IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 6, June 2020

Solving the Classic Snake Game Using AI for Training Electronic Sport Players

Prof. Parth Sagar[1], Nachiket Deodhar[2], Saurabh Mishra[3], Shubham Sharma[4], Akshay Katageri[5]

Assistant Professor, Department of Computer Engineering, RMD Sinhgad School of Engineering, Pune, India[1]

Student, Department of Computer Engineering, RMD Sinhgad School of Engineering, Pune, India[2,3,4,5]

Abstract: An AI bot to enhance the skills of the players in electronic sports. AI bot uses the algorithms Best First Search (BFS), A* with forward Search, and Almighty Move to automatically solve the classic snake game. Player can follow the simultaneously running AI bot to play the game effectively. To introduce the concept of AI Auto-Bot game solver, the work has been performed on the classic snake game which was first introduced in Nokia phones. The game is initiated with the snake of length one and the size of the snake increases by one, each time it eats a new fruit. Actions supported by the snake game simulates directions: 'UP', 'DOWN', 'LEFT', 'RIGHT'. The snake moves with its head in the front direction followed by its body. The game terminates in two conditions they are, the head of the snake collides in its own body and the head collides to the walls of the game board.

Keywords: Best first search, A* search, A* with forward checking, Random move, Almighty move.

I. INTRODUCTION

There are three AI algorithms and two baseline methods to play Snake Game:

1. Best First Search: It is the combination of BFS (Best First Search) and DFS (Depth First Search).It takes into account the closest distance between the snake and the fruit. Closest distance is measured using Manhattan distance. Manhattan Distance = |p1-p2| + |q1-q2|, Where (p1,q1) and (p2,q2) are the co-ordinates of snake head and fruit.

2. A* Search: A* seek set of rules is depending on the fee of the course to attain the cutting-edge fruit from the starting, and the heuristic distance from the top of the snake to the subsequent fruit. Cost manner the variety of pixels the snake has traversed till now, and Heuristic distance that is dependent on heuristic characteristic which unearths the most beneficial minimum distance between the top and the fruit. f(n) = g(n) + h(n), Where g(n) is cost and h(n) is heuristic distance.

3. A* Search with forward checking: A* algorithm has some barriers. It handiest checks the route till the fruit is reached, with the expertise of the previous route fee. It has nothing to do with the results after the fruit is reached. If the top sticks at the lifeless quit or to the snake frame without a course to the destination fruit the Algorithm stops to work. Therefore A* with forward checking is the solution; it tests for the path to attain any required role after the purpose is reached as a precondition after choosing the path.

4. Random Move: It is the first Comparison approach delivered. It considers best the motion of the pinnacle of the snake, the body isn't always considered. It selects the next feasible move randomly with the aid of simply considering that the sport ought to no longer terminate. Although this is not the great approach, but it's far considered as the good evaluation approach.

5. Almighty Move: Almighty Move for N*N map, Where N is Even. It ensures that the snake will surely eat (N^2-2) Fruits. Almighty Move for N*N map, Where N is Odd. It ensures that the snake will simply consume number of fruits more than (N^2- 4N+4), but less than (N^2-2)

II. OBJECTIVE

There are two snakes in the game play, Manual snake that is operated by the player and AI Bot that's operated by way of the AI algorithms. To gain the highest score in the most optimal time and space complexity the guide player has to replicate the movements of the AI Bot. This can be used as an education phenomenon for the visual computer game players. AI Bot is skilled to obtain the maximum score viable inside the minimum variety of steps. This can also be utilized in other video games of bigger length, which might be the part of "Electronic Sport" to train the players.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 6, June 2020

III. EXISTING SYSTEM

A developmental methodology has likewise been proposed for preparing specialists to play an adjusted rendition of the Snake game where few sustenance things diminish the score and snakes length. A weighted blend of rating capacities scores every conceivable iterative step, and the most astounding move is taken. The methodology utilizes four rating capacities.

1. The smoothness capacity finds, for every cell, the most modest number of moves expected to arrive at the cell, and takes on the biggest of these qualities. This evaluation how far the snake can move while constraining heading changes.
2. The space capacity assesses to the quantity of playing zone. A bigger worth shows a place that gives a more noteworthy degree for protective development.
3. Two capacities gauge the potential outcomes of arriving at each fruit type securely. An inaccessible fruit provides worth of null. An accessible sustenance type creates an estimation of the space capacity separated due to separation to the fruit.

IV. PROPOSED SYSTEM

1. On the 10*10 board, there are distinct colorations of snakes; Manual player snake is black in color. AI Bot snake is gray in color. The AI Bot runs as a shadow within the background of the play concurrently for the player to observe it. The two snakes can overlap and have no effect on each other.
2. When the game begins, the AI Bot is initiated to play at the same instance. The player starts to play after the time instance of about 1second. The player can observe the AI Bot precisely when it moves one step ahead.
3. Initially the fruit is black in shade when it is generated. As soon as any of the 2 snakes eats the fruit for the first time, its color changes to red. Then the snake that is left to devour the fruit eats the fruit and the fruit disappears. When the snake eats the black fruit and the fruit turns red, on the same instance another black fruit is generated.

