Norwegian University of Science and Technology

TDT4136 - Introduction to Artificial Intelligence

ASSIGNMENT 2

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Ferdinand Schumacher Ytteborg
Fredrik Bo Gustaf Aale Hægermark

1 Overview

A* Search is one of the best and most popular algorithms for handling path-finding and graph traversals. Unlike other traversal algorithms it has brains. We were given a starting cell and goal or target cell and our goal was to reach the target as "fast" as possible.

2 A* Implementation

The A* Search Algorithm picks a node for each step according to a value f/fScore, which is a parameter equal to the sum of two other parameters; g/gScore (the movement cost from strating point to given node) and h (projected movement cost from that node to the final node). At each step the algorithm picks the node that has the lowest value for f. h is what we call heuristic; because we don't really know the actuak cost from a given node to the end node as their could be walls or other obstacles on the way. However, an assumption is made and the way we calculated the value h in the following tasks, was be using the euclidean distance.

3 Part 1 - Grid with obstacles

3.1 Task 1

The goal of this task was to find the shortest path from **Rundhallen** to **Strossa**. In the figure 1 you can see our solution after implementing the A* search algorithm. The image on the left shows the shortest path, while the one on the right shows the exploration of the algorithm as well, in other words all the nodes with a gScore.

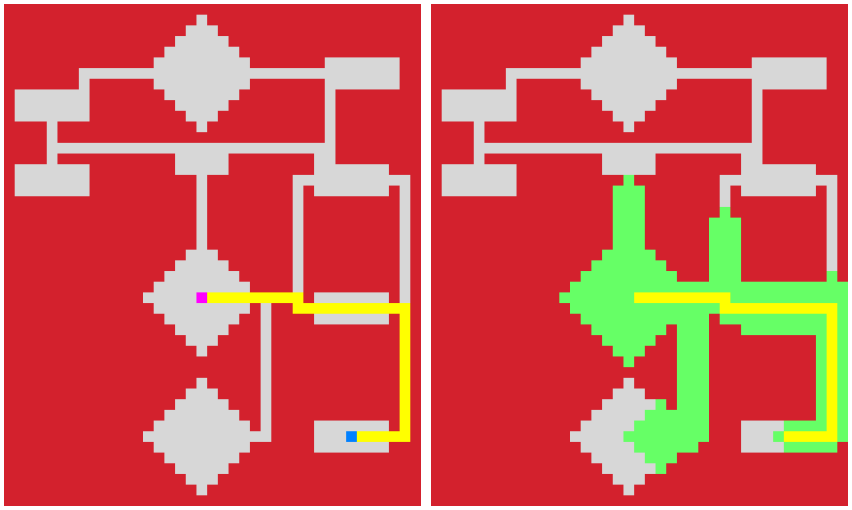

Figure 1: Solution - Task 1

The optimal path from Rundhallen to Strossa is through Lyche, as you can see from figure 1.

3.2 Task 2

The goal of this task was to find the shortest path from **Strossa** to **Selskapssiden**. In the figure 2 you can see our solution after implementing the A* search algorithm. The image on the left shows the shortest path, while the one on the right shows the exploration of the algorithm as well, in other words all the nodes with a gScore.

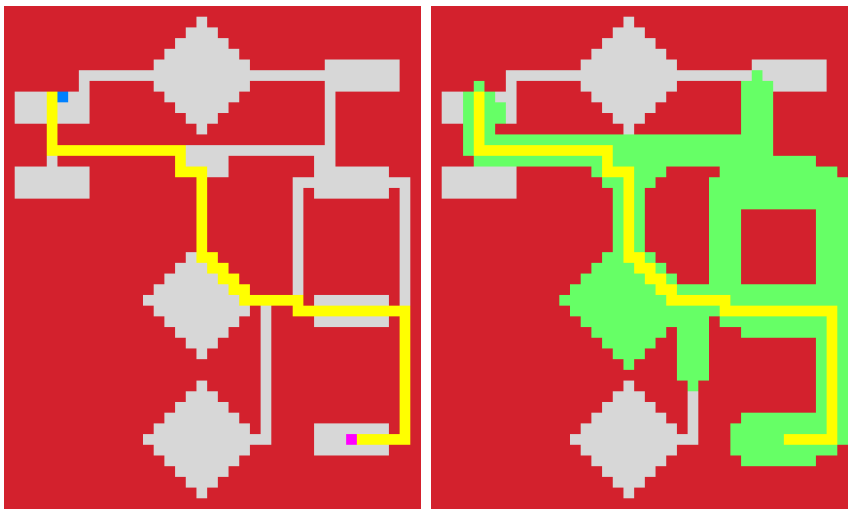

Figure 2: Solution - Task 2

The optimal path from Strossa to Selskapssiden, is through Lyche, then Rundhallen, and finally arriving at Selskapssiden. Once again you can see the path in figure 2.

