



An Improved Genetic Algorithm For Multi Robot Path Planning

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I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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DECLARATION

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Sri Lanka Institute of Information Technology or to any other institution for assessment for any other purpose.

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ABSTRACT

An Improved Genetic Algorithm For Multi Robot Path Planning

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This study addresses the challenge of path planning in mobile robots, which demands efficient navigation through dynamic environments. Traditional stationary robots are limited in meeting the increasingly complex requirements of mobile robots across various sectors. Our research introduces an enhanced path-planning method by integrating Probabilistic Roadmap (PRM) with Genetic Algorithm (GA), forming a PRM-GA hybrid that aims to optimize mobile robot routes. This hybrid approach leverages PRM's efficient mapping of feasible paths and GA's optimization capabilities to achieve routes with minimal distance and fewer turns, thus conserving energy. The enhanced fitness function in the GA component evaluates paths not only on distance but also on smoothness and turn count, promoting routes with fewer directional changes. This combination minimizes the robot's energy consumption while maximizing navigation efficiency. Experimental results confirm that the PRM-GA hybrid outperforms traditional GA-based approaches, yielding optimal paths that reduce distance and turns, thereby enhancing the operational efficiency of mobile robots. This method's effectiveness in path optimization supports its application in various sectors requiring mobile robots, highlighting the potential for increased energy efficiency and streamlined performance in real-world scenarios.

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