

BRIEF HISTORY OF THE **ALGORITHMS**

2.1 Floodfill Algorithm

The Flood Fill algorithm is a simple algorithm that is used to identify and fill contiguous regions in a grid. The algorithm dates to the 1960s and is widely used in computer graphics for tasks such as image segmentation and flood filling.

- Advantages: always finds the shortest path, is easy to implement, and is guaranteed to find a path if one exists.
- Disadvantages: it may not be the fastest algorithm for large or complex maps, and it can be memory-intensive if the map is too large.

2.2 Dijkstra Algorithm

Dijkstra's Algorithm is a popular shortest path algorithm named after its inventor, Dutch computer scientist Edsger W. Dijkstra. The algorithm was first described in 1959 and is used to find the shortest path between nodes in a graph. It has numerous applications in transportation, logistics, and computer networks.

- Advantages: it always finds the shortest path, and it can work well for large or complex maps with weighted edges.
- Disadvantages: it may take a long time to find the path, especially if the map has many nodes or the edges have different weights.

2.3 A* Algorithm

The A* algorithm is a popular pathfinding algorithm that was first described in 1968 by computer scientist Peter Hart and his colleagues at Stanford Research Institute. The algorithm is a combination of Dijkstra's Algorithm and a heuristic function that estimates the distance between the current node and the goal node. A* is widely used in robotics, video games, and other applications that require efficient pathfinding.

- Advantages: it finds the shortest path and is usually faster than Dijkstra's Algorithm due to the heuristic function, which helps it prioritize nodes that are more likely to be on the shortest path.

- Disadvantages: it may not always find the shortest path, especially if the heuristic function is not well-chosen or the map is very large or complex.

2.4 Q-Learning Algorithm

The Q-Learning algorithm is a type of reinforcement learning algorithm that was first described by computer scientist Christopher Watkins in 1989. The algorithm is used to train an agent to make decisions based on rewards and punishments. Q-Learning has numerous applications in robotics, game AI, and control systems.

- Advantages: it can learn optimal paths by exploration and exploitation of the environment, and it can work well for complex maps with many possible actions.
- Disadvantages: it may take a long time to converge to the optimal path, especially if the environment is complex or the state space is large. Additionally, it requires a lot of data to learn effectively.