Comparison and Analysis of Control Techniques Implemented on Boost Converter for Renewable and EV Application

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Abstract:

This paper focuses on the hardware implementation of boost converter control techniques for renewable and EV application using real-time control dSpace MicroLabBox RT (1202) platform. The Output voltage of boost converter is regulated using Proportional-Integral (PI) control or Fuzzy Logic Control (FLC) at various applications like solar energy integration in agriculture, DC microgrid and Electrical Vehicle (EV) or space craft power system. The simulation of boost converter is built in MATLAB software. The control techniques including to regulate the output voltage, two control strategies Proportional-Integral (PI) and Fuzzy Logic Control (FLC) are implemented to achieve precise output voltage regulation to charge the batteries and other application. The experimental results are captured on 100watt boost converter laboratory prototype. The dSpace is powerful real time controller used to study power electronics devices and electrical drives in laboratories. The proposed work, both PI and FLC techniques are implemented and compared through simulation and experimental hardware results. This paper presents a comparative analysis highlights the performance, response time, steady-state accuracy, robustness and suitability of each control strategy for various real-world applications.

Keywords:

Boost Converter, dSpace MicroLabBox, MPPT, Fuzzy Logic Control (FLC), MATLAB Software, Proportional Integral(P-I) Control, Solar Panel.