

Snake Game within Eden

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Abstract

In this paper we explore the implementation of a Snake Game within Eden. We implement the classic game of Snake within Eden and examine some simple AI for the game. As well as this we allow the user to also control the Snake.

1 Introduction

Snake is an arcade game first released into the world in the 1970s[1]. Since then it has become something of a classic. The player controls a long, thin creature, resembling a snake, which roams around picking up food, trying to avoid hitting its own tail. Each time the snake eats a piece of food, its tail grows longer, making the game increasingly difficult. The user controls the direction of the snake's head (up, down, left, or right), and the snake's body follows. The player cannot stop the snake from moving while the game is in progress, and cannot make the snake go in reverse.

In this paper we will implement the game in Eden allowing human control as well as some simple AI models such as the random AI and Heuristics AI.

2 The Game

Snake is a game commonly played on an arena of n by n size. The player controls the snake by pressing the up, down, left or right keys and the snake moves accordingly. When the snake hit a food block it grows in length and when the snake hits its own tail it dies and the game is lost.

2.1 History of the Game

The snake family of games first originated with an arcade game Blockade by gremlin Industries in 1976[1]. Since then it has been popularised in a number of places including Nokia mobile phones as well as BBC Micro.

2.2 The Variables in the game

The variables in the game which can be changed are divided into two categories. Global variables such as number of food, number of players and arena size, etc. Local variables which are specific to each player, such as snake length, snake status, etc.

Global variables are:

- Arena size
- Number of players
- Number of food blocks
- Speed of the game (Time delay)

Local variables are:

- Snake Length
- Snake Segment Positions
- Snake Status (Alive or died)
- Snake Mode (AI controlled, human controlled)

Those are some of the variables which can be changed within the game. In the next section we will discuss some dependencies within the game of snake.

2.3 The Dependencies in the game

Central to this game is a timer which is dependent on the time delay variable. The game can be considered as a turn based game where each turn leads to the next turn automatically after a certain time has passed. Within each turn of the game the player has the choice of inputting up, down, left, right or not inputting anything at all.

Each turn the snake segments positions are then updated. The first segment (the snake head) is dependent on the user input, and each other segment of the tail is only dependent on the segment before it in the previous turn.

Upon collision with food, the snake length is increased, and a new segment is added to the snake at the head.

Upon collision with its own tail the snake dies and the snake's status is turned to that of died.

3 The Model

Upon loading Run.e the user will be greeted with this window (Figure 1).



Figure 1: When the model is loaded

Currently the mode is set to that of a human player. So simply pressing one of the direction keys will allow the game to continue.



Figure 2: After playing for a few seconds

After a few seconds of playing the screen could look something like this.

4 The AI

Two simple AIs are proposed within the model. A random AI, and a simple heuristics AI. We will be using the Snake game as a platform for exploration of AI[2]. The inputs which the AI can give the program are rather simple. The only inputs which the AI need to decide each turn is which direction key to press.

4.1 The Random AI

The random AI simply selects a direction key at random each turn the game is played.

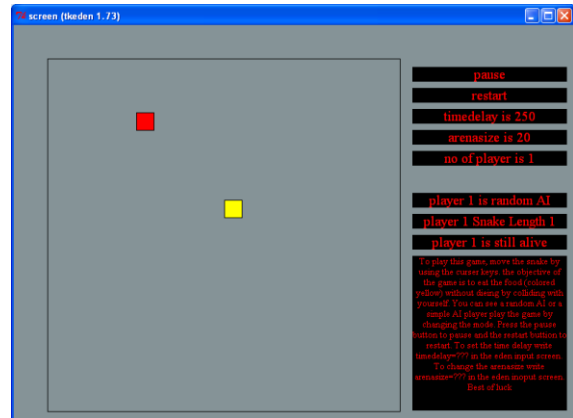


Figure 3: The random AI after a few seconds

As you can see in Figure 3 the random AI has huge problems even to get the first food block. This is not surprising as given an arena size of 20 to randomly get to the position of a single block is $\frac{1}{20^2}$. In fact this can be modelled as a random walk in the x direction and a random walk in the y direction.

4.2 The Simple Heuristics AI

The simple heuristics AI first looks at the blocks surrounding it's head to find input keys which are safe to press. Out of those keys which it thinks is safe to press, it inputs the key which will get the snake head closer to the food, both in the x direction and then in the y direction.

The simple heuristics AI is much better than the random AI.

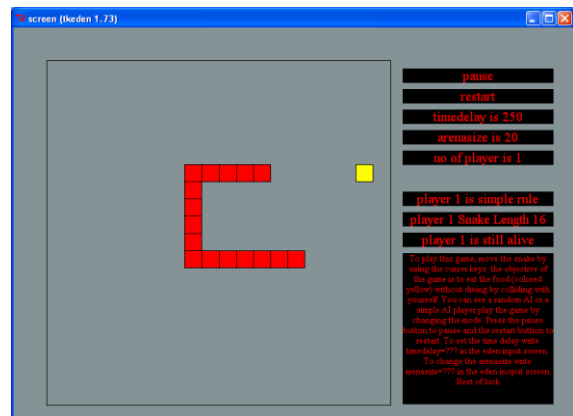


Figure 4: The simple heuristics AI after a few seconds

As you can see Figure 4 looks very similar to Figure 2. Which suggests that the simple heuristics AI is a good approximation of how we normally play the game of Snake.

4 Conclusion

This paper and its model have explored the game of Snake within Eden. As well as providing the ability to play snake within Eden the model also implements some simple AIs in the random AI and the simple heuristics AI.

References

[1] Blockade video game (1976) available at
“<http://www.arcadehistory.com/?n=blockade&page=detail&id=287>”

[2] Meurig Beynon “Empirical Modelling and the Foundations of Artificial Intelligence”