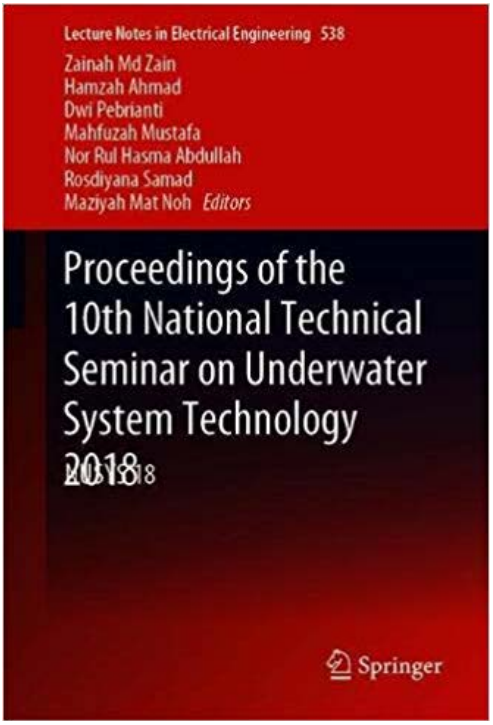

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Contents

Performance Evaluation of PID Controller Parameters Gain Optimization for Wheel Mobile Robot Based on Bat Algorithm and Particle Swarm Optimization

Nur Aisyah Syafinaz Suarin, Dwi Pebrianti, Nurnajmin Qasrina Ann, Luhur Bayuaji, Muhammad Syafrullah and Indra Riyanto

Abstract Tuning Proportional Integral Differential (PID) controller to the best value of gains is essential to develop a reliable controller for wheel mobile robot (WMR). WMR is a nonlinear system that falls into category of underactuated system where the inputs number is less than output number. The selection of PID gains for such system is highly difficult. Optimization of PID controller using Bat Algorithm (BA) is presented in this paper. BA as a nature inspired algorithm is used to search the optimum PID gains for wheel mobile robot i.e. an off-the-shelf mobile robot called mBot so that the system will have good performance in term of steady state error and time response. Kinematic model of mBot robot is used to develop a simulation model to simulate the system. The result of tuning and optimizing PID gains using BA is compared with Particle Swarm Optimization (PSO). The tuning result by using BA outperformed PSO methods with faster processing time and best values of gain Kp and Kd to be applied in the WMR. The PID gain values obtained from the BA and PSO are then applied on the WMR model. The performance of BA shows better result compared to PSO. Settling time for BA is 10.62 s compared with PSO 11.1 s, rise time for BA is 3.24 s while PSO 2.68 s, percentage overshoot of BA 28.2% compared with PSO 28.4%. Thus, the result proven that BA is able to optimize gain of PID controller better than PSO.

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