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Abstract:

Because of advantages of Electrical Vehicles (EV), people are becoming more interested in using them rather than using mechanical differentials. In electrical vehicles different types of electrical machines such as Interior Permanent Magnet Synchronous Motor (IPMSM), Surface Permanent Magnet Synchronous Motor (SPMSM), Induction Motor etc. are used. The design of a controller is a challenging work, as the output of the motor has to match with vehicle input. So, far, most of the reported works have utilized proportional-integral (PI) controllers as the speed control. But, the disadvantages of PI controller are well known, as its design depends on the exact motor parameters and the performance is sensitive to system disturbances. The main objective of this paper is to replace the conventional PI controller by a Fuzzy logic controller (FLC) which is capable of handling highly non-linear Sinusoidal Pulse Width Modulation (SPWM) inverter fed IPMSM motor for high performance application in Electrical Vehicle. The effectiveness of designed Fuzzy Logic controller of an electrical differential for an EV system based on the IPMSMs taking core loss into account with SPWM inverter is evaluated by Matlab/Simulink software. In simulation work different road conditions for EV are considered. After the simulation the designed controller is found to be robust for the speed control application of Electrical Vehicle with IPMSM taking core loss into account.

Keywords: Electrical Vehicle; Interior Permanent Magnet Synchronous Motor; Fuzzy Logic Controller; Proportional Integral; Sinusoidal Pulse Width Modulation