

A Spiral Dynamic Optimised Hybrid Fuzzy Logic Controller for a Unicycle Mobile Robot on Irregular Terrains

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Abstract : This paper presents a hybrid fuzzy logic control strategy for a unicycle trajectory following robot on irregular terrains. In literature, researchers have presented the design of path tracking controllers of mobile robots on non-frictional surface. In this work, the robot is simulated to drive on irregular terrains with contrasting frictional profiles of peat and rough gravel. A hybrid fuzzy logic controller is utilised to stabilise and drive the robot precisely with the predefined trajectory and overcome the frictional impact. The controller gains and scaling factors were optimised using spiral dynamics optimisation algorithm to minimise the mean square error of the linear and angular velocities of the unicycle robot. The robot was simulated on various frictional surfaces and terrains and the controller was able to stabilise the robot with a superior performance that is shown via simulation results.

Keywords : fuzzy logic control, mobile robot, trajectory tracking, spiral dynamic algorithm

Conference Title : ICCARVE 2014 : International Conference on Control, Automation, Robotics and Vision Engineering

Conference Location : London, United Kingdom

Conference Dates : October 24-25, 2014