

عنوان مقاله:

Maximum Power Point Tracking Using State-dependent Riccati equation based Model Reference Adaptive Control

محل انتشار:

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خلاصه مقاله:

In this paper, an adaptive control method is proposed for maximum power point tracking (MPPT) in photovoltaic (PV) systems. For improving the performance of an MPPT, this study develops a two-level adaptive control structure that can decrease difficulty in system control and efficiently handle the uncertainties and perturbations in the PV systems and the environment. The first control level is a ripple correlation control (RCC), and the second level is a model reference adaptive control (MRAC). This paper emphasizes mainly on designing the MRAC algorithm, which improves the underdamped dynamic response of the PV system. The original state-space equation of PV system is time-varying and nonlinear, and its step response contains oscillatory transients that damp slowly. Using the extended state-dependent Riccati equation (ESDRE) approach, an optimal law of the controller is derived for the MRAC system to remove the underdamped modes in PV systems. A algorithm of scanning the P-V curve of the PV array is proposed to seek the global maximum power point (GMPP) in the partial shading conditions (PSCs). It is shown that the proposed control algorithm enables the system to converge to the maximum power point in milliseconds in partial shading conditions.

کلمات کلیدی:

PV systems, Ripple correlation control, Model Reference Control, State-dependent Riccati equation, Partial shading conditions

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