# Development and Comparison of Pathfinding Algorithms in Topographic Mapping

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Pathfinding algorithms are used for autonomous robots in disaster relief/recovery, but one issue is that they cannot function properly unless the map information is accurate. The first part of this research was to modify the depth first search (DFS) and breadth first search (BFS) pathfinding algorithms to enable them to find a path to the goal using flawed maps and also correct the maps for future use. A program was developed to automatically run simulations of the modified pathfinding algorithms for different map sizes, goal locations, obstacle densities, and percentage of map flaws. The combined results from almost 3000 simulations showed that the BFS algorithm greatly outperformed the DFS algorithm in how many moves were taken to get to the goal, while the DFS algorithm outperformed the BFS in finding flaws in the map. The second part of this project was the creation of a low cost robot that could implement the modified BFS algorithm. The robot cost approximately 150 USD, and was built using VEX motors and wheels, a Raspberry Pi, an Arduino UNO, and sonar sensors. The ability of the robot to reach the goal and update the map using the modified BFS algorithm was tested on a 5 x 5 grid, with each tile being 1x1ft. The results demonstrated that the modified BFS algorithm could be used on a low cost, easily assembled robot that could be beneficial in disaster scenarios.

**Awards Won:**