End project in

Artificial Intelligence

Course

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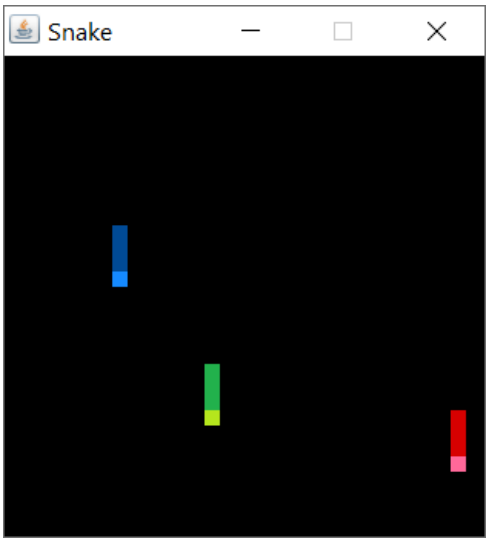
Content

Part 1: Abstract Of The Problem

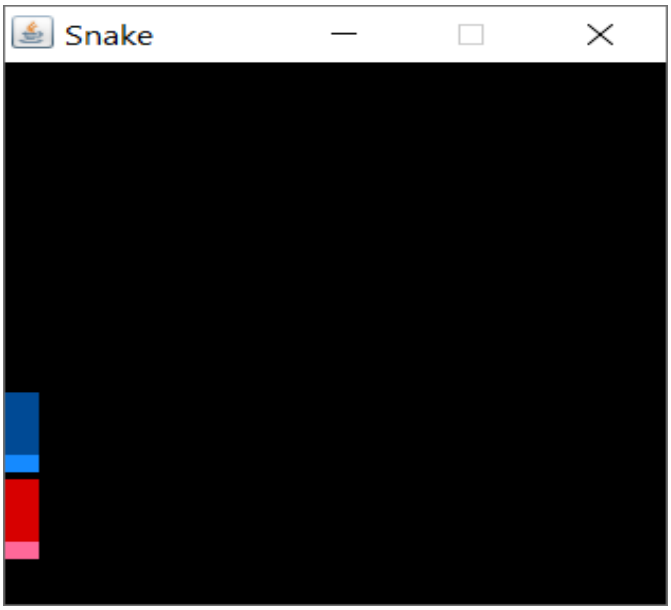
There is a board game in size 300 x 300 pixels , with two types of agents in the game, two agents that aim to cross as many squares on the board as possible, and a single snake agent (later two snakes) that aims to interfere with agents on their way and block them (Adversarial Game) from progressing by sting and finish the game as quickly as possible. All agents have constraints that must not be exceeded , and move in parallel.



Start and Final Situations of the Game

Start Situation : At the beginning of the game the agents will be randomly placed on the board, then they will start making decisions that will fill in the constraints and goal of the game.

Final Situation (game stop conditions) : A final situation is a situation where the snake agent success to get the two agents out of the game and end the game , or sometimes fails, due to the agent's success in escaping from a snake and continuing to accumulate squares.

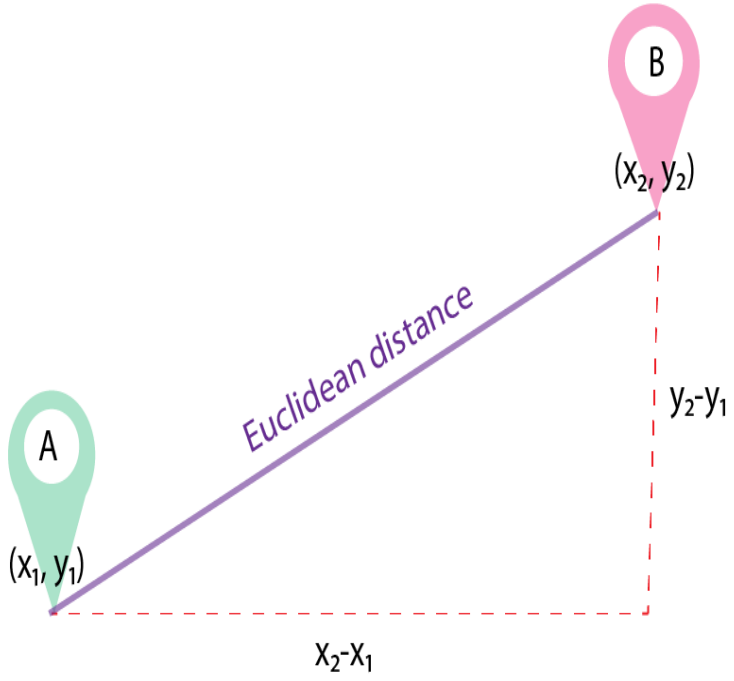


The Problem Solution:

By Heuristic Search

Definition : A heuristic distance is an estimate of the cost (distance) of the shortest path from node n to a goal node.(Aerial Euclidean distance)

Will be used by the agents in the game to make decisions and choose the next best step as possible.



