

REPORT Lab 1

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After studying the provided context, the conclusion was to solve at the same time both assigned tasks by implementing a search algorithm, realizing thus a sort of goal-based agent.

Depth First Search (DFS) is the algorithm used to achieve the two main goal states:

- Find an unexplored tile: the world graph is expanded by looking at the four closer tiles the agent can reach. A new path is found every time we encounter an unexplored tile. On the way to the unexplored tiles, we smartly avoid known walls.
- Find the way back to “home” (the initial tile), once all tiles are explored.

The main reason DFS was chosen over other algorithms, such as BFS, is due to the nature of the context. Specifically, DFS works well when the cost for reaching every tile is the same and it has a lower time and space complexity. Moreover, other algorithms wouldn't have been very practical, given that the agent doesn't know the world in advance.

The agent's state has been enhanced by storing additional information needed:

- The current path that is following.
- A simple Boolean flag to know if it's going back to the initial tile or if it's still exploring the world.

The agent during its life will execute the following steps in order:

1. If the tile the agent is currently standing on is dirty, it will get cleaned up.
2. If the agent is following a path it will try to reach the next tile of it, otherwise it will use DFS to look for a new unexplored tile.
3. Once all tiles are explored, DFS is used to find a path back to the initial tile, which has been stored at the beginning in the agent's state.

The transitional model of the agent consist of the DFS algorithm, contained in the `dfs()` function, and some logic used to choose the right direction and orientation of the agent needed to reach the next tile without putting too much weight on the performance measure.

During most, if not all of our tests the agent was able to clean the world with a positive performance measure score both with and without any obstacles in the world, proving the superiority of this goal-based approach when compared to the other implementations provided.