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A New Approach on Maximum PowerPoint Tracking For Photovoltaic System

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***Abstract*—** Photovoltaic (PV) offers an environmentally friendly source of electricity, which is however still relatively costly today. The maximum power point tracking (MPPT) of the PV output for all sunshine conditions is a key to keep the output power per unit cost low for successful PV applications. This paper presents various methods and its description of MPPT techniques with their advantages and complexities.

1. INTRODUCTION

With the advancement in technologies, the most of world's needs depends on energy consumption. In a parallel definition it is considered to be the backbone of any country's economic growth. Hence forth energy development focuses on the maximum exploitation of sources available. It is well known fact about the distribution of energy supplements available across the globe. Due to discreet distribution of resources in atmosphere and also the consistency in supplies, multiple sources of resources exist to survive the needs of an area.

Depending on the availability and their nature the energy resources are classified in two broad categories:

a. Renewable Energy Resources
b. Non- Renewable Energy Resources.

Solar Energy-

Solar energy, the electromagnetic radiations in the form of light and heat energy from the sun, is commercialized using a range of ever-evolving technologies such as solar heating, solar photovoltaics, solar thermal electricity, solar architecture and artificial photosynthesis.

Solar technologies are broadly classified in their characteristics as they are either passive solar or active solar depending on the way they capture, convert and distribute solar energy. Active solar techniques include the use

of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal massor light dispersing properties, and designing spaces that naturally circulate air.

The energy received from the sun gets reflected back up to 30% in space. The rest energy is stored by the upper clouds, massive water bodies and land masses. The solar energy is considered to be the source energy for the existence of life cycle. It is solely responsible for every single bio-activity surviving on this planet. From the photosynthesis in crops to arising of clouds to carry water droplets are activities of sun.

The human controlled approach of solar energy began long ago. Some small scale utilization of solar energy for home purpose included heating of water bucket in sun, drying of clothes, heating the food. With passage of time, better methods were developed for the efficient use of solar energy. Solar water heaters, solar cookers, solar water purifiers, solar cells came into existence. However the solar energy is highly un-uniform at most of the geographical locations for example: mountains do not get sufficient solar energy for domestic purposes, cloudy day and winters have lower temperature for devices to work hence the applications working on solar power are powerful in some areas and useless in others.

With the evolution of renewable energy resources use of solar energy to produce electricity has boosted in the past years. Large fields of photo-voltaic plants are placed at sunny places covering major of part of their day with intense sun radiations.

Maximum Power Point Tracking

The amount of power generated by a PV depends on the operating voltage of the array. A PV's maximum power point (MPP) varies with solar insulation and temperature. It's V-I and V-P characteristic curves specify a unique operating point at which maximum possible power is presented in the output. At the MPP, the PV operates at its highest efficiency. Therefore, many methods have come into existence to determine MPP Tracking. For example: Ibrahimm and Housing employed the look-up table on a microcomputer, to track MPP, Midya et al. applied a dynamic MPP tracker to PV appliances Enslin and Snymam suggested the concept of "perturb and observe" (P&O), alternatives of the same have been recently presented. Koutroulis et al.and Hussein et al. offered the incremental conductance (Inc Cond.) technique, since when, enhanced Inc Cond. techniques have been proposed. Several investigations have recently applied three point weight comparison, short current pulse, fuzzy logic to resolve this problem.

Permutation and Observation Method

Following equation describes the change in power of a PO technique:

$$\Delta P = P_k - P_{k-1}$$

If the change of power defined by above equation is positive, the system will keep the direction of the incremental current (increase or decrease the PV current) as the same direction, and if the change is negative, the system will change the direction of incremental current command to the opposite direction. This method works well in the steady state condition (the radiation and temperature conditions change slowly). However, the P&O method fails to track MPP when the atmospheric condition is rapidly changed.

2.Proposed Methodology

Since MPPT using P&O method takes a much time for set Maximum power point. So, to increase the response time we are proposing a novel technique. Very first we observe P & O method carefully, By the analysis it is clear that for a configured system the value of the reference(Ire) is fix for every value of insulation. So by putting a test in MATLAB environment we created a table which has columns, one is value of sun irradiation and other one is corresponding value of Ire.

