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Solar MPPT using fuzzy logic and adaptive mutation

The growing demand for green energy has motivated researchers to explore various clean energy sources like wind energy and solar energy. Among all of the renewable energy resources, solar energy is used the most because of its efficiency and abundance. Most recently the use of photovoltaic (PV) cells has significantly increased in both grid-connected and standalone inverter systems. However, the performance of PV cells is strongly depends on the environmental factors like solar irradiation. To increase the efficiency of solar PV systems we can make use of Maximum Power Point Tracking (MPPT) techniques. This paper introduces a novel MPPT approach that integrates a fuzzy logic controller with adaptive mutation. Conventional fuzzy logic-based MPPT algorithms perform well under variable environmental conditions, but they depend on fixed membership functions and static fuzzy rule sets. In order to overcome this limitations, we propose a method which uses adaptive mutation to dynamically adjust fuzzy parameters, ensuring optimal duty cycle generation.

keywords: MPPT, Renewable energy resources, Adaptive mutation, fuzzy logic

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