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Abstract:

Because of the advantages of electrical differentials, people are becoming more interested in using them rather than using mechanical differentials. The mechanical differentials are replaced by using the two rear motors. In the electrical vehicle (EV) different types of electrical machines such as induction motor, permanent magnet synchronous motor etc. are used. The design of a controller is a challenging work, as the output of the motor has to match with the vehicle input. There are already some works done with IPMSM (Interior Permanent Magnet Synchronous Motor) for designing electrical differentials. The controller which was designed in this paper mainly depends on the mathematical model of the IPMSM. Unfortunately, to design the controller for IPMSM the inverter portion was taken as ideal, but to observe natural response of the motors; an inverter should be added with the motors. In this paper, the PI controllers of an electrical differential for an EV system based on the IPMSMs taking core loss into account with SPWM inverter feed is designed. The performances of designed controllers are evaluated by Matlab/Simulink software. In the simulation work three road conditions for EV are considered. One is when the road is curved to right. Other is when the road is curved to left and another one is for the slope type road. Their performances are shown separately.

Keywords: SPWM, IPMSM, electrical vehicle, PI controller