

Team Megabyte

Project 1

CPSC 335-02

Complexity Order of Langton's Ant Problem

The initial configuration of the program is initially composed of all black cells at state 0 with the colors of the tiles changing each time the ant passes a tile. The colors go through a cycle in this order: black (0) → red (1) → yellow (2) → blue (3) → green (4) → black (0). If the ant lands on an odd colored tile, it will turn to the right and move forward by one cell, else it will turn left and move forward in that direction. During the process, the ant runs into cells that have already been visited, during the first few iterations out of 1000, the ant eventually reveals a somewhat symmetrical pattern. The ant will turn periodically to the central square from where it started.

Big-O Running Time of the Program

The running time for our Ant Cella algorithm is $O(N)$. The function runs n times, using a for loop, since any function running inside the move function will be nested.

Main Operations

The main operations is the move function that passes seven parameters which initializes the movement of the ant. Depending on those factors, the ant should end up designing a specific pattern since the movement has been set to move 1000 steps.

styles: "graphics package"; running time of $O(1)$

turn functions: change the ant's direction of movement; running time of $O(1)$

setup (draw_grid): creating the grid; running time of $O(N)$

draw_bot: changes the color of each cell according to the ant; running time of $O(1)$

move_bot: moves the ant forward from one cell to the next; running time of $O(1)$