$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

The game Environment

The game environment consists of a 300X300 pixels board, with the agents initially placed on the board at random ,which size is 4 squares(400 pixels) .

The environment is accessible and familiar to all agents, Where each agent can notices:

1- Board Boundaries
2- Location of other agents
3- Its own location and its components

Game Agents

In the game there are two types of agents:

Run Agent(Green and Red)

Goal: The goal of the run agent is to get through as much as possible Total Squares.

Move: Run Agent can move in all directions and change its place, if the next step is constrained.

Three options at most in each move.

Constrains(Impact on decision making) :

1- Do not cross the board boundaries.
2- The next step will keep you away from snake agent as much as possible (The distance from the head of snake agent).
3- Do not cross other agents' place(include all the body).
4- Do not cross your body.
5- If the worst step is single take it (the goal is to get through as much as possible Total Squares)

Snake Agent

(Blue and later also orange)

Goal: Chase other agents, block them and sting in, in order to finish the game as quickly as possible.

Move: Snake Agent can move in all directions and change its place, if the next step is constrained.

Three options at most in each move.

Constrains (Impact on decision making):

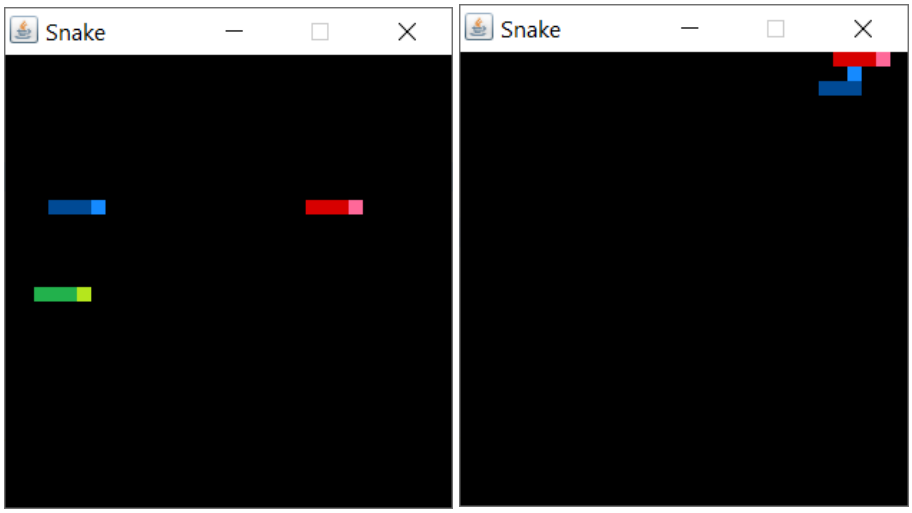
1- Do not cross the board boundaries.

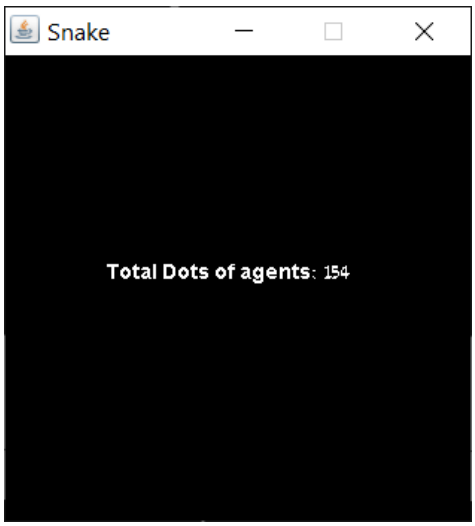
2- The next step will keep you close from each run agent as much as possible (Look for the closest point in the agents' bodies).

3- Do not cross your body.

