Pongskorn Kaveesoontornsanoh 2014: Self-Balancing of Two-Wheeled Mobile Robot with Linear Quadratic Regulator and Model Predictive Controller. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Associate Professor Withit Chatlatanagulchai, Ph.D. 80 pages.

Many researchers have paid attention on two-wheeled robot because it is a system that is difficult to control due to its non-minimum phase property, its having multiple inputs and outputs, and the number of inputs is fewer than the number of output. The two-wheeled robot is suitable for research that needs to prove the efficiency of the applying control system. Besides, the two-wheeled robot is able to move swiftly similar to human. There exist many research works showing the performance in robot movement. From this agility of the robot movement, the two-wheeled robot can be applied to real work in place of humans.

This research applies the linear quadratic regulator and the model predictive control techniques to controlling the robot. Each technique has different characteristics. The linear quadratic regulator depends on accurate mathematical model to handle the system uncertainty and to balance the robot. Tilt angle measurement of the robot is a major problem in balancing the two-wheeled robot. In this research, an accelerometer and a gyroscope are use together.

Simulation results show the stability in balancing the two-wheeled robot of the linear quadratic regulator and the model predictive controller. The two types of controller are different. The results show specific characteristic of each controller. The model predictive controller incorporates constraints on inputs and outputs. It can be applied to industrial work that consumes high energy. Experimental results show the efficiency of the complementary filter that can handle noise and sensor drifts for both sensors.

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