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Torque Control of IPMSM considering actual controller and driving condition

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In this paper, we study the robust torque control of wireless tram with independently rotating wheelsets(IRWs). In order to perform robust torque control of Interior Permanent Magnet Synchronous Motor(IPMSM) in the driving condition, D-Q axis current information are required. However, it is difficult to get appropriate current information, because of a lot of current vector exists for required torque. If current vector is calculated in real time, the load of the DSP is increased and it is difficult to consider the driving condition. Therefore, it is more suitable to use the current vector table in the offline. Current vector information should take into account variation of the four variables (speed, torque reference, battery voltage, and temperature) in the IPMSM. Therefore, it requires excessive FEA or experimentation. However, since the linkage flux in the motor contains both speed and battery voltage information, it is possible to simplify it by affecting three variables (linkage flux, required torque, temperature). In addition, if samarium cobalt is used as a permanent magnet, it can be reduced to two variables. FEA has an advantage that nonlinear and cross-saturation effects can be considered. However, FEA is a numerical analysis that assumes various ideal conditions, it is difficult to consider the actual controller and driving conditions. As a result, there is a difference between the FEA and the actual experimental results. In actual motors, there is influence on carrier frequency and dead time, and voltage error of inverter. In this paper, we have studied torque control considering driving condition through motor-inverter co-simulation. Moreover, the influence of the controller can be considered. The results of the experiment show that the co-simulation is more similar than only FEA.

Submitters Country

Republic of KOREA

Primary author: OH, Ye Jun (Hanyang University)

Co-authors: JOO, Kyoung-Jin; Mr LEE, Gang Seok (Hanyang Univ.); Mr LEE, Hyungwoo (Korea National University of Transportation)

Presenter: JOO, Kyoung-Jin

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