CS 254 Project Proposal

Analysis of Various Pathfinding Algorithms

(shortest path algorithms used in games)

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Overview

Pathfinding is the plotting, by a computer application, of the shortest route between two points. It is a more practical variant on solving mazes. Pathfinding is closely related to the shortest path problem, within graph theory, which examines how to identify the path that best meets some criteria (shortest, cheapest, fastest, etc) between two points in a large network.

Two primary problems of a pathfinding are (1) to find a path between two nodes in a graph; and (2) the shortest path problem - to find the optimal shortest path. The first problem is solved by basic algorithms like Breadth- first search and depth-first search by exhausting all possibilities. The more complicated problem is finding the optimal path. Bellman-Ford, A, Dijkstra's algorithm and some other algorithms can be used to solve the second problem.*

Goals

- *To study the basic pathfinding algorithms, particularly A*, Dijkstra, BFS, Bellman-Ford.*
- *To find out examples where some of these algorithms might fail to find the shortest path to the target.*
- *To analyse the complexity of the A* algorithm and compare it with other commonly used algorithms.*
- *To study various optimizations done till now and, if possible, try to propose our own optimized A* algorithm.*

Algorithms

A algorithm: A* is a variant of Dijkstra's algorithm commonly used in games. A* assigns a weight to each open node equal to the weight of the edge to that node plus the approximate distance between that node and the finish. This approximate distance is found by the heuristic, and represents a minimum possible distance between that node and the end.*

Dijkstra's algorithm: This algorithm begins with a start node and an "open set" of candidate nodes. At each step, the node in the open set with the lowest distance from the start is examined. The node is marked "closed", and all nodes adjacent to it are added to the open set if they have not already been examined. This process repeats until a path to the destination has been found. Since the lowest distance nodes are examined first, the first time the destination is found, the path to it will be the shortest path.