So for simulation we put these values in a 2D lookup table, and replace the P&O block with this 2D-lookup table as shown below:

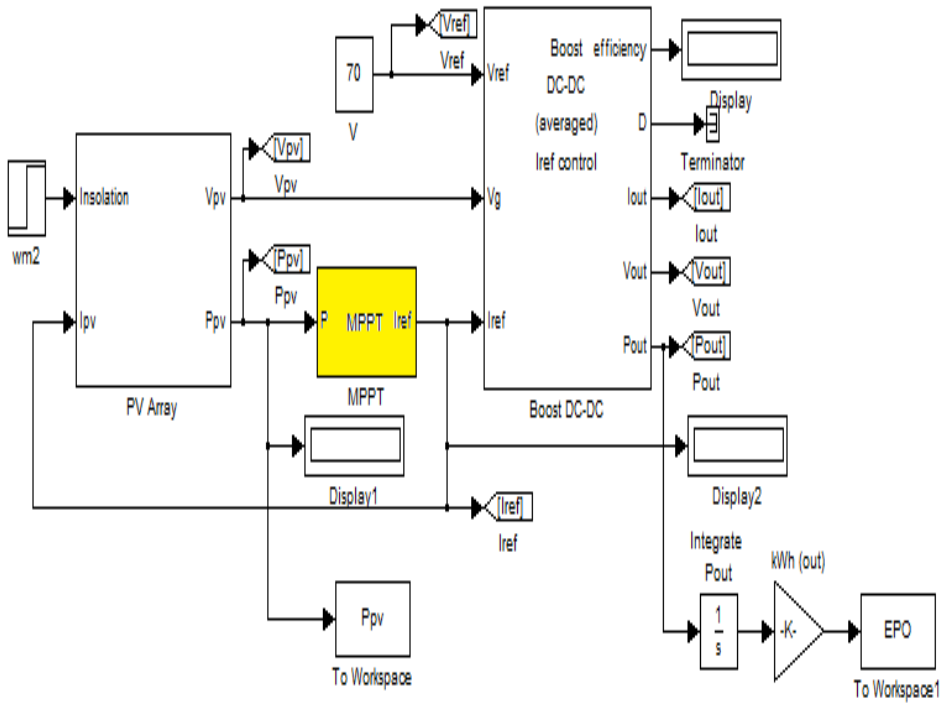

