page is displayed. These options allow the user to change the environment variables of the game. The options included are, walls, borders, growth, train, and speed.

The walls, borders and growth options are the same as the player options. When the train option is enabled, the user can watch as the agent trains and learns. The agent will play a number of 8000 episodes and the epsilon variable will have a decay rate of 0.0008.

When the train option is not enabled, the agent will only make use of the knowledge accumulated in the relative q table with no exploration at all. However the agent will not be able to learn from any experience but it only does exploitation of its current knowledge.

To exit this function the user presses the esc button located in the top left corner of their keyboard.

The speed option has three options; low, mid, and high. These options determine the speed of the snake while the agent manoeuvres it.

The arrow in the bottom left corner allows the user to go back to the main menu while the menu in the bottom right corner starts the game with the environment variables the user chose.

When the game has started, 4 pieces of information are displayed in the lack bar at the bottom of the game field.

Score is the agent's score in the current game episode. Max Score is the highest score the agent has gotten while playing the set of episodes. Episode is the number of games the agent has played. E represents epsilon which is the trade-off between exploration and exploitation.

6. Food

Each food item is displayed randomly on the game field. The food is what makes the snake grow. The food is represented by the red square while the snake is represented by the growing white line


7. Movement & Direction

To eat the food items the user must navigate the snake through the game field. The snake will travel in a straight line unless the direction is changed by pressing on the arrows buttons in the user's keyboard.

8. Scoreboard

The scoreboard can be found on the options page. Because there are so many combinations of rules and settings that can be configured there are many scoreboards to match every combination. When the user clicks on the scoreboard button located at the bottom of the options screen it displays the top ten scores for the rules configuration the user inputted.
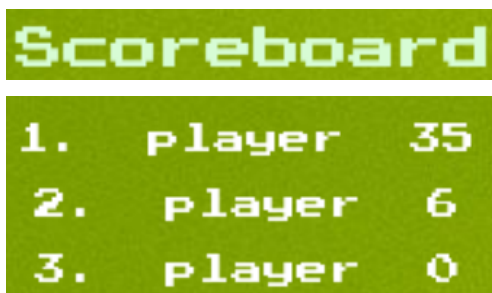
9. Quit

To quit the game the user can press the esc button located in the top left corner of their keyboard or they can use the Quit button provided in the menu. This quit button closes the application.