Intelligent Path Tracking Hybrid Fuzzy Controller for a Unicycle-Type Differential Drive Robot

Authors : Abdullah M. Almeshal, Mohammad R. Alenezi, Muhammad Moaz

Abstract : In this paper, we discuss the performance of applying hybrid spiral dynamic bacterial chemotaxis (HSDBC) optimisation algorithm on an intelligent controller for a differential drive robot. A unicycle class of differential drive robot is utilised to serve as a basis application to evaluate the performance of the HSDBC algorithm. A hybrid fuzzy logic controller is developed and implemented for the unicycle robot to follow a predefined trajectory. Trajectories of various frictional profiles and levels were simulated to evaluate the performance of the robot at different operating conditions. Controller gains and scaling factors were optimised using HSDBC and the performance is evaluated in comparison to previously adopted optimisation algorithms. The HSDBC has proven its feasibility in achieving a faster convergence toward the optimal gains and resulted in a superior performance.

Keywords : differential drive robot, hybrid fuzzy controller, optimization, path tracking, unicycle robot
Conference Title : ICEECST 2015 : International Conference on Electrical Engineering, Computer Science and Technology
Conference Location : Boston, United States
Conference Dates : April 20-21, 2015