Robo AI

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Introduction

The goal of this thesis project is to solve the problem of maze collection using a group of robots. The project focuses on maximizing the number of mazes collected in the shortest amount of time. The robots are deployed in a maze environment where multiple mazes are placed. The objective is for each robot to collect a maze and deliver it to a designated collection point.

Modes of Operation

The project offers three modes of operation: Information Mode, Cooperation Mode, and Mute Mode. In Information Mode, robots have access to the positions of all mazes on the grid without the need for communication or exploration. Cooperation Mode requires robots to rely on a common database for communication and information sharing. As robots explore the grid, they update the common database with discovered information. In Mute Mode, robots operate individually, maintaining their own databases without communication or information sharing.

Adding New Maps

The project allows for the addition of new maps by creating a new .txt file that represents the grid maze and placing it in the /maps directory. The program recognizes the new map and makes it available for selection.

Algorithms

I used A* algorithm for pathfinding.
Additionally, the project employs a custom algorithm for searching new cells to explore. This algorithm determines which unexplored cell the robot should visit next, taking into account the current state of the maze, the collected information, and the objective of maximizing the maze collection rate.
The combination of the A* algorithm for pathfinding and the custom algorithm for cell exploration enables efficient navigation and decision-making for the robots in the maze environment.

Potential Future Developments

The project can serve as a foundation for further development in the field of maze exploration and coordination among robots. Potential future developments could include:
Enhanced Algorithms: Further optimization of exploration and pathfinding algorithms to improve efficiency and maze collection rates.
Multi-Robot Collaboration: Expanding the Cooperation Mode to support more advanced communication and coordination strategies among robots.
Intelligent Decision-Making: Integrating AI techniques to enable robots to make intelligent decisions based on the collected information and the current state of the environment.
Real-World Implementation: Adapting the project to real-world scenarios, such as warehouse automation or search and rescue operations, where robots navigate physical mazes to collect objects or search for targets.