AN OPTIMIZED PATH PLANNING TECHNIQUES FOR MOBILE ROBOTS

ABSTRACT

Designing an intellectual path planning techniques for multi-robot dynamic environment is very critical nowadays due to its complexity. The long-standing problems in multi-robot systems are avoiding collisions between single robots without compromising the system's objective. This is due to the fact that current collision avoidance strategies are either prone to gridlock, in which the robots may never reach their desired goal position, or are computationally intractable, in case the solution may not be delivered in a reasonable amount of time. Investigate whether it is possible to create a gridlock and theoretically tractable solution for collision detection in multi-robot systems.

To address these challenges, this study proposes a hybrid optimized path planning model for a mobile robot dubbed improved PSO (IPSO) mixed with whale optimizer (WA). The shortest, smoothest, and safest path for a mobile robot is obtained using a hybrid multi-objective technique that incorporates improved particle swarm optimization and modified whale optimization models.

The suggested hybrid optimization model is suited for mobile robot navigation in dynamic environments, obtaining a shorter, smoother, and safer path than existing algorithms, according to experimental data. The basic goal is to create a minimal path from the source to the destination that avoids all of the map's obstacles.

The proposed distinct optimization algorithms outperformed than conventional meta-heuristics called “genetic algorithm, direct ant bee colony, conventional PSO, and conventional Whale optimizers”. The performance metrics “path length, time complexity,

efficiency" are estimated to validate the proposed heuristics with the prevailing methods. The path length obtained for "genetic algorithm, direct artificial bee colony optimization and proposed hybrid optimization models are 12.64 m, 12.26 m, and 11.64 for case 1 and 13.96 m, 13.68 m, 597 12.02 m for case 2" respectively.

In comparison to the other two techniques, the presented hybrid modelling approach achieves a minimal path distance of 11.64m for case 1 and 12.02m for case 2 and average computational time is 7.05 seconds for case-1 and 7.38 seconds for case-2.