MPPT algorithms selection in the photovoltaic system under partial shading conditions using the impulse interactions

Abstract

Maximum Power Point Tracking (MPPT) algorithms are used to increase the energy production from photovoltaic cells. Since the amount of available light, temperature, shading, and load characteristics can change during the day, the algorithm has to continuously search the power-voltage characteristics of the system to obtain the best performance.

The dissertation describes the research conducted by the author, which is the process of developing a maximum power point tracking algorithm based on pulse interactions. The main objective of the work was to prove the validity of the thesis concerning the application of impulse interactions in order to increase the efficiency of the entire energy harvesting system. The author presents the most important information and problems related to the tracking of the maximum power point under partial shading conditions. He presents the results of real partial shading analysis obtained from the measurement system and the partial shading profile that he used to verify different MPPT algorithms. The dissertation describes the specifics of numerical modeling of photovoltaic modules considering the nonlinear capacitance and presents an extended model of a photovoltaic module. The work presents the method of estimating the model parameters based on the data provided by the panel manufacturers. The last section of the dissertation presents the author's maximum power point tracking algorithm, which selects the MPPT tracking algorithm based on the system response. The last section of the work contains a discussion of the results obtained and a description of the conclusions reached by the author.

Mateusz Bartczak