

عنوان مقاله:

A New Hybrid Predictive-PWM Control for Flying Capacitor Multilevel Inverter

محل انتشار:

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نویسندگان:

P. Hamedani - Department of Railway Engineering and Transportation Planning, University of Isfahan, Isfahan, Iran

M. Changizian - Department of Railway Engineering and Transportation Planning, University of Isfahan, Isfahan, Iran

خلاصه مقاله:

Background and Objectives: Model predictive control (MPC) is a practical and attractive control methodology for the control of power electronic converters and electrical motor drives. MPC has a simple structure and enables the simultaneous consideration of different objectives and constraints. However, when applying MPC for multilevel inverters (MLIs), especially at higher voltage levels, the number of switching states dramatically increases. This issue becomes more severe when MLIs are used to supply electrical motor drives. Methods: This paper proposes three different MPC strategies that reduce the number of iterations and computation burden in a ۳-phase ۴-level flying capacitor inverter (FCI). Traditional MPC with a reduced number of switching conditions, split MPC, and hybrid MPC-PWM control are investigated in this work. Results: In all methods, the capacitor voltages of the FCI are balanced during different operational conditions. The number of iterations is reduced from ۵۱۲ in traditional MPC to at least ۱۹۲ in the split MPC. Moreover, the split MPC strategy eliminates the usage and optimization of weighting factors for capacitors voltage balance. However, in the hybrid MPC-PWM control method in comparison to other methods, the voltage balancing time is much lower, the phase current tracks the reference more accurately, the transient time is lower, and the efficiency is higher. In addition, the capacitors voltage ripple is negligible in the hybrid MPC-PWM control method. Conclusion: Simulation results manifest the effectiveness of the suggested hybrid MPC-PWM methodology. Results manifest that the hybrid MPC-PWM control offers perfect dynamic characteristics and succeeds in maintaining the voltage balance during different operational conditions.

کلمات کلیدی:

(Calculation burden, Delay compensation, Flying capacitor inverter, Hybrid Method, Model Predictive Control (MPC)

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