

COMS 4444: Project 4, Group 7

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1 Introduction

In Project 4: Amoeba, the goal is to design and implement a movement strategy for an amoeba-like agent within a grid whose non-amoeba cells are either empty or contain bacteria.

1.1 Problem Specification

We control an amoeba-like creature that occupies a connected set of cells in a 100x100 grid. The grid wraps around horizontally and vertically. Each cell not occupied by the amoeba is either empty or it contains a bacterium, with the bacteria density given by the parameter d .

Bacteria are sensitive to their immediate surroundings, and if possible they will try to move away from neighboring bacteria and neighboring amoeba cells. The bacteria move at a speed of one cell per turn. The bacteria will not move if they are surrounded by at least 3 other bacteria or amoeba cells. The bacteria will not move if they are surrounded by empty cells, but they will move if they are surrounded by one or two non-empty cell.

The amoeba also moves at a speed of one cell per turn. Its movement is governed by a parameter called the metabolism, m , where $0 < m \leq 1$. On any turn, the amoeba may retract up to m of its cells, and it may extend up to m of its cells. The amoeba may not retract or extend more than one cell in any direction. The amoeba may not retract or extend a cell if it would cause the amoeba to become disconnected.

2 Initial Implementation

The first thing that came to mind is that it would be beneficial to have a lot of information about the state of the grid and to have a lot of flexibility in terms of what parts of the amoeba we can move and by how much. This led us to space-filling curves, and from there we decided to implement a modified pseudo-Hilbert curve as the goal shape for our amoeba. This curve is defined as follows:

- TODO: define curve

3 Improvements

4 Tournament Performance

5 Conclusion

5.1 Future Work

5.2 Acknowledgements

5.3 Summary of Contributions