

ABSTRACT

Search in an unknown area required a tool so that the search can be carried out without endangering humans. The robot is used to be able to perform searches in an unknown area which is one solution to be able to explore the area, but a search using one robot requires a longer process, therefore the use of multiple robots in conducting searches in unknown areas is used to solve problems in tracing. using a single robot in mapping.

The use of a frontier-based method to explore unknown areas requires SLAM for simultaneous localization and mapping and the Navigation Stack is used by the robot as a reference for autonomous robot motion. The results of the mapping carried out by SLAM are used as a frontier point using the msgs marker as the goal of robot navigation by calculating the frontier cost from the difference in costmap using the parameters on the navigation stack and explore_lite, frontier-based exploration will be terminated if the mapping simulation is done or there are problems where the robot exploration took too long so the robot decided to leave the frontier.

Map merging is used by multi robots to unify the mapping results of each robot where it is necessary to merge the tf robot using tf_static, using tf_static requires one of the maps to be the parent tree which is then used by the child tree robot to combine the maps of each robot into the parent tree. Mapping time on multi robots takes 19 minutes 30 seconds, while in single robots it takes 20 minutes 20 seconds where it can be seen that using multiple robots to perform tracing speeds up the search time. The movement of the robot from the two simulations can be seen using a ground route, which compares the position of the robot on the map and the simulation environment which can be seen in the odometry plot graph and the robot's processing time. The results of multi-robot mapping have a separate stacking and map due to the parent tree selection where one robot is not used as a parent tree, causing accumulation and separation which causes the mapping accuracy to decrease, while in a single mapping robot there are unexplored locations which cause the mapping accuracy to decrease.

Keywords: *Multi-Robot, Frontier-Based, SLAM, Motion Planning*