ABSTRACT

Electric Vehicles have been rising in popularity, due to the need for energy efficiency and low maintenance, BLDC motors are chosen as the machine of choice. However BLDC motor control with the conventional trapezoidal method is not able to optimize the amount of torque produced and maximize efficiency. This Final Project proposes a BLDC motor controller with vector control (Field Oriented Control/FOC) to optimize torque production with a more efficient current consumption as well as reducing torque ripple, thus increasing operational comfort. The system design consists of the development of hardware – with an STM32G431RB microcontroller, DRV8302 Gate Driver, and IRFB4110 MOSFET – as well as the development of firmware running the FOC algorithm and producing PWM signals to control a 3-Phase Inverter. The research goes through, literature review, then circuit prototyping, and implementation with an actual BLDC Motor. This research finds that vector control can produce the same speed with lower power consumption (30%) when compared to trapezoidal commutation with an efficiency of 20% at 100 RPM.

Keywords: BLDC Motor, Vector Control, Field-Oriented Control, 3-Phase Inverter, Electric Vehicle