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Robust Mobile Robot Path Trajectory Tracking based on In Intelligence Swarm-Neural Algorithm

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***Abstract*—Today, mobile robots are growing and developing applications and entering the real world. One of the most important issues related to mobile robots is robust path or routing tracking problem. We are always looking for optimal routes in terms of distance and time with minimum error in routing a mobile robot, so it understands and meets the environmental conditions and restrictions. Mobile robot routing tracking is one of the NP-hard problems, because the complexity of this issue increases exponentially with the increase of constraints and space dimension. The main goal in robust trajectory tracking is to find the path between the starting point and the target point without hitting fixed and moving obstacles. Also, finding the optimal route according to evaluation criteria such as route length, route time, energy consumption or less risk will increases the complexity of the robot's decision making. In this paper, robust mobile robot path trajectory tracking is simulated with the D* Lite algorithm along with the Deep Recurrent Neural Network (DRNN) in the MATLAB platform. We use path recognition in robust and optimal way with observer to calculate and identify control errors based on the D* Lite algorithm and tracking the targets of mobile robot without encountering obstacles and other disturbances with training in a RDNN. The simulation results represent the proposed method leads to optimize route tracking and cost reduction in a dynamic environment with uncertainty.**

Keywords: Mobile Robots, Robust Tracking, Routing, D* Lite Algorithm, Deep Recurrent Neural Network (DRNN)

I. INTRODUCTION

At first, the use of a mobile robot was limited only to manufacturing industries. But nowadays it is usually used many fields such as entertainment, medicine, mining, rescue, education, military, aerospace, agriculture and etc. [1]. The robot is equipped with many intelligent equipment when performing the timing task in path identification and tracking which required to model the environment and localize its position, control movement, collision detection and avoid obstacles using navigation techniques [2]. The most important function of any navigation method is planning a safe path (by identifying and avoiding collisions with obstacles) from the initial position to the target position. Therefore, the appropriate selection of navigation technique is the most important step in planning the robot path when working in a simple and complex environment [3]. Currently, many techniques have been developed by various researchers in the field of mobile robot navigation and routing [4-6]. Mobile robots navigation and routing is divided into three categories: global navigation, local navigation and personal navigation. The ability to define the position of elements in the environment according to the reference axis and stimulate towards the predetermined goal is global navigation. Local navigation deals with identifying the dynamic conditions of the environment and establishing positional relationships between different elements. Also, personal navigation is controlling different elements of the environment relative to each other.

In [7], presented the first optimization problem for routing in mobile systems. In this research, the classic problem of positioning and routing determined by the limited capacity of mobile equipment. We can refer to [8] as researches that have had many effects on the routing of mobile systems. In this research, the problem of routing and target positioning considered as a strategy to solve it with the lowest cost. Other similar methods have been presented to date, which can be