Fuzzy Logic Cross-Coupling Controller (FLCCC) and PID Controller Design to Increase Position Control for Axis Servo Motor Of CNC

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ABSTRACT

On each axis of CNC servo motor, there is disturbances in the form of load, frictional forces, and other factors. In addition to the servo, the disturbances are also a frictional force on the rail and ballscrew axis. Difference disturbances on each axis causes movement between axis out of sync, so it is not a precision CNC machine.

Proportional-Integral-Derivative (PID) controller at each axis is expected to speed up the response and eliminating the steady state error output. PID controller is placed on each axis. Fuzzy Logic Cross-Coupling Controller (FLCCC) is used to minimize the contour error and the tracking error caused by the difference load on each axis. FLCCC put on the cross axis.

PID controller and FLCCC can decrease RMSE value 0.2127 on linear contours, 1.2812 on circular contour, and 1.0196 on square contour. This indicates that the PID controller and FLCCC can make more precise contour than the PID controller and CCC.

Keywords : CNC Machine, Cross-Coupling Controller, Fuzzy Logic Controller, PID Controller.