Visualizing and Designing Multi Agent Search Algorithms

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Introduction

The purpose of our research is to study distributed search-and-escape algorithms. These algorithms involve mobile agents (or bots) searching in geometric domains, such as a closed disk or a convex polygon. By working together and communicating with one another, the mobile agents search for an exit hidden on the perimeter. The goal of our research is to create and study exit strategies that terminate as quickly as possible.

Main Problem(Proposition)

The purpose of our research is to propose an algorithm for two distinguished and a helper bot to find an unknown exit on a disk.

mypics/temp.JPG

Figure 1. Temp 1

Definitions

A **distinguished** bot is one that ends the algorithm, when it reaches the exit. A **helper** bot is one that helps distinguished find the exit. An **exit** is a point unknown to the algorithm, that is located on an edge. The exit is **found** if a bot's coordinates match the exit locations. The algorithm **terminates** if a specified subset of bots shares a position with the exit.

Main Topic

Figure 2. Temp 2

Figure 3. Temp 3

Algorithm Description

A distinguished and helper bot move together at some α below the negative x axis, where then the helper travels clockwise, and the distinguished counter. The other distinguished travels along the positive x axis, where it then travels counter clockwise.

Future Work

Later on we will study further distributed algorithms of search and escape, such as lines or triangles.

Our Conjectures and Analysis

This algorithm does not have the best lower bound.	*True*
If the game is linear with n squares then its graph is a path with n vertices.	*True*
If a game is non-linear its graph must have a vertex degree 2 or more.	*True*
If a game is non-linear its graph must have at least one vertex with degree three.	*False*
There is a non-linear game whose graph is almost a path.	*True*
Any game with 3 or less squares is linear.	*True*

Conclusions

This algorithm has an upper bound of blank, being faster than an algorithm of one distinguished and two helpers with an upper bound of 3.83.

Figure 4. Temp 4

Acknowledgements

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References

[1] Jurek Czyzowicz, et. al., Evacuating Robots via Unknown Exit in a Disk, Springer-Verlag Berlin Heidelberg; 2014.

[2] Jurek Czyzowicz, et. al., Fun with Algorithms, arXiv:1804.06011v1 [cs.MA] 17 Apr 2018.

Figure 5. Temp 5