Robot Navigation for the Exploration of Lunar and Planetary Surfaces

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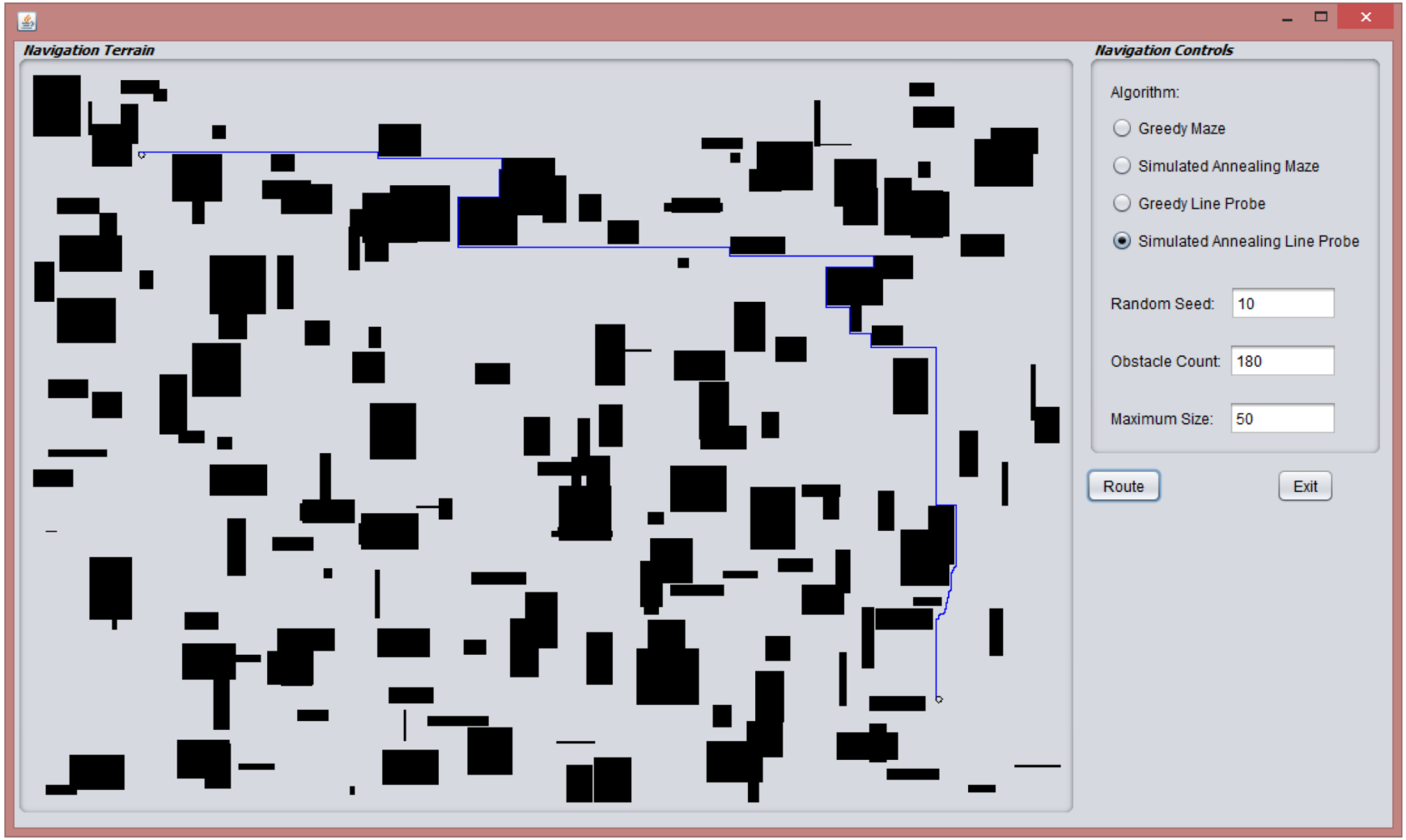
Project Overview

- I wrote a new algorithm based on routing algorithms for integrated circuits using Java
  - It was tested based on its ability to navigate around various amounts and sizes of obstacles against a greedy maze routing algorithm
  - The greedy maze router was used on the Sojourner rover as part of the Mars Pathfinder mission in 1997
- To visualize the simulation results, I created a user-interface using Java


Navigation Terrain
Navigation Controls
Algorithm:
Greedy Maze
Simulated Annealing Maze
Greedy Line Probe
Simulated Annealing Line Probe
Random Seed: 10
Obstacle Count: 180
Maximum Size: 50
Route
Exit

Results

- By using graphs and *t*-tests, I determined that the new algorithm performed significantly more efficiently than the greedy maze router when there were more obstacles and when the obstacles were of larger sizes

Application

- The new algorithm is designed for smaller robots on rough terrain such as on the moon or on Mars
- In larger robots such as the Mars Curiosity rover, more complex navigational methods with map-building are used
- It is more efficient for smaller robots to use simpler algorithms

- The new algorithm was implemented onto a Roomba robot using a Raspberry Pi to test its real-life functionality