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Title:	Optimum Speed Control of SPWM Inverter-fed IPMSM for the Application ED Based EV
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Published Journal Name:	AIUB Journal of Science and Engineering (AJSE)
Type of Publication:	Journal
Volume:	17 Issue 2
Publisher:	American International University-Bangladesh (AIUB)
Publication Date:	August, 2016
ISSN:	1608 – 3679
URL:	https://orp.aiub.edu/ajse-vol-15-no-1-august-2016
Other Related Info.:	Page 25-32

Citation: Sumon Kumar Ghos, Mohammad Abdul Mannan, “Optimum Speed Control of SPWM Inverter-fed IPMSM for the Application ED Based EV”, AIUB Journal of Science and Engineering (AJSE), Vol. 15, No, 1, pp. 25-32, August, 2016.



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Abstract:

Recently, the mechanical differential (MD) is going to replace to by electronic differential (ED) to design the modern electrical vehicle (EV) because of its simplicity, faster response, accurate control capability, configurable and many other eminent features. The ED has been designed by incorporating the electrical motors where the dynamic and robust control of motor is important to ensure the good performance of an EV with ED. In this paper, the LQR speed control IPMSM for ED is proposed for an EV to realize the feature of having precise control over torque and speed considering the core losses. Based on the mathematical model of IPMSM with considering core losses a discrete-time augmented has been developed to design LQR speed control system for speed control of SPWM fed IPMSM. The performance of the designed controller is evaluated using MATLAB/Simulink contrivance where all the simulation results put enough evidence that smooth, precise and robust performance is achievable with the proposed controller. Over and again, under variable load condition, the performance of the controller is analyzed and appreciable outcome is attained.

Keywords: Mechanical Differential, Electronic Differential, Interior Permanent Magnet Synchronous motor, Sinusoidal Pulse Width Modulation, Linear Quadratic Regulator