Figure1: showing the replacement of MPPT

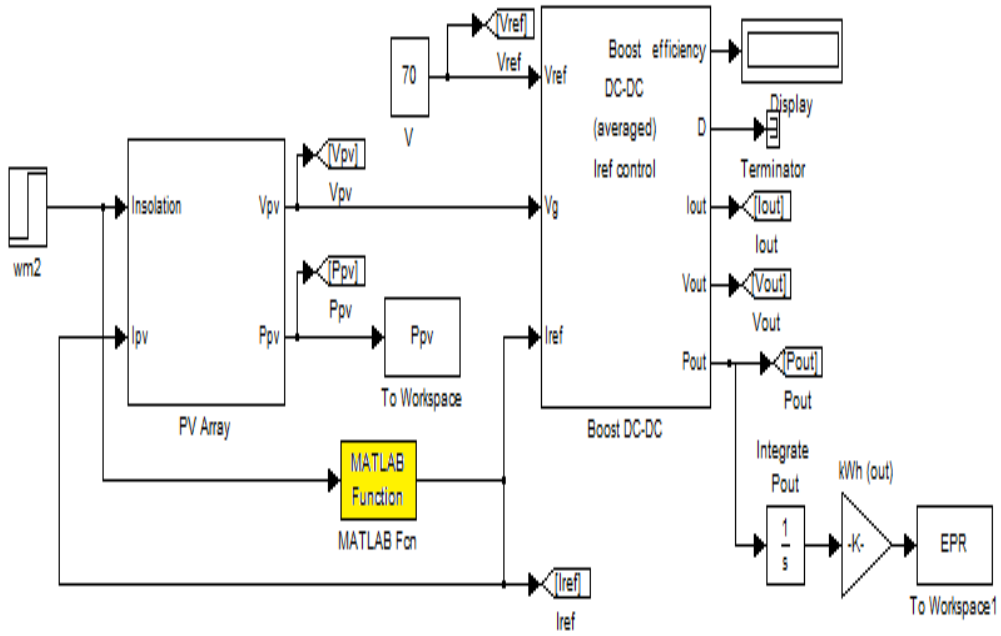

Figure2: showing the replacement of Lookup table

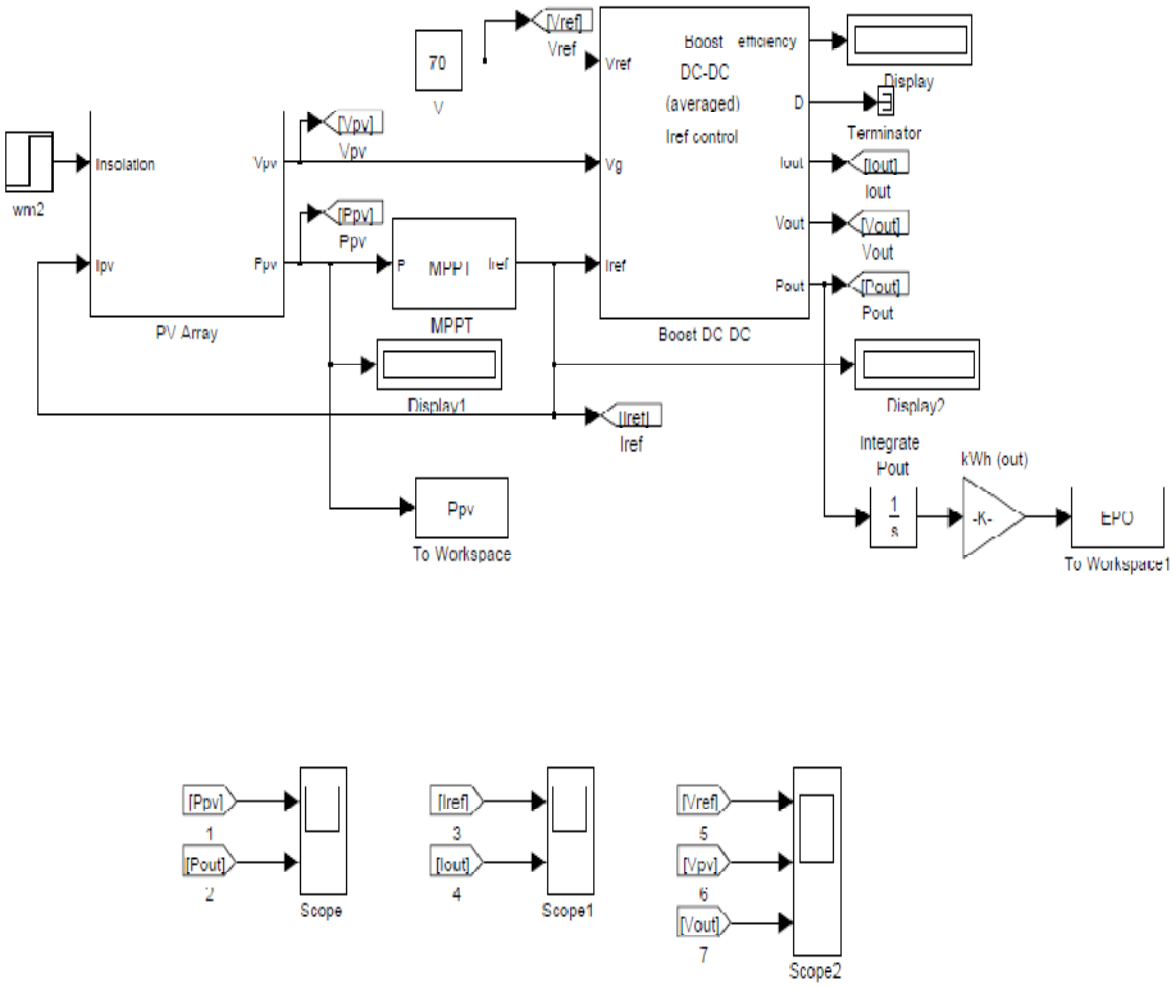

