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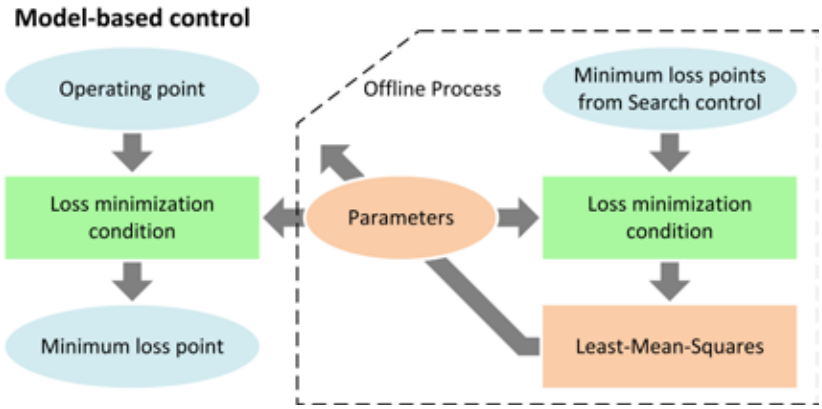
Loss minimization control of three-phase motors



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Summary: Loss minimization control of three-phase motors

Nowadays, three-phase motors are very widely used in many types of applications, such as in the industry, the commercial, residential, agricultural and transportation sectors. Simultaneously, efforts to reduce losses of these motors have also been performed for power saving requirement. To contribute in these efforts, this research work develops optimization control strategies which combine the model-based control technique and the search control technique to minimize electrical losses of induction motors, permanent magnet synchronous motors and synchronous reluctance motors. The strategies focus on establishing the loss minimization condition from the loss model and then combining with optimal results obtained from a search control strategy to determine unknown parameters of this condition. In this way, they can be performed without knowledge of motor parameters.

Also, this book presents a new approach based on the hybrid control technique to minimize copper losses of the externally excited synchronous motor. From the motor model optimal values of current components are defined as an explicit solution. Then, by combining with a search control algorithm, the explicit solution is able to avoid variation of motor inductances due to the magnetic saturation. The advantages of this hybrid control strategy are that it requires no extra hardware and can be easily performed with only knowledge of the ratio between stator- and excitation resistances, which is not seriously affected by variations of the motor temperature.