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Fuzzy Logic Based Fault Tolerant Model Predictive MLI Topology

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Abstract : This work presents a comprehensive study on the employment of Model Predictive Control (MPC) for a three-phase voltage-source inverter to regulate the output voltage efficiently. The inverter is modeled via the Clarke Transformation, considering a scenario where the load is unknown. An LC filter model is developed, demonstrating its efficacy in Total Harmonic Distortion (THD) reduction. The system, when implemented with fault-tolerant multilevel inverter topologies, ensures reliable operation even under fault conditions, a requirement that is paramount with the increasing dependence on renewable energy sources. The research also integrates a Fuzzy Logic based fault tolerance system which identifies and manages faults, ensuring consistent inverter performance. The efficacy of the proposed methodology is substantiated through rigorous simulations and comparative results, shedding light on the voltage prediction efficiency and the robustness of the model even under fault conditions.

Keywords : total harmonic distortion, fuzzy logic, renewable energy sources, MLI
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