Introduction to Path Planning

Path planning is a key part of robotics where robots figure out the best way to move from one place to another. They use special algorithms to avoid obstacles, follow rules, and reach their goals safely and quickly. It helps robots do their jobs well and handle different situations in smart and efficient ways.

Types of Path Planning Algorithms:

-SLAM: Updates the map of an unknown environment as it moves more and more
-Dijkstra's Algorithm: Finds the shortest path based on cumulative costs.

-A* Algorithm: Considers both cost and estimated remaining cost to the goal for efficient paths.

-RRT (Rapidly-exploring Random Trees): Rapidly explores the robot's configuration space.

-PRM (Probabilistic Roadmaps): Builds a graph representation of the environment for path planning.

-Potential Field Methods: Guides robot motion using attractive and repulsive forces.

-Genetic Algorithms: Evolutionary approach to improve paths through selection and mutation.

These algorithms help robots navigate efficiently and avoid obstacles while reaching their destinations.

Local planner and Global planner:

In path planning for robotics, we have two main components: the local planner and the global planner.

Local Planner: The local planner handles short term navigation decisions in real time. It focuses on avoiding obstacles and adjusts the robot's path within a small area around it.

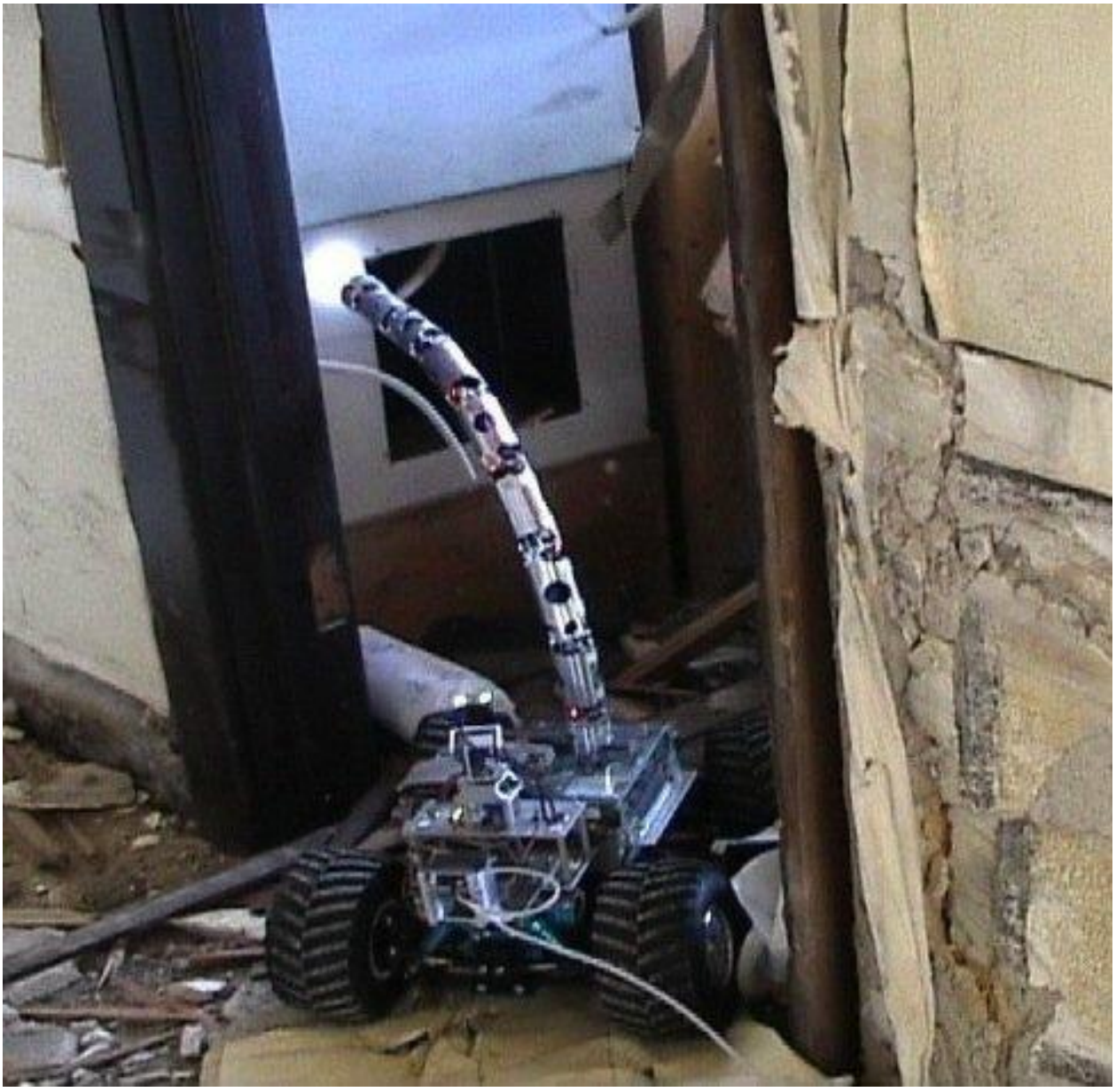
Global Planner: The global planner determines the overall path from the start to the destination. It considers the entire environment, including obstacles, and plans an optimal route for the robot to follow.

Together, these planners work together to enable robots to navigate efficiently and safely towards their goals.

Challenges and Future Trends in Path Planning:

Path planning in robotics faces challenges: dynamic environments, high dimensional spaces, real time performance, uncertainty, human-robot interaction, machine learning, and multi-robot collaboration.

Practical Applications of Path Planning:



Real world applications of motion planning. An urban search-and-rescue robot from Carnegie Mellon University's Biorobotics Lab

Path planning is used in all sorts of endeavors, from saving people's lives to simple tasks like cleaning a room or picking up a bottle from the floor.

Conclusion and Resources:

Path planning is a really important element of Robotics and we should dedicate a lot of resources, effort and attention to it. Fundamentally,

Robotics wouldn't be a specialization if Path Planning wasn't a thing.

https://www.sciencedirect.com/topics/engineering/path-planning#:~:text=Algorithms%20of%20global%20path%20planning,developed%20by%20the%20Dijkstra%20algorithm.

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