ABSTRACT

An inverted pendulum is a mathematical representation of an unstable system. One of the inverted pendulum models consists of two components, namely the train or cart and the pendulum. Without control, the pendulum will continue to fall because the system is unstable. Therefore, a controller is needed to control the inverted pendulum model.

In this study, the Linear Quadratic Gaussian (LQG) method was used to produce a 0° upright pendulum train according to the reference position. Linear Quadratic Gaussian (LQG) is a Linear Quadratic Regulator (LQR) with the addition of an optimal estimator in the form of a Kalman filter. Kalman filters are used to reduce measurement and process noise. Cart position, cart speed, pendulum angle and pendulum angular velocity are system inputs which are represented in state form. The result of LQG is the gain L which is used as system feedback. The purpose of this research is to produce a visual simulation as well as a graph of the inverted pendulum model. This model was tested using the simulink and simmechanics matlab features.

From the position test results the Robot can work using LQG, producing output in the form of animated videos and system dynamics graphs. The test results are the most stable robot position at -3 m with a rise time of 2,31 s, settling time of 2,44 s, and maximum pendulum deviation angle of 1,9°.

Keyword: LQR, LQG, Inverted Pendulum, Cart-Pole, Simmechanics