Multi-Agent Planning

NMIS-Industry Doctorate Programme

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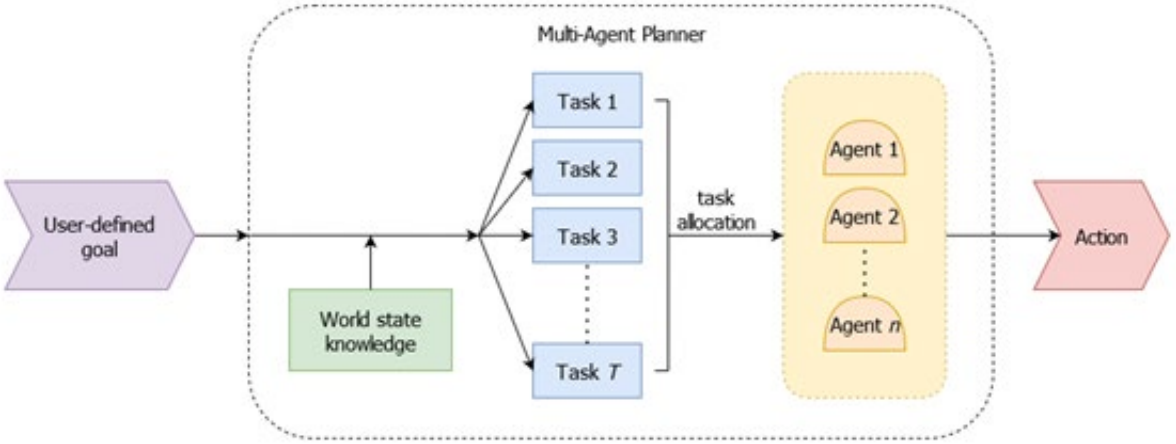
Abstract:

The use of multiple robots to perform tasks in a coordinated manner has seen increased interest in recent years, with potential applications in areas such as search and rescue, exploration, and construction. Multi-agent planners (MAPs) break down user-defined goals to smaller actionable tasks for individual robots while ensuring these tasks do not conflict with each other. This project will develop a MAP based on weaknesses of current planners as determined by literature review.

Simplified flowchart of a multi-agent planner:



Project Description / Activities:

Although there are many potential use cases for multi-agent systems, the difficulty in coordinating multiple robots to perform a task limits real-world applications. Multi-agent planners use a world-state representation to decompose user-defined goals into steps that are manageable by a single agent, enabling the use of swarms without a human operator needing to specify individual tasks for every agent. However, there are still a number of deficiencies in existing MAPs, especially for heterogeneous swarms — that is, swarms where agents are not identical — or for systems that need to operate in real-time.

This project aims to develop a novel planner to address a key weakness of current state of the art. The new MAP will be validated on hardware platforms with the goal of providing a solution robust enough to be usable in industry.

Key Results / Impacts to Date:

- review of state of the art path planning and localization methods
- review of state of the art MAPs (ongoing)

Future Work:

- identify key shortcomings of existing MAPs
- develop new MAP to address focus weakness
- deploy new MAP on heterogeneous multi-agent system