

Data and Info Visualization - Individual Project Proposal

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1 Idea Description

I have been working on building my skills as a game developer for as long as I have been learning programming and computer science. While game development isn't my primary academic focus, nor is it my intended career path after graduate school, I have always been interested in making games as a hobby. In the vein of tying my interests together, I would love to work on visualizing two different pathfinding algorithms operating in a navigable grid. The pathfinding algorithms would be A^* and Breadth-First-Search (BFS). Both of these pathfinding algorithms are very common in the game development world, and each has its own benefits and drawbacks. The goal of this project would be two-fold. I would like to implement my own visualization of each pathfinding algorithm from scratch, using either C# .Net, or using an OpenGL library in C++. I would build out an executable that allows the user to specify the dimensions of the grid, mark the start and finish for the algorithm, and mark certain cells as "walls", i.e. impassable cells. The user would then be allowed to run both algorithms (visualized simultaneously), and step through each calculation like the functionality provided by a debugger. The appropriate pathfinding information would update on the visualization as the user is stepping through execution, and at the end some runtime statistics would be displayed to allow a more direct comparison of each algorithm in a "real" scenario. A^* pathfinding calculates scores in each cell, and those scores determine the optimal path from start to finish, whereas BFS checks the neighbors of each cell, counting how many nodes away the current cell is from the start, until it finds the path that goes through the least amount of nodes. Both algorithms provide plenty of information that could be visualized intermittently as the user steps through the code.

2 Software

Like mentioned above, I would like to make this visualization in C# .Net, or using an OpenGL library in C++. I have experience with both of those development environments, and I am confident that I could implement this idea successfully. If I find that I can't complete the assignment in time, due to a lack of foresight or other complication, I am quite familiar with the game engine Unity, which would allow me to very quickly implement these ideas, since Unity will handle all of the rendering. In any of these approaches, I would still need to code the visualization, code

both algorithms, and build a UI to allow the user to customize the visualization as specified above. Unity doesn't have any built-in grid maker or pathfinding algorithms implemented.

3 Example Visualizations

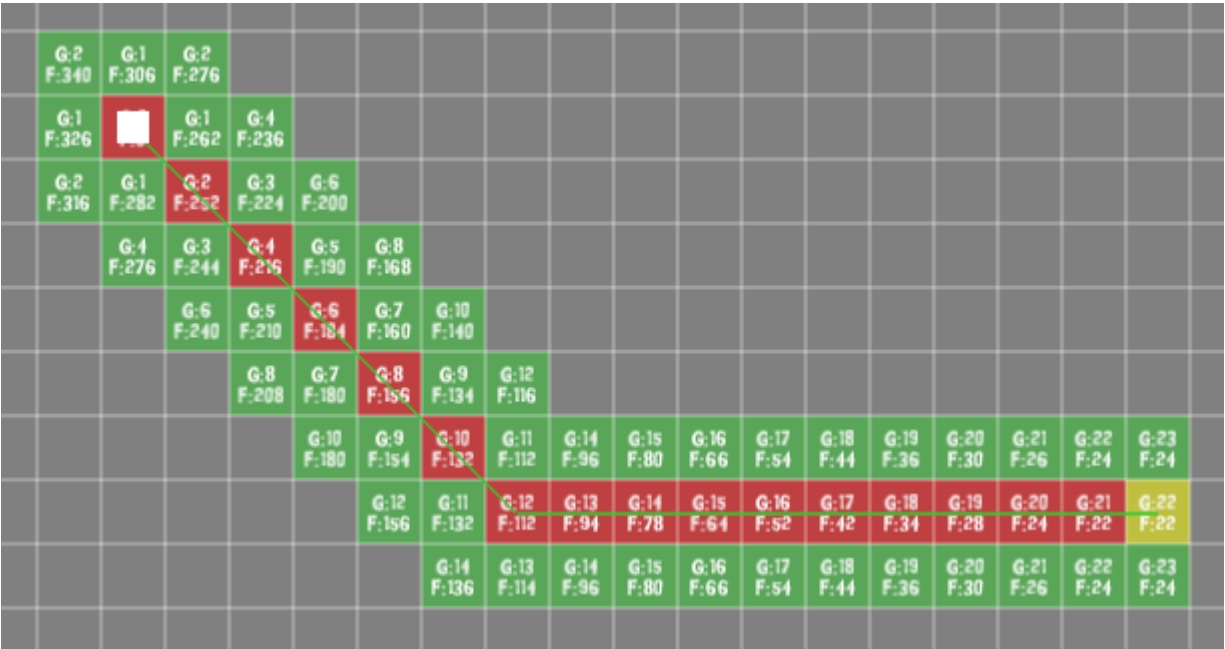


Figure 1: A^* pathfinding algorithm calculating the optimal route from start to finish

