Abstract

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Improved performance low-cost incremental conductance PV MPPT technique

Variable-step incremental conductance (Inc.Cond.) technique, for photovoltaic (PV) maximum power point tracking, has merits of good tracking accuracy and fast convergence speed. Yet, it lacks simplicity in its implementation due to the mathematical division computations involved in its algorithm structure. Furthermore, the conventional variable step-size, based on the division of the PV module power change by the PV voltage change, encounters steady-state power oscillations and dynamic problems especially under sudden environmental changes. In this study, an enhancement is introduced to Inc.Cond. algorithm in order to entirely eliminate the division calculations involved in its structure. Hence, algorithm implementation complexity is minimised enabling the utilisation of low-cost microcontrollers to cut down system cost. Moreover, the required real processing time is reduced, thus sampling rate can be improved to fasten system response during sudden changes. Regarding the applied step-size, a modified variable-step size, which depends solely on PV power, is proposed. The latter achieves enhanced transient performance with minimal steady-state power oscillations around the MPP even under partial shading. For proposed technique's validation, simulation work is carried out and an experimental set up is implemented in which ARDUINO Uno board, based on low-cost Atmega328 microcontroller, is employed.