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MODEL OF SOLAR PV MODULE AND MPPT TECHNIQUES IN SIMULINK ENVIRONMENT

Nazeer Ahmed Ansari,Neel Kamal
Department of Electrical Engineering
Noida International University
Greater Noida, U.P.

ABSTRACT

This paper presents the concept of getting maximum power from the photovoltaic array using MPPT techniques (incremental and P & O) as solar energy is available in abundance from very beginning of our human civilization , which turned out to be the ultimate source of energy. The objective of this paper is to provide concepts to enhance the low efficiency of photovoltaic array.

KEYWORDS: MPPT Techniques, Simulink,

1: INTRODUCTION

A photovoltaic system is a system which converts sunlight into electricity. The basic device of a photovoltaic system is the photovoltaic cell. Cells may be grouped to form panels or modules. Panels can be grouped to form large photovoltaic arrays. The term *array* is usually employed to describe a photovoltaic panel (with several cells

Connected in series and/or parallel) or a group of panels Most of time one are interested in modeling photovoltaic panels, which are the commercial photovoltaic devices. This paper focuses on modeling photovoltaic modules or panels composed of several basic cells. The term *array* used henceforth means any photovoltaic device composed of several basic cells. In the Appendix at the end of this paper there are some explanations about how to model and simulate large photovoltaic arrays composed of several panels connected in series or in parallel. All though solar cells prices were very expensive at the beginning, they become cheaper during last decade due to developing manufacturing processes, so that it is expected that the electricity from PV arrays will be able to compete with the conventional ones by the next decade. Since a PV array is an expensive

System to build and the cost of electricity from the utility grid, the user of such an expensive system naturally wants to use all of the available output power. Therefore, PV array systems should be designed to operate at their maximum output power levels for any temperature and solar irradiation level at all the time.

The first purpose of this paper is to present a brief introduction to the behavior and functioning of a PV device and write its basic equations, without the intention of providing an in depth analysis of the PV phenomenon and the semiconductor physics. The introduction on PV devices is followed by the modeling

And simulation of PV arrays, which is the main subject of this paper.

The performance of a PV array system depends on the operating conditions as well as the solar cell and array design quality. The output voltage, current and power of PV array vary as functions of solar irradiation level, temperature and load current. Therefore the effects of these three quantities must be considered in the design of PV arrays so that any change in temperature and solar irradiation levels should

Not adversely affect the PV array output to the load/utility, which is either a power company utility grid or any stand alone electrical type load. Salamh and Dagher have proposed a switching system that changes the cell array topology and connections or the structural connections of the arrays to establish the required

Voltage during different periods of a day The PVA model proposed in this paper is circuitry based model to

be used with simulink.

2: OBJECTIVE

The objective of this paper is to improve the efficiency of photovoltaic array by using incremental and P&O techniques.

To present the comparison of the techniques so as to understand them in a better way and ease the readers for the better result

3: MODELING OF PV ARRAY

An ideal solar cell can be considered as a current source with current produced directly proportional to solar radiations falling on it. The practical behavior of cell is deviated from ideal due to the optical and electrical losses. The single diode equivalent circuit of solar cell is represented in fig.1. The optical loss is represented by current source itself, where generated current is proportional to light input. The recombination losses are represented by diode connected parallel to current source, but in reverse direction as recombination current flows in the opposite direction to light generated current [1]. The ohmic losses in the cell occur due to the series and shunt resistance denoted by Rs & Rsh respectively. The series resistance is resistance offered by the solar cell in the path of current flow.

