Systematic Study of Maximum Power Point Tracking Methods Used in Photovoltaic-Based Systems

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Abstract Photovoltaic (PV) systems use maximum power point tracking (MPPT) devices for extracting maximum power from solar panel irrespective of dynamic change in temperature and irradiance. In this paper, concise and organized assessment of numerous maximum power point (MPP) methods is discussed that encompasses the perturb and observe (P&O), open–circuit voltage (OCV), incremental conductance (IC) approach, neural network approach (NN) and the fuzzy logic method (FLC). The MPPT strategies are assessed on the bases of simplicity, speed, implementation cost and performance under partial shading condition (PSC); therefore, the right literature review is crucial while designing photovoltaic systems. The comparison of various MPP tracking algorithms is likewise given. Further, mathematical modeling of current equations of solar cell is also done. Moreover, the workability of perturb and observe MPPT is tested in MATLAB/Simulink and results carried out are also given.

Keywords PV systems · MPPT methods

1 Introduction

The development of the country is largely dependent on successful production and supply of electricity. In "1950," India started the electrification program in rural areas to improve the standard of life and improve economic development [1–6]. Harvesting solar energy for clean electricity helps in improving various sectors such

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