INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Development of New MPP Estimation Schemes and Maximizing the Power Generation of a PV array Under Partial Shading Conditions

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SHORT ABSTRACT

This thesis presents the new maximum power point (MPP) estimation schemes for a single diode model (SDM) and double diode model (DDM) photovoltaic (PV) module under different environmental conditions (DEC). It also addresses maximizing the power generation of a PV array under partial shading conditions (PSC). The main contributions of the thesis are given as follows:

1. A robust estimation of MPP of a single diode model (SDM) and double diode model (DDM) PV module under different solar irradiation and temperature conditions has been proposed, and the estimation of MPP of a PV array is carried out by using Levenberg-Marquardt (LM) algorithm based on its characteristic equation.
2. A novel approach for the conversion of I-V relationship of a PV module from an implicit function into an explicit function, i.e., current is a function of voltage only for the simple and accurate estimation of the MPP of a PV module under DEC has been proposed.
3. A Futoshiki puzzle pattern for the arrangement of the modules of a PV array under PSC has been proposed for the power enhancement with respect to the total cross tied (TCT) configuration. Also minimized the miss match losses of the PV array in the Futoshiki configuration with respect to the TCT configuration under different shading conditions.
4. A generalized algorithm for the physical relocation of the modules with a fixed electrical connection (PRM-FEC) in the TCT configuration of a PV array under different shading pattern has been proposed for the power improvement with respect to the TCT configuration.