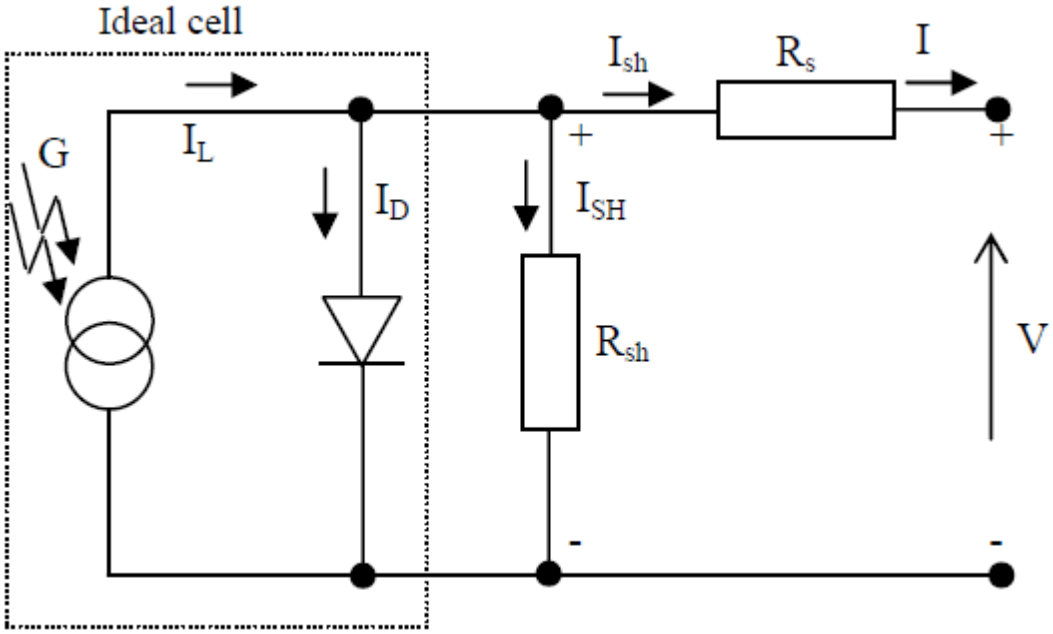

Fig: equivalent circuit for PV cell

The other practical work is going on and it will soon be publishing in the next papers.

These are the few work related to my work which may give you idea to proceed further.

