FUZZY SLIDING MODE CONTROL DESIGN OF A TWO-WHEELED INVERTED PENDULUM ROBOT

ABSTRACT

Inverted Pendulum Problem has become an interesting topic for the control engineering community. The uniqueness and complexity of the Inverted Pendulum problem has made it ideal for control techniques that are used as military and commercial applications.

Inverted Pendulum Robot has a behavior like Pendulum chart that has the properties of unstable and nonlinear systems. This robot has the characteristics and ability to maintain balance with two wheels. To control the balance of the robot, it is required controller that must be robust against disturbances and uncertainties in the robot dynamic model Inverted Pendulum like Sliding Mode Control (SMC) and Fuzzy Sliding Mode Control (FSMC) methods.

Sliding Mode Control (SMC) and Fuzzy Sliding Mode Control (FSMC) is used in this thesis. From the results, shows that the design of robust controller in Inverted Pendulum Robot system using the FSMC is more stable against parameter uncertainty and internal disturbance like impulse signals and random signals, and reduces chattering in responds system compare with the SMC, so that responses become more stable.

Key Words: Inverted Pendulum, robust, SMC, and FSMC.