

Extremum Seeking Approach for Real-Time Self-healing of Position Sensor Offset Error in PMSMs

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Abstract

The inherent advantages of permanent magnet synchronous machines (PMSMs) such as high efficiency have become a reason to use them more often in the industry including safety-critical applications such as transportation electrification. Among the number of factors, the accuracy of the rotor position is a key variable in achieving efficient and reliable field-orientation-based torque regulation. With the reliance on the rotor position signal being high, position sensor fault diagnosis and mitigation facilitates an added layer of safety. The proposed model-free extremum-seeking approach for position sensor fault compensation alleviates the reliance on motor parameters in detecting, quantifying, and compensating for position sensor error, which is known to vary based on various factors, introducing error. The theoretical framework for the proposed approach is presented in this paper along with simulation and experimental validation.

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