ABSTRACT

Fuel shortages and air pollution level that are worrying in Indonesia prompted the author to create an environmentally friendly vehicle. Electric unicycle is a one-wheeled motorcycle driven by electricity. What makes this vehicle superior to others beside its green quality is the level of flexibility that is relatively higher than other vehicles.

The movement of electric unicycle uses the principle of inverted pendulum. To move forward, the rider only have to lean the vehicle forward and to brake the rider should lean the vehicle backward. This vehicle is equipped with an accelerometer sensor and a gyroscope sensor for detecting the tilt angle of the vehicle. In the implementation, to prevent the sensor readings from a lot of noise, Kalman Filter is used. As for the control of motor speed, PD controller is used.

In this thesis, the parameters of Kalman filter that produces the optimum output is $Q_{accelerometer} = 0.001$, $Q_{bias} = 0.003$ *and* $R = 0.03$. *PD parameters used are* $Kp = 5$ *and a* $Kd = 1.9$ *with rise time response of 0.7 seconds.*

Keywords : Electric Unicycle, Accelerometer, Gyroscope, Inverted Pendulum, Kalman Filter, PD Controller