Figure:3 Simulation Model for P&O Method

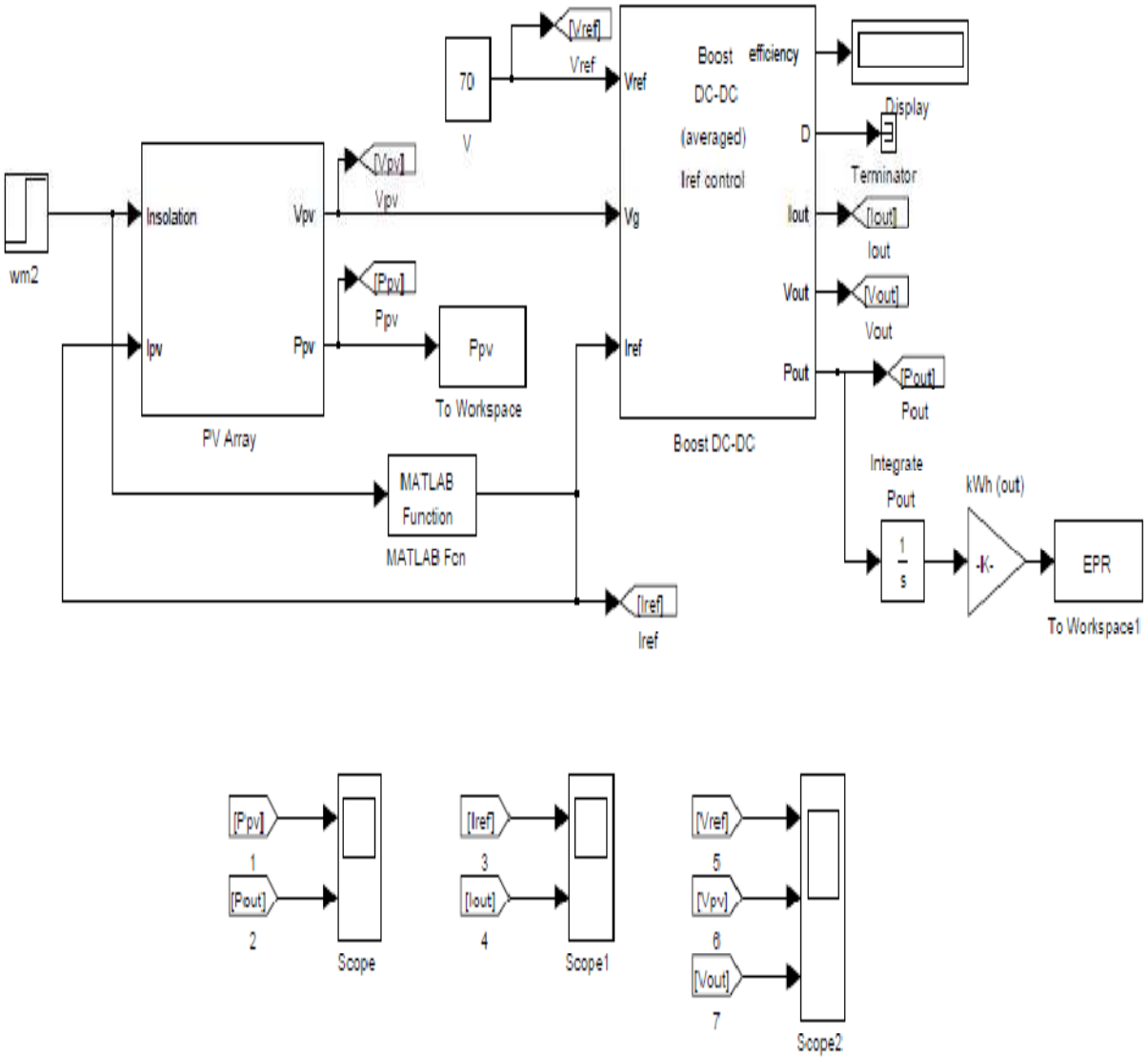

Figure:4 Simulation Model for Proposed Method

3.Result and Simulation

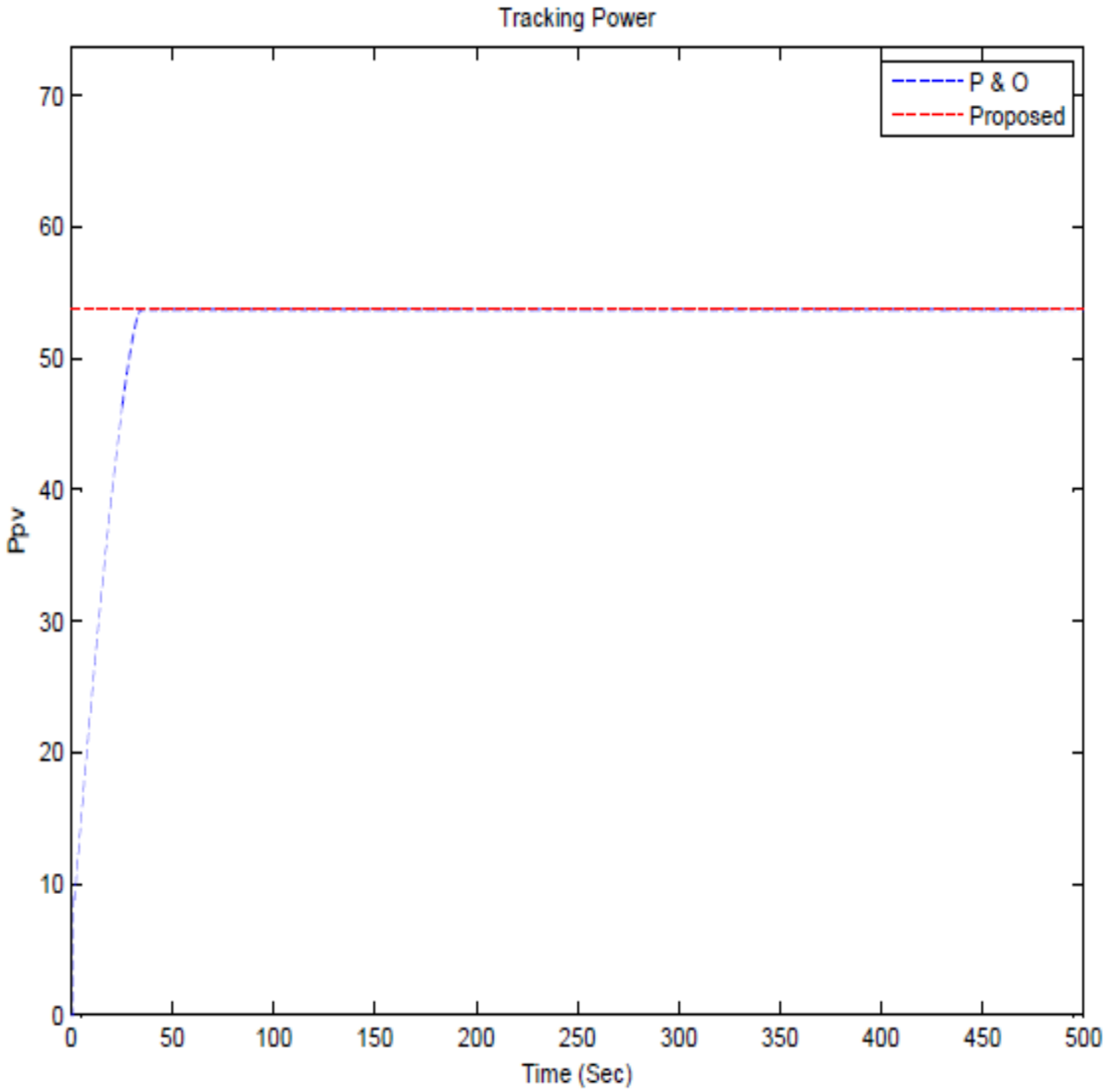

Figure:5 Energy Graph of P&O Method and Proposed Method at insolation = = 600

For P&O: 0.42558 kWh

Proposed Method: 0.43566 kWh

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