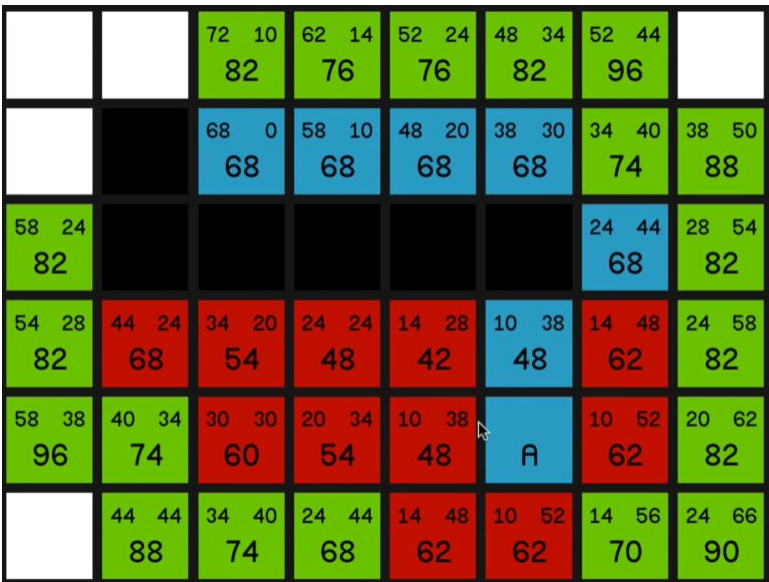


Figure 2: A^* pathfinding algorithm optimally navigating around a wall

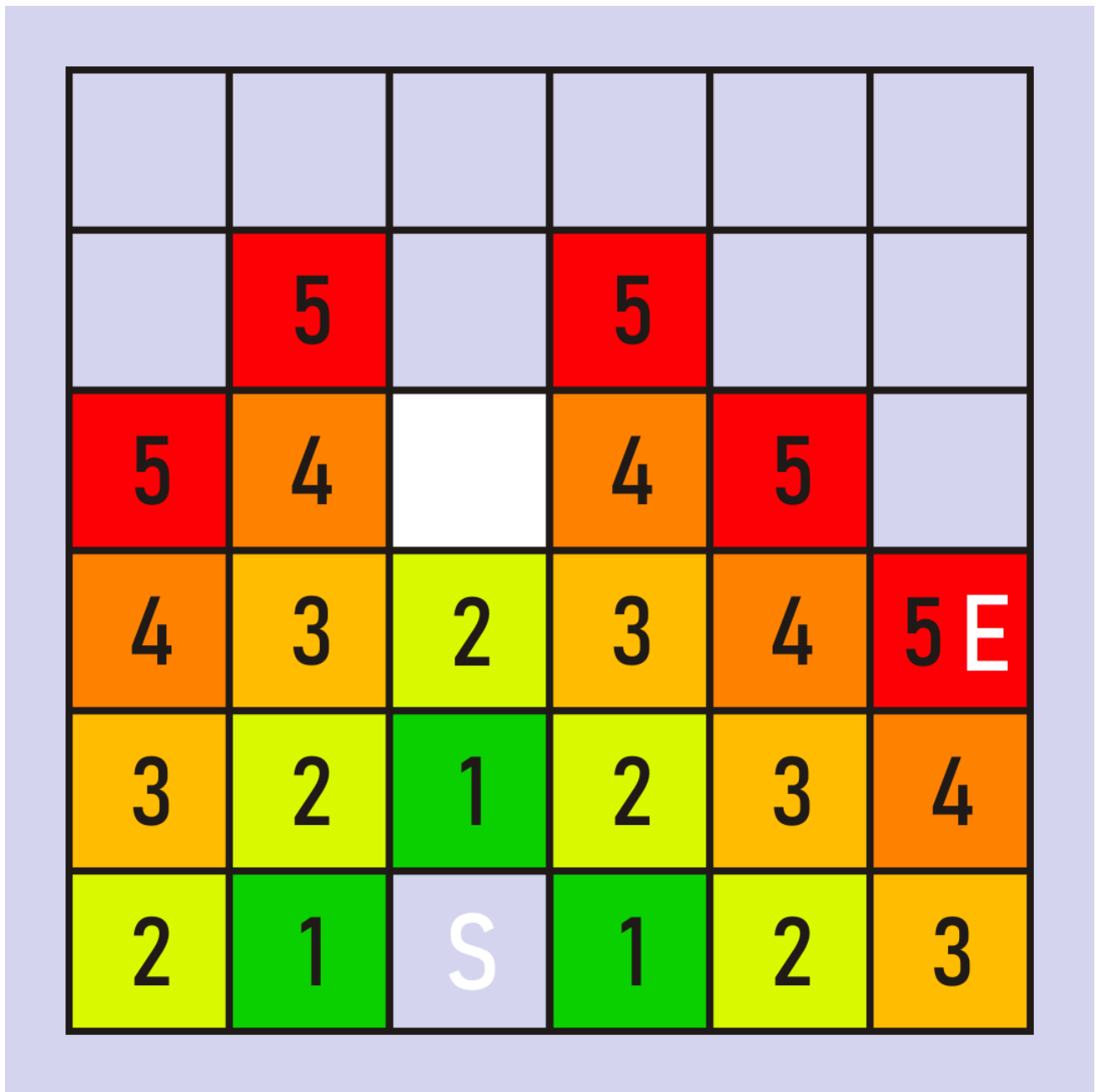


Figure 3: Breadth First Search calculating shortest route from S to E