ICIEA 2022

16 - 19 Dec 22

Chengdu, China

ICIEA22-000404
Model Predictive Control of Energy-Stored Quasi-Z-Source Inverter Without Weighting Factor

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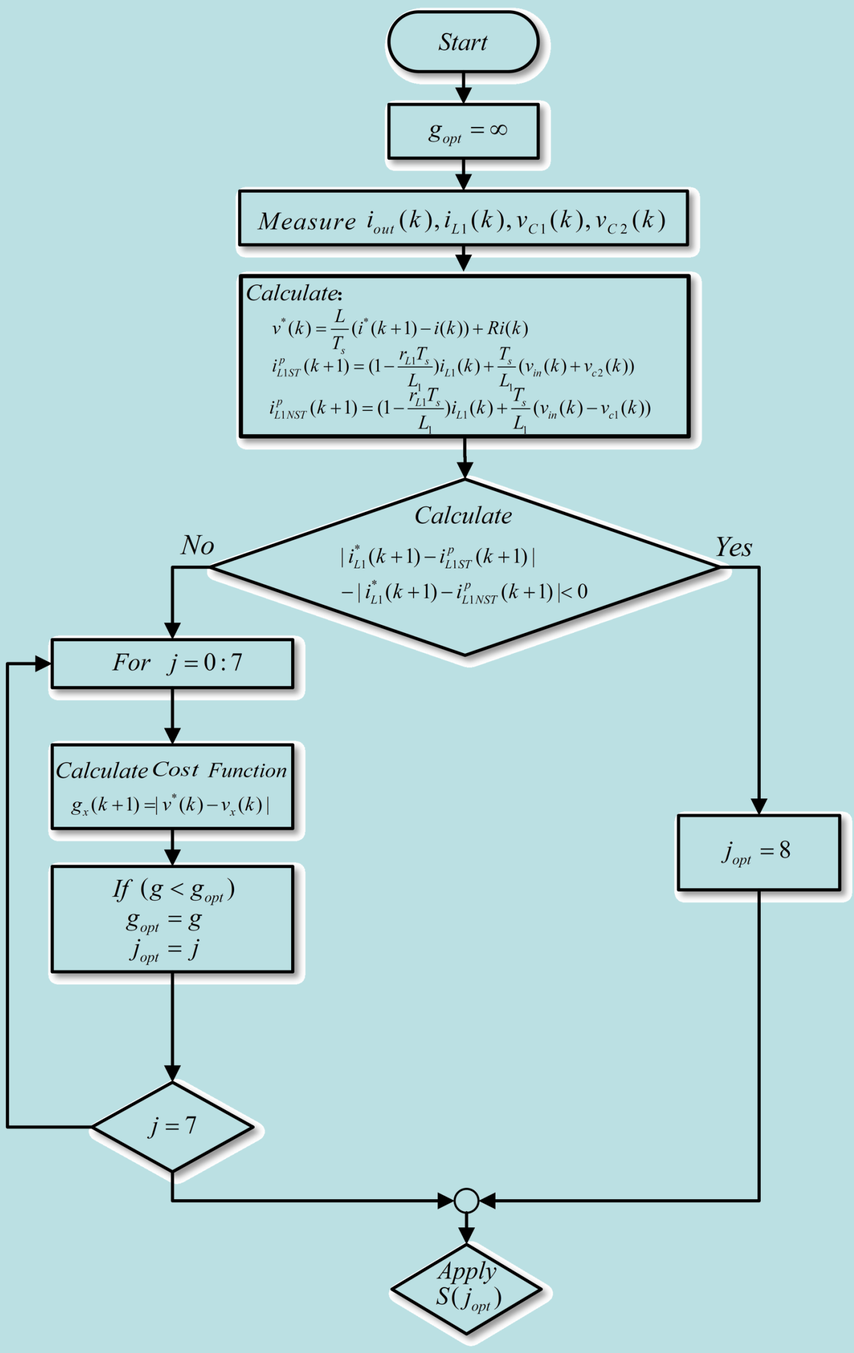
Purpose

- ✓ Cost function for FCS-MPC simplified
- ✓ Reduce the time required for the operating system
- ✓ Enhance the dynamic and static performance of the control system

Method

- ✓ The switching state of the inverter at time instant k is determined by choosing which voltage vector approaches the ”**required voltage vector**”
- ✓ The Shoot-Through or Non-Shoot-Through state is determined by the predicted value of the inductor current.

