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Degree programme

Degree programme	Thesis type
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Original title
Investigation of Frontier and Rapidly-Exploring Random Tree Based Robot Exploration Algorithms and Implementation of Multi Robot Exploration

Abstract of thesis
This research focuses on the exploration of unknown area by a Jackal UGV robot using two different methods: frontier exploration and rapidly exploring random tree (RRT) exploration. Robots play a crucial role in exploring unknown environments. Therefore, it is necessary to understand and optimize these methods. The experiments were performed in three maps of varying sizes using different levels of complexity. The simulations utilize a 2D LiDAR. The area coverage, time, exploration rate, and the robustness of both methods were analysed and compared. Despite localization inaccuracies and path planning issues, both methods achieved high completion rates. The frontier exploration method generally outperformed the RRT exploration in terms of speed, showing that Frontier exploration utilizes a more efficient exploration policy. Improvements such as incorporating an exploration route and considering unreachable but obtainable areas are suggested. Furthermore, the inclusion of a multi-robot system for improved efficiency and how to implement a multi-robot system are explained. Lastly, the limitations and improvements of the 2D simulation in representing real life exploration are also discussed.

Number of pages	16
Language of the thesis	English
Year of publication	2023

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