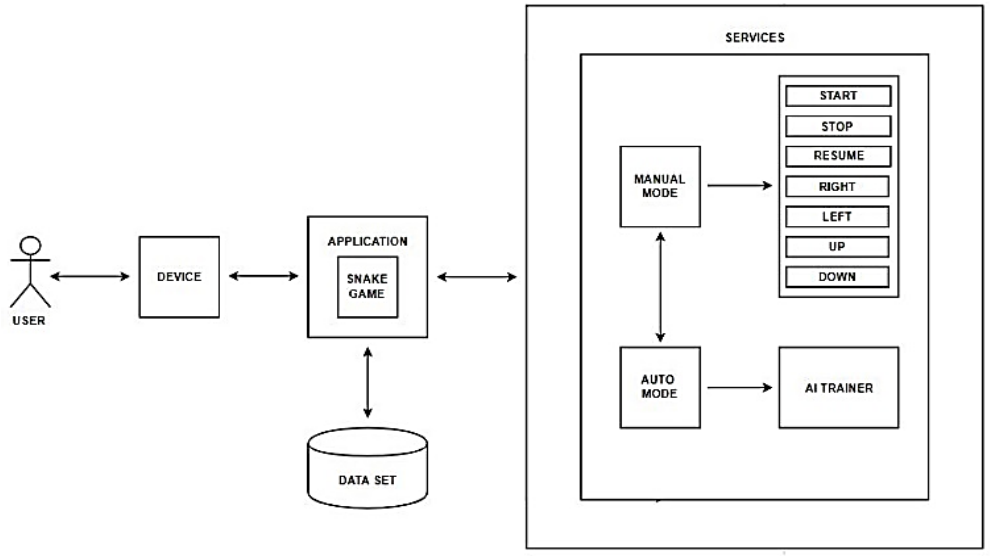


Fig 1. System Architecture

V. RESULT AND DISCUSSION

Working of AI Bot using AI algorithms is determined by means of analyzing the algorithms and evaluating them on the idea in their performance. The number of iterations for each algorithm is determined by means of running the AI Bot for one hundred times at the board of length 10*10.

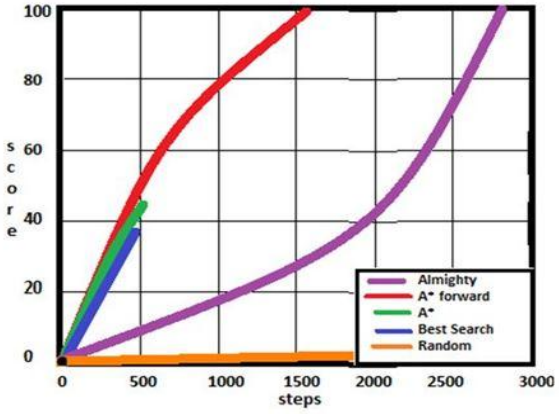
1. Best First Search is used for 4 iterations, i.e. To devour the primary four end result. As it reveals the shortest distance between the snake head and the fruit. For snake of size 4, it isn't always viable to that its head touches its body; consequently there is no chance that the snake dies.
2. A* with ahead checking is used for the next 34 iterations, i.e. to devour the subsequent 34 culmination. It will increase its duration from 4 to 38. It is determined via performing the iterations for one hundred times. A* with forward checking assessments for the conditions after the fruit is consumed for sustenance.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 6, June 2020



ALGORITHMS	SCORES	STEPS REQUIRED
ALMIGHTY MOVE	100	2300-2700
A* WITH FORWARD SEARCH	40-80	250-1250
A*	24-40	200-300
BEST FIRST SEARCH	14-26	100-200
RANDOM MOVE	3-7	200-800

3. Almighty Move is used for the following 62 iterations, i.e. to devour all of the last sixty two culminations. It will increase its duration from 38-100. Here the most rating is reached. There is not any possibility of the failure of Almighty flow, however the motive why it isn't always used from the first new release itself is that the range of steps required increases to a huge quantity, as a consequence increasing the time complexity.

VI. CONCLUSION

Henceforth after reading and analyzing the idea, we conclude that for AI Bot to reap the most score in the minimum number of steps use BFS for first four actions, use A* with forward checking for subsequent 34 moves, and use Almighty Move for the last 62 moves. The other conclusion made is we are able to use the AI Bot to educate the gamers for "Electronic Sports". Performing this education, Bot in the snake recreation can cause a future of training Bots in various games. This can be the future for the efficient gaming and training surroundings.

REFERENCES

[1]. Automated Snake Game Solvers via AI Search Algorithms Shu Kong, 80888472, skong2@uci.edu Joan Aguilar Mayans, 87286425, joana1@uci.edu.
[2]. Snake Game AI: Movement Rating Functions and Evolutionary Algorithm-based Optimization Jia-Fong Yeh, Pei-Hsiu Su, Shi-Heng Huang, and Tsung-Che Chiang Department of Computer Science and Information Engineering, National Taiwan Normal University, Taiwan {40247006S, 40247031S, 40247032S}@ntnu.edu.tw, tcchiang@ieee.org.
[3]. M. Gallager and A. Ryan, "Learning to play Pac-Man: an evolutionary, rule-based approach," Proceedings of IEEE Congress on Evolutionary Computation, pp. 2462□2469, 2003.
[4]. N. Cole, S. J. Louis, and C. Miles, "Using a genetic algorithm to tune first-person shooter bots," Proceedings of IEEE Congress on Evolutionary Computation, pp. 139□145, 2004.
[5]. N. Böhm, G. Kókai, and S. Mandl, "An evolution approach to Tetris," Proceedings of The Sixth Metaheuristics International Conference, 2005.
[6]. C.-Y. Cheng, Y.-H. Chen, and T.-C. Chiang, "Intelligent level generation for Super Mario using interactive evolutionnary computation," The 27th Annual Conference of the Japanese Society for Artificial Intelligence, 2013.
[7]. T. Ehlis, "Application of genetic programming to the snake game," Gamedev.Net, 2000.
[8]. Learn Snake: Teaching an AI to play Snake using Reinforcement Learning (Q-Learning), https://italolelis.com/snake.