ABSTRACT

Fauzi Fathurahman. Design and Implementation of Fuzzy Logic in Microcontroller ATMega16 for Obstacle Avoidance Robot. Supervised by HENDRA RAHMAWAN and HASAN MAYDITIA.

Robot was created to relieve human tasks. One of them is an obstacle avoidance robot. This robot has an ability to avoid obstacles and to move around autonomously in accordance with the rules embedded in it. In this study, fuzzy logic is implemented on the microcontroller ATMega16 in obstacle avoidance robot system design for easing in defining the object's position and accelerating the speed based on distance objects. This robot system is capable of handling three inputs and two outputs. Input is accepted as the value of the distance through the three ultrasonic sensors and the outputs are the speed and the angle of the robot turns. The output of fuzzy system is displayed on the LCD character 16x2. In the decision taking, Mamdani fuzzy modeling was used because it is intuitive. This system consists of ATMega16 microcontroller as hardware and CodeVision AVR as the compiler and downloader of the program into ATMega16 microcontroller and Matlab as the fuzzy simulation program. In the test, the results of fuzzy in Matlab are compared to the human expert opinion. The result of the fuzzy in Matlab can be accepted by the human expert. In the experiment, the results of fuzzy in Matlab are compared to the embedded systems. For the speed test, it produces 0.44% of average error with 99.56% accuracy rate. For the steering angle, it produces 0.22% of average error with 99.56% accuracy rate. The average fuzzy execution time of each rule in the microcontroller is 0.184441 ms. The fastest execution time is in rule 1, that is when three input sensors are in the close range. The longest time is in rule 27, that is when three input sensors are the far range.

Keyword: Obstacle Avoidance Robot, Sensor Ultrasonics, Fuzzy Logic