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

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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 two 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 BA and PSO are then applied on the WMR model. The result of time response and steady state error from BA shows better (?) performance compared to PSO. Settling time, rise time, % OS, and steady state error → please mention the value of all the time response analaysis and also the steady state error in here for BA and compare it with the result from PSO. Then conclude which one is the best one. (I think mostly, journal needs 300 words abstract. Please try to write abstract near to 300 words)

Keywords: Bat Algorithm, underactuated system, proportional integrated differential controller.