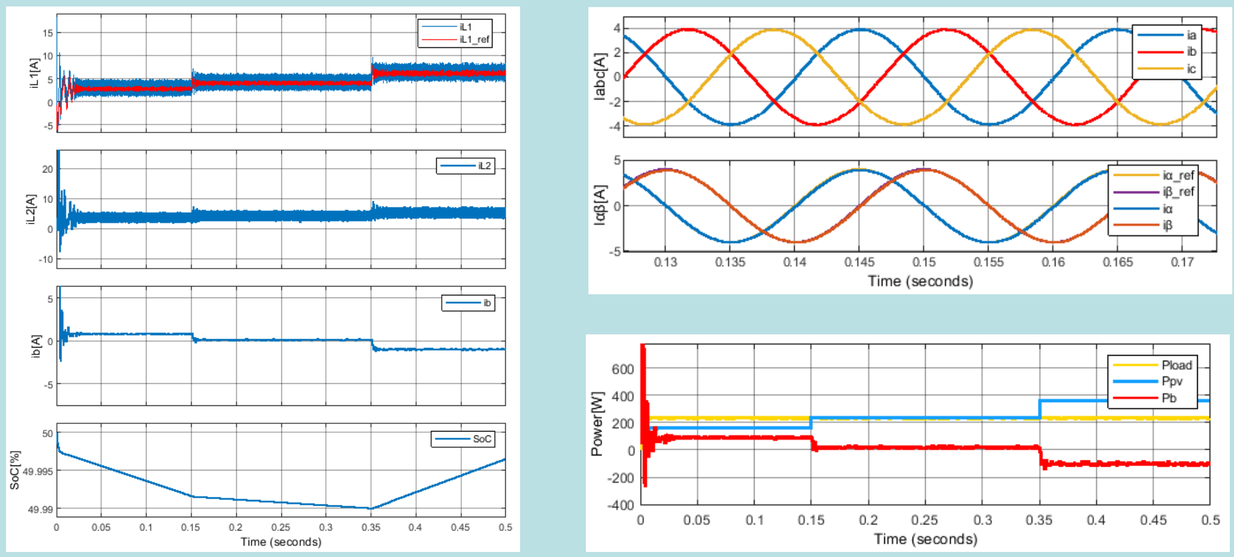


The improved MPC algorithm reduces the computational effort by **68%** compared with the traditional MPC algorithm.

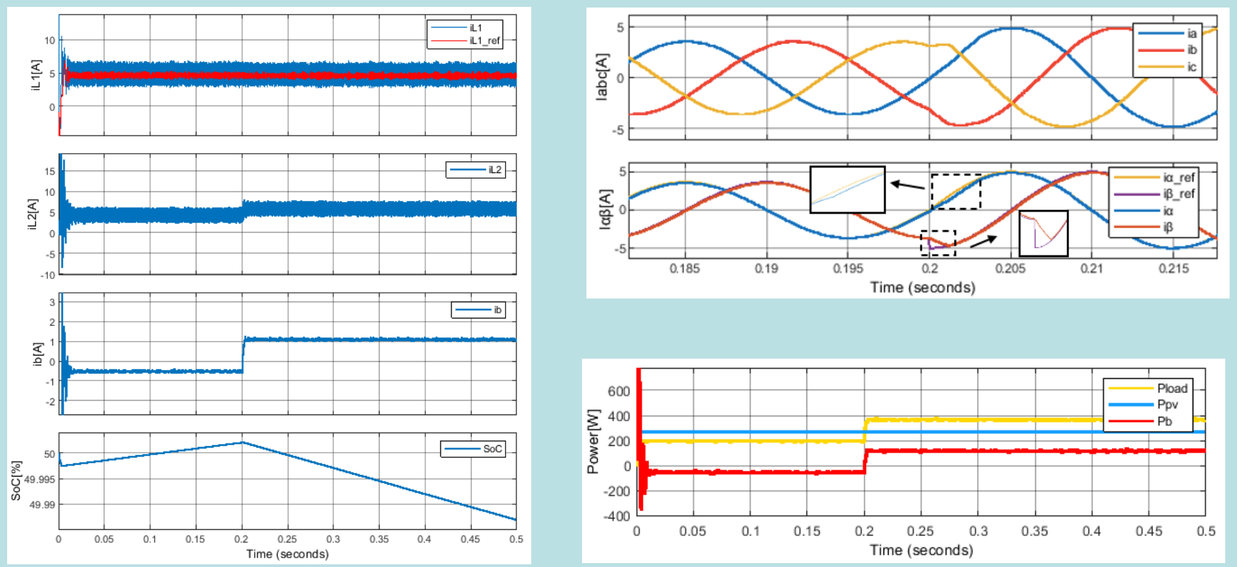
Figure 1 Flowchart of the proposed MPC algorithm

Results

Photovoltaic Power Fluctuation:



Load Power Fluctuation:



Total Harmonic Distortion:

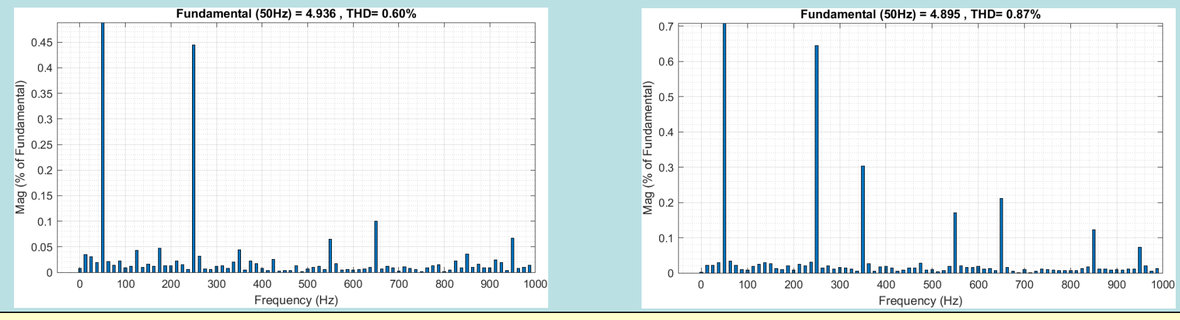


Figure 2 the inductor current of the qZSI network, battery current, and SoC of the battery, Three-phase currents, System power diagram, Load current harmonic spectrum

Summary

This paper proposes an MPC strategy without a weighting factor for ES-qZSI. In the control logic, the inductor currents are controlled independently, and the ST and NST states are selected in advance, thus saving loop calculations and eliminating the weighting factor. Additionally, the voltage vector selection method is used to simplify the cost function and reduce the time required to operate the system. The proposed improved MPC strategy exhibits excellent performance in reducing the THD for the load current and reducing the computational effort required.