Simulations

1





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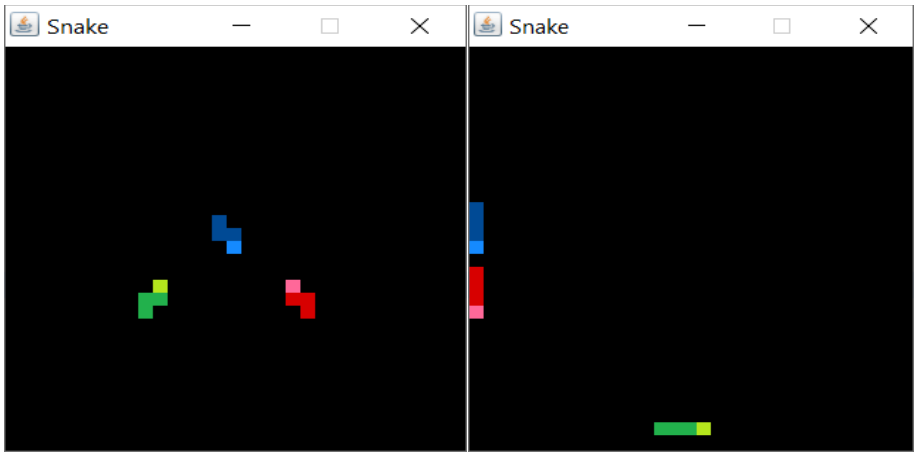

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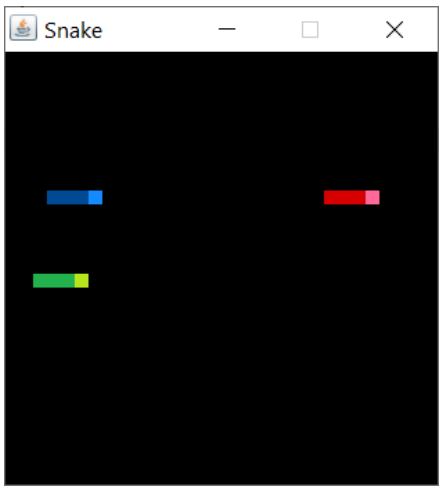

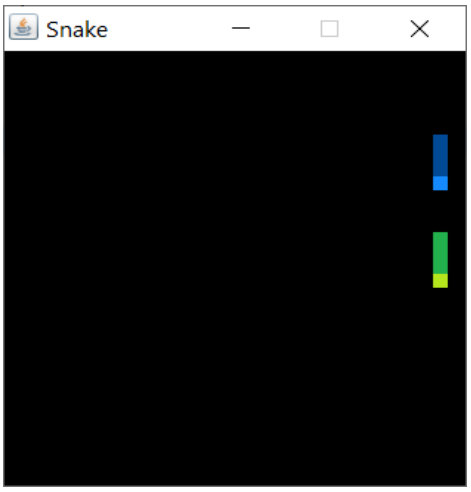

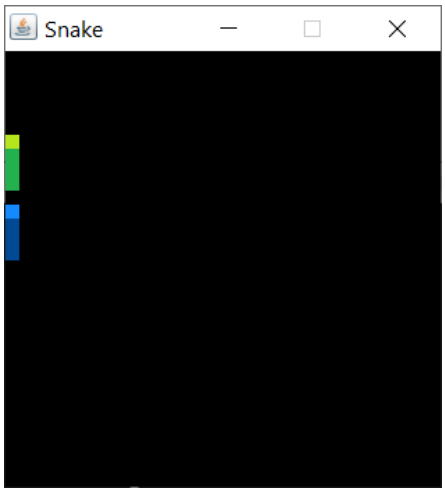

Results

1-The snake failed to eliminate the agents and the game did not end.

2- The snake successed to eliminate the agents.

3- The snake successed to eliminate only one agents.

Part 2

The same game with two run agent and two snake agent (new constraints on snakes), according to the same move conditions .

