"Speed Control of a 3-Phase Induction Motor Based on Robust Optimal Preview Control Theory"

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Abstract

A synthesized method for speed control of a threephase induction motor (IM) based on optimal preview control systemtheory is implemented in this article. An IM model comprisesthree-input variables and three-output variables that coincidewith the synchronous reference frame that is implemented usingthe vector method. The input variables of this model are the stator angular frequency and the two components of the stator spacevoltage vector, whereas the output variables are the rotor angular speed and the two components of the stator space flux linkage. The objective of the synthesized control system is to achieve motor speed control, field orientation control, and constant flux control. A novel error system is derived and introduced into the control law to increase the robustness of the system. The preview feed-forward controller, which includes the desired and disturbance signals, is used to improve the transient response of the system. A space vector pulse-width modulation (PWM) control technique for voltage source-fed IM is prepared for microprocessor-based control. Spectral analysis of the output voltage is evaluated to predict the effect of the proposed space vector modulation technique on the dynamic performance of the IM. The optimal preview controlled system is implemented, and its applicability and robustness are demonstrated by computer simulation and experimental results