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COMPARATIVE STUDY OF MAXIMUM POWER POINT TRACKING USING LINEAR KALMAN FILTER & UNSCENTED KALMAN FILTER FOR SOLAR PHOTOVOLTAIC ARRAY ON FIELD PROGRAMMABLE GATE ARRAY

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ABSTRACT: ***The paper proposes comparative study of Field Programmable Gate Array implementation of 2 closely related approaches to track maximum power point of a solar photovoltaic array. The current work uses 2 versions of Kalman filter viz. linear Kalman filter and unscented Kalman filter to track maximum power point. Using either of these approach the maximum power point tracking (MPPT) becomes much faster than using the conventional Perturb & Observe approach specifically in case of sudden weather changes. In this paper comparative analysis of both the algorithms being implemented on FPGA is presented. Experiments have been performed under optimal conditions as well as under cloudy conditions i.e. falling irradiance levels. Using the linear Kalman filter the maximum power point of a solar PV array has been tracked with an efficiency of 97.11% while using the unscented Kalman filter technique the maximum power point of the same solar PV array is tracked with higher efficiency of 98.3%. However, the***

maximum power point has been tracked at a much faster rate i.e. 4.5 ms using the linear kalman filter approach as compared to the unscented kalman filter approach which tracks maximum power point at 11 ms which is in turn faster than existing generic Perturb and Observe approach which takes 15ms to track the maximum power point . The system has been implemented on Altera EP2C20F484C7 FPGA board.

Index Terms: Maximum Power Point Tracking (MPPT), Kalman Filter, Unscented Kalman Filter, Perturb and Observe (P&O), Photovoltaic (PV), FPGA.