

ABSTRACT

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Growing concern about environmental issues caused by the use of environmentally harmful fossil fuels has stimulated research into the spread of so-called green energy sources. Among them, the photovoltaic energy, also known as photovoltaic system (PV system), stands out for the possibility of being used both on a large scale and on a small scale, as for example, PV-household applications. An important feature of the PV system is the possibility of being dynamically conditioned to produce its maximum energy. For this purpose, these sources are used together with power converters controlled by MPPT (Maximum Power Point Tracking) algorithms. Currently, one of the bottlenecks in the use of photovoltaic energy lies in the effect of partial-shading effect due to different causes as, for example, by leaves or objects falling on the panels. As a consequence, the power x voltage characteristic curve may present local maximum points and a global maximum point. In this context, this work proposes a hybrid solution using Particle Swarm Optimization (PSO) and Incremental Conductance algorithms in a complementary way, so that the resulting algorithm is able to identify the global maximum point in any situation, provided there is a prior knowledge of the domain to be traced. Further details of this method, based on particle swarm optimization, are presented throughout the paper. Simulation results involving different test cases are presented with the objective of observing the performance of the proposed algorithm.

Keywords: Photovoltaic system; Energy Generation; Partial shading; Maximum Power Point Tracking; Particle Swarm Optimization; Solar power generation; Iterative algorithms; Global Maximum Power Point Tracking; GMPPT.