

Snake: The Game

Ernesto Melchor

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1 Background

Snake is the name of a video game concept where the player maneuvers a line which grows in length every time it consumes food. In the game, the line and the board boundaries are the primary obstacles. The concept originated in the 1976 arcade game Blockade, and the ease of implementing Snake has led to hundreds of versions (some of which have the word snake or worm in the title) for many platforms.

2 The Project

In this project we will implement a version of Snake: The Game and a variation of the game that allows for competition. A common approach for designing the game takes an object oriented approach using nested arrays. To make our design more interesting we will not use Python lists to store our data, instead we will use a variation of Linked Lists that we will call Tiles. Before we build up to designing the board where the game will be played we first need to talk about how to create tiles.

3 The Tile Class and Variations

In the snake game there are 5 different types of tiles:

1. The head tile: a tile representing the head of the snake. A head tile at time step t will be denoted by $H_{i,j}^{(t)}$ where (i, j) are the row and column locations of the tile in the grid.
2. The tail tile: a tile representing the tail of the snake. A tail tile at time step t will be denoted by $T_{i,j}^{(t)}$ where (i, j) are the row and column locations of the tile in the grid.
3. The body tile: a tile representing a portion of the snake that is neither a tail nor a head. A body tile at time step t will be denoted by $B_{i,j}^{(t)}$ where (i, j) are the row and column locations of the tile in the grid.

4. The food tile: a tile representing the food that the snake eats. A food tile at time step t will be denoted by $F_{i,j}^{(t)}$ where (i, j) are the row and column locations of the tile in the grid.
5. The empty tile: a tile representing an empty tile. An empty tile at time step t will be denoted by $E_{i,j}^{(t)}$ where (i, j) are the row and column locations of the tile in the grid.

4 The Grid Class

The grid class is built from multiple tile instances that are connected to one another. A tile can either be placed on top, below, to the left, or to right of another. A grid has also has an immutable grid size and a board state for every given time step t .

5 Snake: The Rules

The rules of the game go as follows:

1. The head of the snake can move in four directions at any given time: up, down, left, or right. The snake's head, however, cannot move back to the block in the previous time step $t - 1$ unless the snake is only one tile long.
2. If no new input is given then the snake continues to move in that direction until a new direction is provided.
3. If the snake's head encounters a food tile then it eats the food and the score goes up by 100 points.
4. When the food is eaten the snake grows longer for Δt time steps.
5. When food is eaten it is removed from the board and a new location for the food is randomly chosen from the empty tiles.
6. If the snake's head collides with the boundary or any other part of the snake (body or tail) then the game ends and the score is recorded.