4 Part 2 – Grids with different costs

4.1 Task 3

The goal of this task was to find the shortest path from **Lyche** to **Klubben**. In the figure 3 you can see our solution after implementing the A* search algorithm. The image on the left shows the shortest path, while the one on the right shows the exploration of the algorithm as well, in other words all the nodes with a gScore.

The optimal choice, that is the shortest path, is to go from Lyche through Edgar on the way to Klubben. For a better visual understanding of the solution, see figure 3

4.2 Task 4

The goal of this task was to find the shortest path from **Lyche** to **Klubben**, considering cake party at Edgar. 4 you can see our solution after implementing the A* search algorithm. The image on the left shows the shortest path, while the one on the right shows the exploration of the algorithm as well, in other words all the nodes with a gScore.

As we can see from figure 4, the optimal path is no longer to go through Edgar, since there is a cake party going on there. Instead one can see that the algorithm decides to

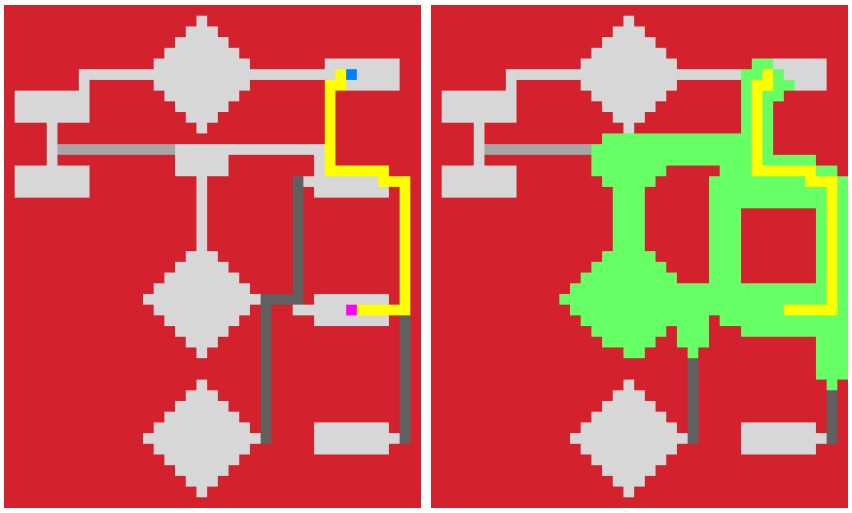

Figure 3: Solution - Task 3

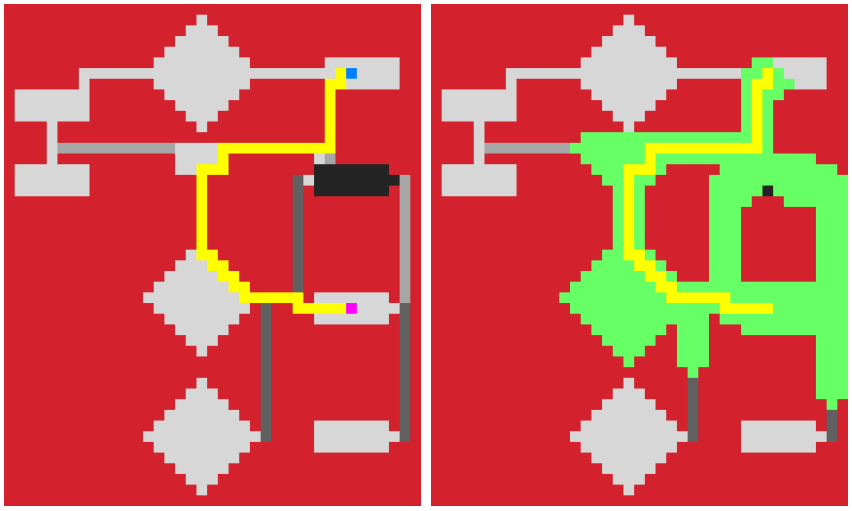

Figure 4: Solution - Task 4

go around Edgar when this extra bit of complexity is added to the task. In other words, the optimal road changes from the previous task due to the new information given in the task description.