Abstract

Nowadays in modern automobiles the power steering function is almost obligatory. This function enables the driver to control the car on a significantly higher safety level. In the newest innovations power steering is achieved with electric motors due to easier development and the possibility for many add-ins.

In electric power steering (EPS) the motors have to meet srict operational requirements. To accomplish these a complex motor control loop is needed, which demands huge amount of computing. I gained insight to a control loop named Field Oriented Control (FOC) and carried a part of it into execution – my exact task was to implement the processing of the signals of the rotor angle sensor on an FPGA circuit.

The first part of my thesis is about the theoretical knowledge required for the task. First, a short overview is given about the steering system and the basics of power steering functionality. The next chapter descibes the requirements of EPS motors and the types of electric motors typically used. Next, the Field Oriented Control is detailed. I have been paying special attention to the basic principle of control and the tasks of every component in the loop – I have also been using a direct example to present the operation of the control loop. Finally, the physical basis of the GMR detection of rotor position is presented, as a GMR based detection has been used in my exact task.

The second part of my thesis is about the particular steps of my solution for the task and the decisions behind them. First, a short summary is given about the specific GMR sensor which has been used. Next, the computing steps of the angle process is described in depth, touching upon the design of the interface panel, the communication between the panel and the FPGA, the process thread in the FPGA and the tests of the process components.

At the end of my thesis the possibility for redundancy in the panel and the process thread is examined in order to meet the regulations of automotive industry. Finally, a short list is given about the opportunities for further development.

As a result of my task, the samples of the designed interface panel have been manufactured and the implementable process thread is made. According to the first measurements the circuits are able to provide information about the rotor angle.