<u>The Snakes succeed, or the two agents survive.</u>

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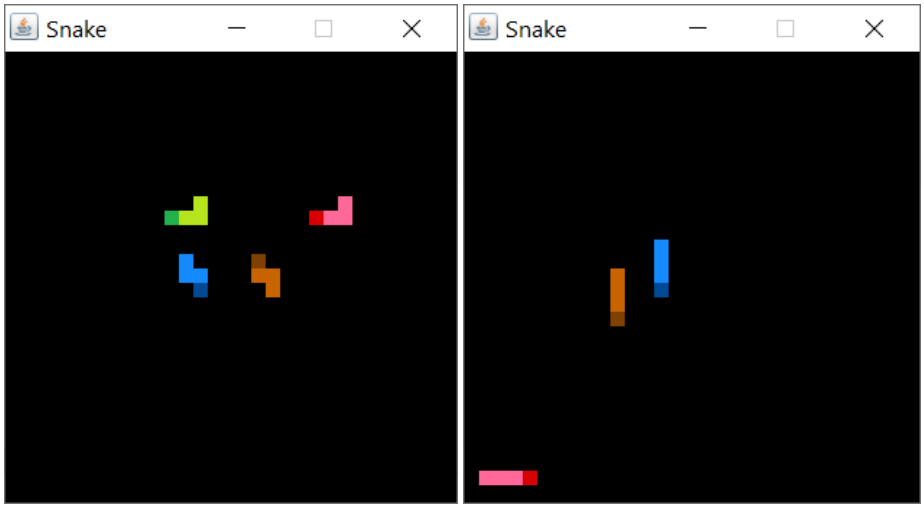

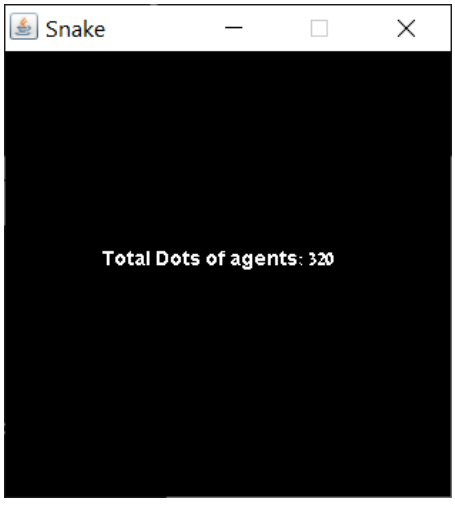

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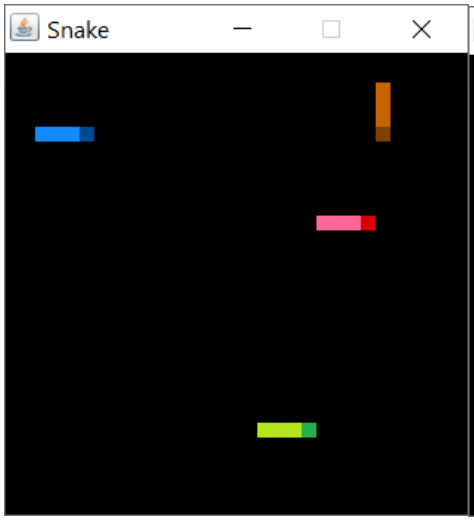

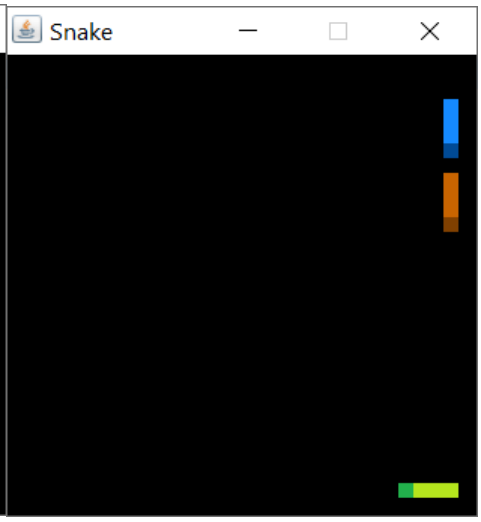

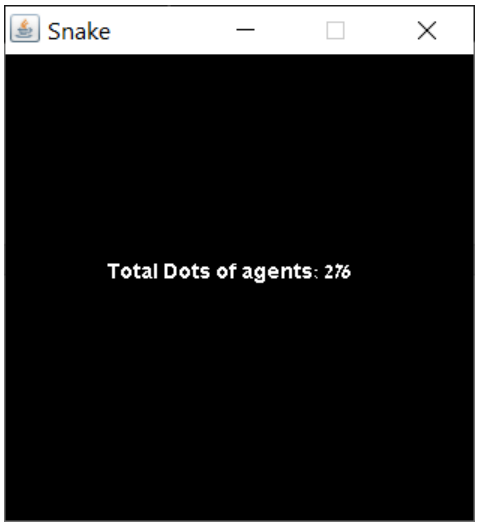

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