

Modeling and control of an electric power steering system

Nguyen, Kien-Trung, Lin Hai-Ping

E-mail: 9706983@mail.dyu.edu.tw

ABSTRACT

Power steering is now standard equipment on almost all vehicles. Power steering has evolved over the years from a simple control valve and external hydraulic ram on the regular steering mechanism to integrated rack and pinion systems with variable assist under different driving conditions. Recently, Electric Power Steering (EPS) is making inroads into the marketplace and increasingly applied due to several its advantages, example simplicity, fuel consumption and logistical benefits. Electric Power Steering adopts the motor to offer helping driver directly by certain assist torque. The amount of this assist torque is automatically controlled by the EPS system electric control unit (ECU) and depends on the vehicle speed and steering, wheel torque, angular position and turning rate, etc. The electric steering unit is still connected to the steering wheel by a steel shaft, but this is only used to provide input to the sensor during normal operation. If the steering module detects a fault, it shuts down the electric motor and the steel shaft allows the vehicle to still be steered. This thesis discussed the structure, operating principle, characteristics, and simulation of EPS system. The parameters for this simulation are from experiment on real system. And results of the simulation are compared with previous studies. The author develops a new control algorithm for an EPS system and designs an ECU for experimental system to validate that control algorithm. This ECU communicates with extended device, such as Angle Sensor, Torque Sensor, to get input signal via the vehicle's Controller Area Network (CAN) providing accurate, real-time data to other systems on the vehicle and can enable a high level of integration with other on-board systems for improved vehicle control. ECU controls the assist motor through H bridge circuit to produce assist torque for driver.

Keywords : Electric Power Steering, angle sensor, torque sensor, assist torque, H bridge circuit, control algorithm, CAN.

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