ABSTRACT

Robot is a mechanical device that can perform physical tasks, using either the supervision and control of the human. One of the types of robots that are very popular and simplest is the robotic arm system. Robotic arm is a mechanical system which is used in manipulating the movement of lifting, moving, and manipulating the workpiece to lighten the work of man.

In this final project the author will use fuzzy logic method and kalman filter method on the robotic arm system that is controlled by human hand gesture. Accelerometer, gyroscope and magnetometer sensors were mounted on human hand so that the user can control the movement of the base rotation, shoulder, wrist pitch on robotic arm. The Flex sensor that has been mounted on the finger is used to control the movement of the gripper. In this system, kalman filter is used to get an accurate value on accelerometer and gyroscope sensors while magnetometer sensor is used to avoid measurement errors on the state of the sensor tilt using a tilt compensation[16]. As for controlling the speed of a DC motor, a fuzzy logic control method was used in order to minimize the position error rate and shorten the response time required for robotic arm when it reaches the desired position according to the user's hand gestures.

To acquire controlled angle of the robot using human hand gestures, an accelerometer and gyroscope sensor were used in combination with Kalman filter. After obtaining the value of a good reading, the data will be processed by the fuzzy logic controller to set the direction and speed of a DC motor to match the desired position. From the experimental results Fuzzy Logic and Kalman filter, an optimal Kalman filter parameter values that has been obtained are Q accelerometer = 0,001; Q gyroscope = 0.003 and R = 0.03, and fuzzy logic testing at each joint has an average error, 1.1% for the wrist, 19.21% for the shoulder, and 12.9% for the base. Based on an initial test result of fuzzy logic control respons; relatively, on a differences above 40 has a better response compared to a differences below 40 which has a slower response. On a magnetometer experimental showed that the sensor can function well in measuring the pitch angle based on motion to tilt 30° from the plane.

Keywords: Kalman filter, Fuzzy Logic, Arm Robot, accelerometer, gyroscope, magnetometer, flex, base rotation, flex elbow, wrist pitch, gripper.