



# **Development of Modified PWM Technique: To Minimize Torque Ripples in Permanent Magnet Brushless DC Motors**

*Wael Salah*

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## **Development of Modified PWM Technique: To Minimize Torque Ripples in Permanent Magnet Brushless DC Motors** Wael Salah

This book focuses on the torque improvement of the PM BLDC motors by minimizing the generated torque ripples. An extensive review of the applied torque ripple minimization techniques is presented. The torque ripples in BLDC motor drives usually originate from the motor design structure, as well as from the drive side in the forms of current ripples. The torque ripples from the control side appear in the forms of spikes and dips on the output torque which is inherently due to the phase current mismatch during phase current commutation. Practically, the rate of current rise and decay between the phases are not equal, hence, the main concept in this project is to estimate and control the rate of the energized phase current to match the rate the de-energized phase current during current commutations. As a result, the torque ripples will be minimized. A modified PWM strategy is applied to slow-down phase current or to speed-up phase current based on motor speed. A visible reduction of torque ripples is achieved when the modified PWM technique being applied at different loads and speeds with an effective minimization of torque ripples within constant torque region.

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