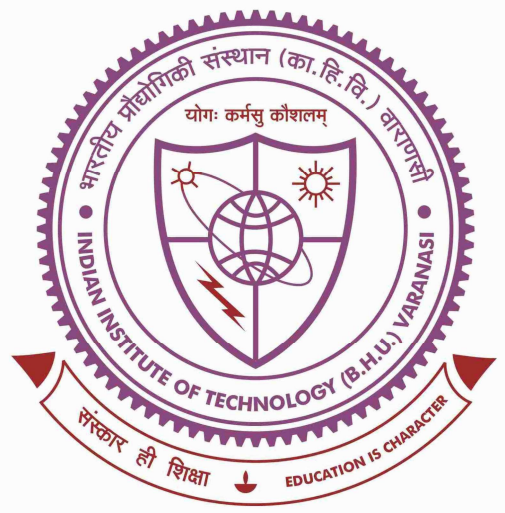
MPPT Design Techniques for Stand-Alone PV System Using SEPIC Converter



Thesis submitted in partial fulfillment
for the award of degree

Doctor of Philosophy

by

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2020

Chapter 5

Conclusions and Future Work

5.1 Summary and Contribution

The MPPT is the important part of any PV system for extracting the available maximum power from the PV module/array at any solar insolation and temperature conditions. A current sensor based MPPT algorithm using a novel ASS method to control the duty-cycle of SEPIC converter is proposed. Due to the linear property of current with insolation change, the proposed MPPT ensures uniform convergence compared to the voltage sensor based one. The same is validated by simulation and experimental results. The presented results show the steady-state power deviation is lesser in the current sensor based algorithm as compared to the voltage sensor based one due to the low sensitivity of the current sensor. Also, the proposed MPPT algorithm has faster tracking time due to a new adaptive step-size scheme proposed. Hence, the proposed technique improves both the transient as well as steady-state responses. The scheme may be extended to a combined voltage and current sensor based scheme where switching function of the voltage and current sensor based algorithms can be combinedly used and benefit of both the schemes can be explored.

An output voltage based MPPT technique is proposed for a standalone PV system with SEPIC converter. The proposed MPPT technique is empowered with adaptive step-size for faster tracking response as compared with fixed step-size techniques. The proposed technique is shown to perform better in tracking responses and thereby yielding better overall efficiency of the system. Simulation comparison for different insolation-level changes demonstrate the efficiency of the proposed technique. Experimental results

obtained using a laboratory prototype also corroborates the same. The technique may further be improve using an appropriately varying scale factor β.

5.2 Future Work

There are a of lot of scope in the solar energy system. In this thesis, modeling of PV system with DC-DC SEPIC converter were developed. These models can be modified taking into account some realistic situations such as grid perturbations etc. Some suggested new directions of the thesis are follows.

- The thesis proposed new MPPT algorithms and their implementations with current sensor based at partial shading conditions for standalone as well as grid connected PV systems.
- Also, it is proposed to use this technique along with soft computing techniques for enhancing the transient response of PV systems under partial-shading conditions similar to the works in [123, 124].
- The distributed MPPT and battery charge controller can be further investigated by considering the load voltage and state of the charge of battery under uniform and partial shading conditions.