Fuzzy Logic Controller Optimized by MABSA for DC Servo Motor on Physical Experiment

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Abstract This paper represents the control system of the DC servo motor using fuzzy logic controller optimized by MABSA. The fuzzy logic controller that can use in a wide range is well known to the industry application and control system. However, there are still problem with the speed and position control of DC servo motor. Both speed and position cannot be balanced when loading and unloading materials. Therefore, the fuzzy logic controller will be designed using the Matlab toolbox and then will be optimized by the modified adaptive bats sonar algorithm (MABSA) to solve this problem. The best position of the range of the membership functions will be generated through the algorithm and then will be inserted in the membership function of the designed fuzzy logic controller. After the proposed design is fully developed, an experiment will be carried out to test the performance. The performance will be in terms of rising time, settling time and percentage of overshoot. The experiment will be using Arduino as the microcontroller and encoder as the feedback. The experiment will be compared with the cases that use the fuzzy logic controller only without the optimization of MABSA. The result shows that the proposed design gives a 19% improvement in rising time and 8% in settling time. In conclusion, the proposed design of FLC optimized by MABSA is better compared to FLC without optimization.

Keywords Fuzzy logic controller · Bat algorithm · DC servo motor · Optimization · Matlab and simulink

1 Introduction

DC motor is the most widely used as an actuator for continuous motion production and whose speed of rotation can be easily controlled [1]. The function of the DC motor that has the stationary part (stator) and the rotating part (rotor) making them ideal for use in applications where speed and position control are required [2]. There are

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