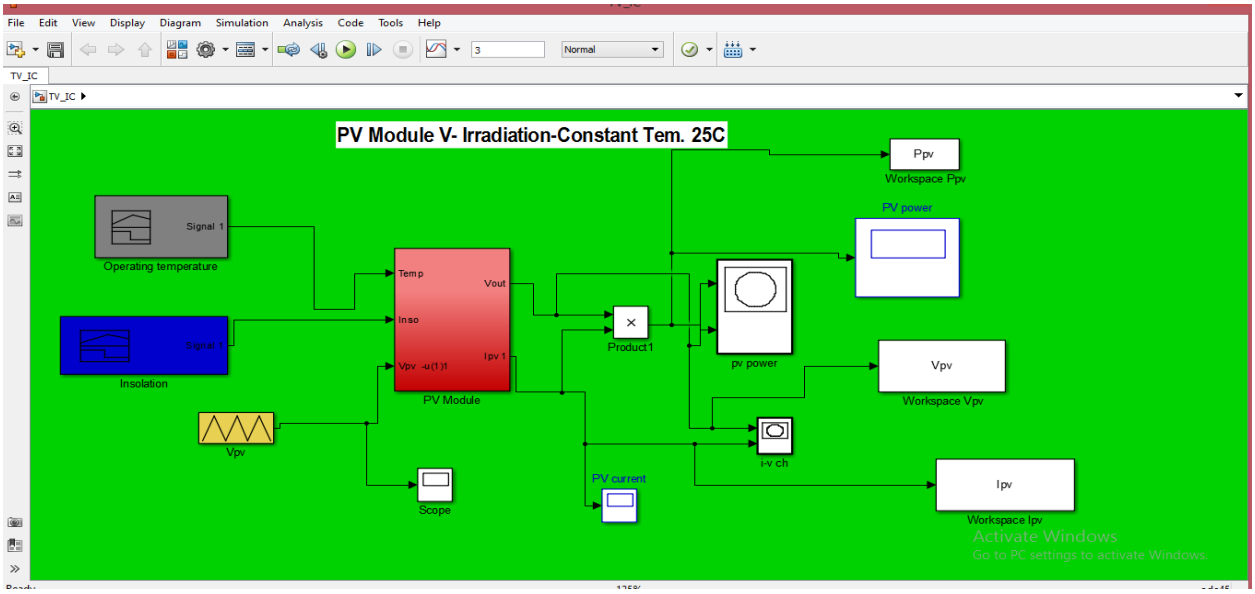

Fig: Irr-var,temp-constant

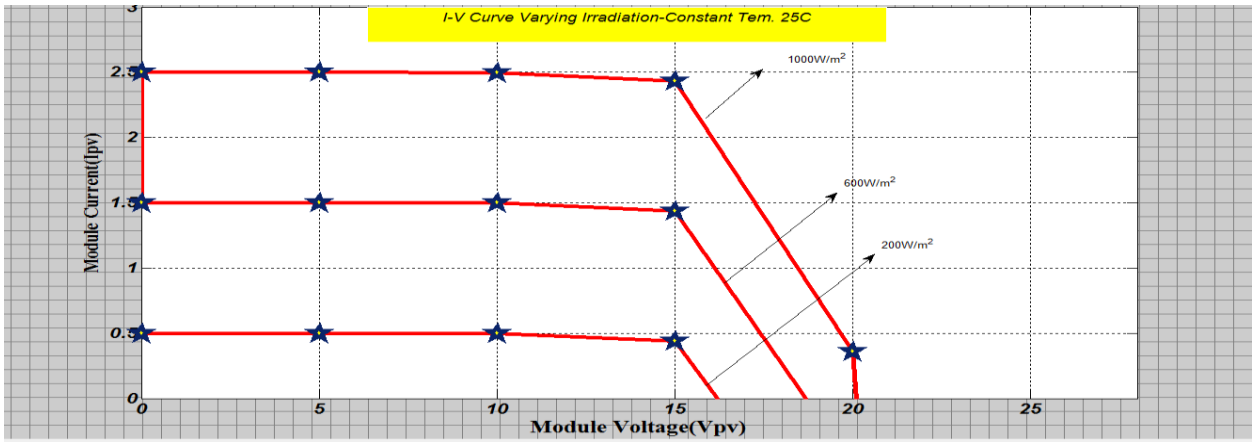

Fig: I-V curve

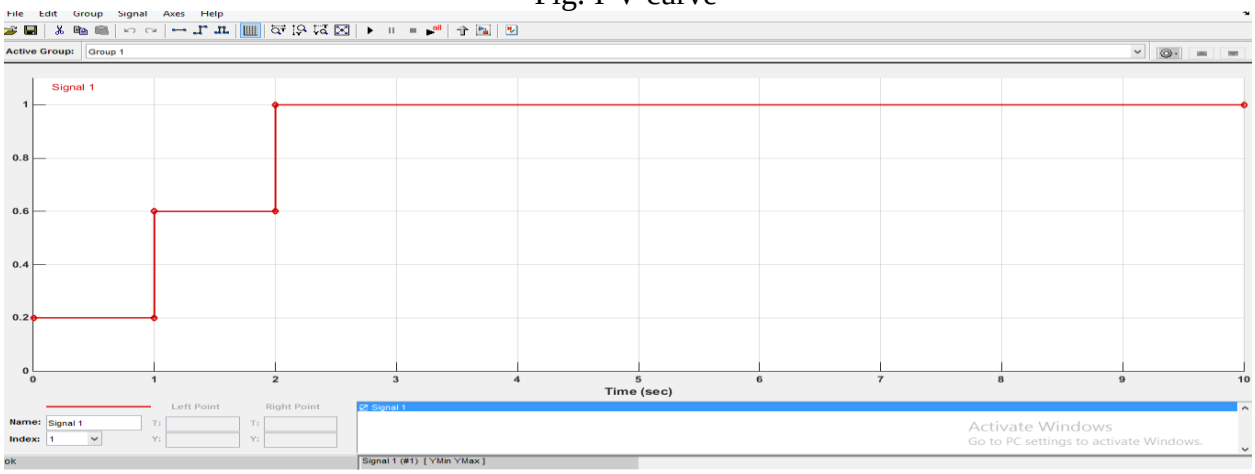

fig: Isolation diagram

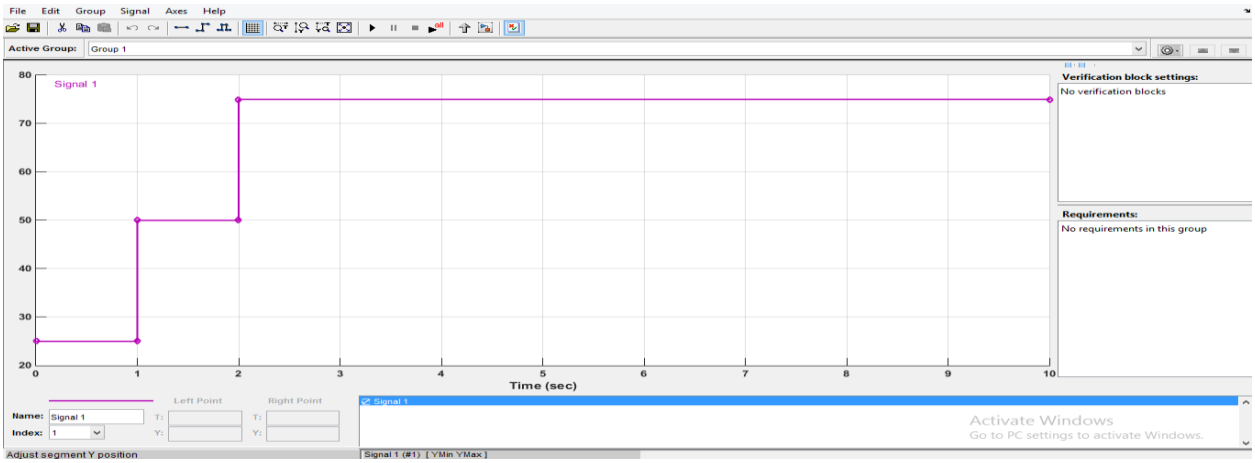

Fig: operating temperature.

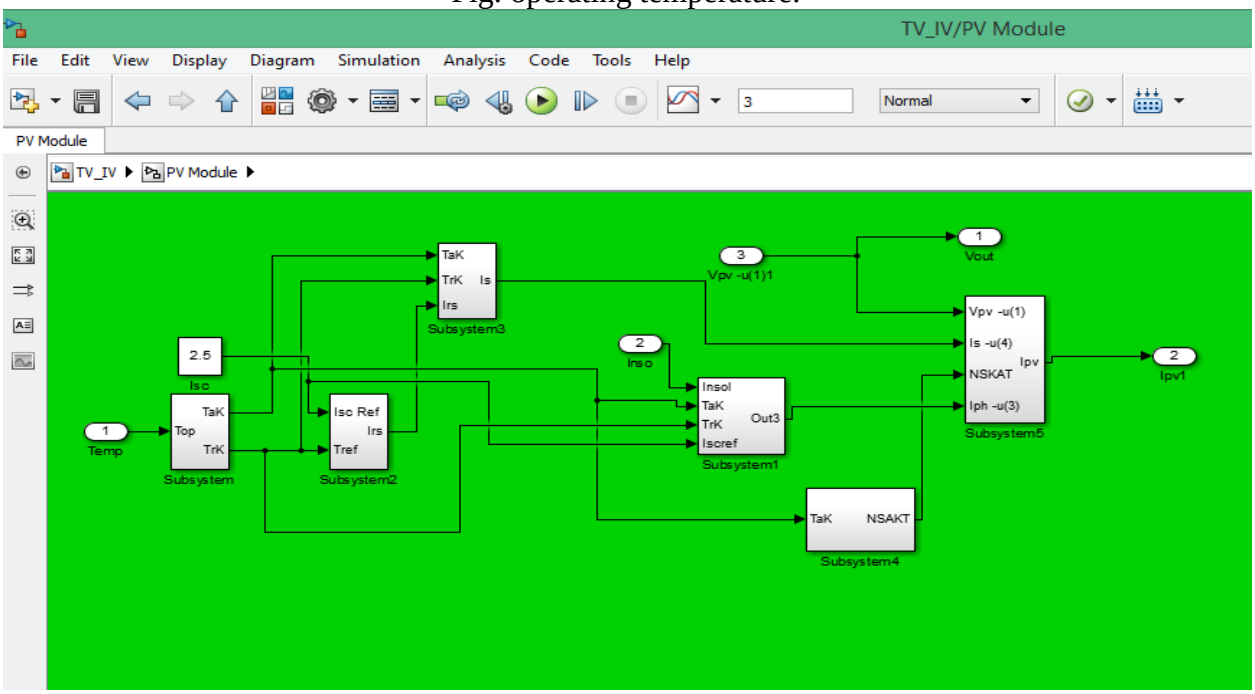

Fig:PV module

4: CONCLUSION

The I-V and P-V characteristics of module are obtained using the MATLAB/Simulink for different values of insulations. The P-V characteristics are also obtained using the M-file with Incremental Conductance method. It is observed that the characteristics obtained using both methods are matching with the theoretical Also the module voltage Vmp and Current I power Pmax are obtained which are fairly same as indicated by the manufacturer of solar panel. Thus the proposed simulation model in conjunction with MPPT algorithm can be used with DC-DC Boost converter to obtain the required dc voltage to supply the dc load.

5: REFERENCE

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