ABSTRACT

Navigating an autonomous robot in an uncontrolled environment is challenging because it requires a set of subsystems that work together. In order to adapt to navigation in unfamiliar environments, mobile robots must possess intelligent capabilities, such as environmental cognition, behavioral decisions, and learning. The robot will then navigate between these obstacles without crashing and reach a specific destination point.

This research is concerned with the automatic navigation of the mobile robot from the initial position to the destination position. To solve some sub-problems related to automatic navigation in an uncontrolled environment. Monte Carlo simulation is performed to evaluate the performance of the algorithm to show under what conditions the algorithm performs better and worse. Using a reinforcement learning framework, to obtain position mapping to optimize action on mobile robots. Reinforcement learning requires a large number of training samples, which is very difficult to be directly applied to real mobile robot navigation scenarios. To solve this problem, the robot is trained in a simulation environment of the Gazebo platform middleware Robot Operating System (ROS), followed by the application of deep Q-Learning training on mobile robot navigation scenarios using a simulator that resembles real-world conditions.

It is hoped that through simulation and experimentation, its effectiveness can be proven. After being trained in this method, the dopat robot moves safely to the target, navigating in an unknown environment without any prior demonstration. In addition, an in-depth quantitative and qualitative evaluation of this method is presented by comparison with the normal path planning method supported by previous global environmental maps. **Keywords:** ***Autonomous robot, Q-Learning, Neuro Fuzzy, Behavior-Based Robot***