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A HIGH EFFICIENT SOLAR STREET LIGHTING SYSTEM USING HYBRID MPPT TECHNIQUE

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Abstract

Solar photovoltaic is considered as one of the popular sources of renewable energy due to several advantages, notably low operational cost, almost maintenance free and environmental friendly. To extract maximum power from the PV modules, Maximum Power Point Tracking (MPPT) technique is normally employed. In conventional method, PSO and P&O are used to obtain Maximum Power Point (MPP). However, this method faces challenges such as long convergence time, steady state oscillations and less efficiency. This paper proposes a hybrid MPPT method which combines Perturb & Observe (P&O), Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) algorithms. By this approach, the convergence time is reduced, steady state oscillations are minimized, and efficiency is further increased. Nowadays solar energy is most widely used for street light application and the proposed hybrid MPPT is implemented for street lighting application. The excellent performance of the proposed hybrid MPPT method is verified by comparing it against the combined P&O and PSO method using simulation. The simulation results enumerated the advantages of the proposed hybrid MPPT such as fast-tracking speed; locating MPP for any environmental variations; and increased efficiency.

Keywords: Maximum Power Point Tracking, Perturb & Observe, Genetic Algorithm, Particle Swarm Optimization, Solar street lighting.