

**Title:**

Multi-robot Path Planning

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**Scientific Summary:**

Motion planning for a single mobile robot has been extensively studied over the last decades and several approaches have been developed to deal with it for a robot in an environment contained a set of stationary obstacles. Moreover, there are other studies for planning a path for a robot in an environment with moving obstacles which are intractable even in simple cases [1-2]. Based on this fact, motion planning for multiple robots is inherently hard. On the other hand, many practical applications of robots such as assembly planning and automated manufacturing which require the use of two or more robots in a common workspace. For example, cooperation between the robots provides many benefits, and this is why multi-robot motion planning is so appealing. Multi-robot motion planning problem is generally defined as follows: given a set of  $m$  robots in a work space, each one with start and goal positions; determine the path that each robot should follow to reach its goal while avoiding collisions with obstacles and other robots. Due to the objective of the robots, there are different assumptions for the problem. For example all the robots may have the same goal from different starts, or each robot is destined to reach its individual goal. The main issue in mobile robots motion planning is to coordinate the motions of the multiple robots interacting in the same work space to avoid potential collisions.

**Variety of the multi-robot problem:**

- Continuous or Discrete Work Space,
- Static or Dynamic Space
- Robot's Dynamics, Robot's abilities and Constraints

**References**

- [1] J. E. Hopcroft, J. T. Schwartz and M. Sharir, "On the complexity of motion planning for multiple independent objects; PSPACE-Hardness of the "Warehouseman's Problem", " In The International Journal of Robotics Research, 3(4), pp.76-88, 1984.
- [2] S. M. Lavalle, Planning Algorithms, Cambridge University press, 2006.