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IMPLEMENTATION OF MATLAB TO EFFICIENCY OF STANDALONE PV CELL THROUGH HC ALGORITHM AND TRANSCONDUCTANCE

Ashutosh Kumar[1], Vikas Janjria[2]
Department of Electrical Engineering, Ganga Institute of Technology and Management, Kablana, Haryana, India

Abstract: This research can be used to analyze the evolution of the MPPT algorithm (tracking the maximum power). This thesis provides modeling and simulation for maximum power point (MPPT) for climbing (HC) using the new Single Induction Inductor (SEPIC). This research first presents a practical example of photovoltaic cells through which the optical matrix model is obtained. The HC algorithm is used to track the maximum power of the solar panel. The MPP of the solar panel is different with irritation and temperature. The improved SEPIC adapter is used from DC to DC with respect to PV arrays to maximize the operation of the power point and maintain the constant output voltage. In this enhanced enhancer, two inductors are used to feed the load through two independent converters. The entire system is simulated using MATLAB /Simulink and simulation results are presented.

Key Area: PV Stand Alone, MMPT technique, Tran conductance, MATLAB

I. INTRODUCTION

1.1 Introduction of Photovoltaic System

Solar cells turn sunlight directly into electricity. Solar cells are often used to charge calculators and watches. They are made of semi-conductor materials similar to those used in computer chips. When sunlight absorbs these materials, solar energy releases electrons from their atoms, allowing electrons to flow through the materials to produce electricity. The process of converting light (photons) is called photovoltaic (PV) electricity. Solar cells are typically integrated into units containing approximately 40 cells; many of these units are mounted on PV panels that can measure several meters on each side. These flat PV arrays can be mounted at a fixed angle to the south, or can be mounted on a sun tracking device, allowing them to capture as much sunlight as possible throughout the day. Many conductive photovoltaic matrices can provide sufficient power for the home; for large electrical applications or industrial applications, hundreds of matrices can be connected to one large photovoltaic system

1.2 Solar Cell

The best photovoltaic cells are known as a way of generating electricity using solar cells to convert the sun's energy into an electron flow. The photoelectric effect refers to the photons of the electron that raise the light in a higher energy state, allowing it to function as an electric charge carrier. The photoelectric effect was first observed by Alexander-Edmund Beckerle in 1839. The photovoltaic term refers to the neutral mode of operation of the photocurrent diode in which the current through the entire device returns to the light energy of the transformer. Almost all photovoltaic devices are a type of photovoltaic diode. Solar cells produce electricity from the direct current of sunlight that can be used to power equipment or to recharge the battery. The first practical application of photovoltaic cells was the use of satellites in orbit and other spacecraft, but at present most units are used for grid-related power generation. In this case, the inverter is required to convert DC to AC.

II. LITERATURE SURVEY

In conventional hard conversion converters, the loss of conductivity is very low. But high conversion losses make transformers less efficient. Then the soft switch technology is introduced to make the switch transitions in the case of zero voltage or zero current state, so that the dominant part of the losses (those caused by the switch under high voltages or currents) can also be reduced and the transformer efficiency can be greatly improved. The soft switch is designed and verified for the PV system adapter in [1]. The detailed analysis is performed at the expense of the conductive loss and the switch to the pulse converter for soft conversion. The procedure for selecting the resonant element is discussed [2]. Many of the topology conversion converters were reviewed and compared to their efficiency and other coefficients. The isolated and non-isolated transformers of the PV system are discussed and their suitability according to the requirements. This detailed analysis of many circuits of DC-DC enhancement adapters is based on circuit complexity, the efficiency will be useful in the correct choice of the method of adapter design [3]. Three different holes, batch and buck enhanced topology are discussed with stable state analysis and the design of auxiliary and main circuits is reported in [4]. We suggest a soft inverter switch circuit that is operated with a three-phase induction motor, which is useful to reduce losses in the optical system after running the DC-DC adapter [5]. A soft switch that uses two main switches and two drives where the auxiliary key works with some delay from the main switch, and the loss of the auxiliary key switch is reduced to zero. In this case, a greater conversion rate can be obtained, while control is difficult in this case [6] - [9]. The design of the digital PID controller for the soft transformer has been reported using pole positioning technology in [10]. Several ZCS circuits are reported and analyzed in comparative literature.

III. PROBLEM IDENTIFICATION

Although solar energy is an infinite energy source Derived from the environment, and their supply is intermittent; however, its availability is less than expected and is out of human control compared with conventional power plants. Continuous research and development continues to address the challenges of solar power generation, ie, high initial cost, change, space needs for the installation of photovoltaic panels, and the conversion of less efficient energy, for example. Solar energy is not always available when necessary. Unlike traditional sources of electric power, solar resources can not be deployed. Can not control the power output. The daily and seasonal effects and limited predictability are produced in an intermittent generation. The problem with the previous job was to indicate that the tracking system is not ready for the tag. If we have an independent system, the maximum efficiency must be so that it can only be used for a particular system.

IV. PROPOSED WORK

Simulate through MATLAB to track the maximum strength (MPPT) of the escalation (HC) using SEPIC. This research first presents a practical example of photovoltaic cells through which the optical matrix model is obtained. The HC algorithm is used to track the maximum power of the solar panel. The MPP of the solar panel is different with irritation and temperature. The improved SEPIC adapter is used from DC to DC with respect to PV arrays to maximize the operation of the power point and maintain the constant output voltage.

V. PROPOSED METHODOLOGY

5.1 Photovoltaic Cell

A photovoltaic cell or photovoltaic cell is a semiconductor device that converts light into electrical energy by a light effect. If the photon's photon energy is larger than the band area, the electron emits and generates the current of the electrons. However, photovoltaic cells are different from optical diodes. In the photodiode, light falls on channel n of the semiconductor connector and becomes a current or voltage signal, but the photovoltaic cell is always polarized.

5.2 PV Module

In general, a series of photovoltaic modules are arranged in series and parallel to meet the power requirements. Photovoltaic modules of various sizes are commercially available (generally 60 watts to 170 watts). For example, a typical small desalination plant requires a few thousand watts of power.

5.3 PV Modeling

A group of photovoltaic cells consists of several photovoltaic cells in a parallel chain of connections. Series connections are responsible for increasing unit effort, while parallel communication is responsible for increasing current in the matrix. Typically, a solar cell can be formed with an existing source and an inverted rectangle connected to it. It has its own series and parallel resistance. The resistance of this series is due to an obstacle in the flow of electrons from the intersection n to p and the parallel resistance returns to the leakage

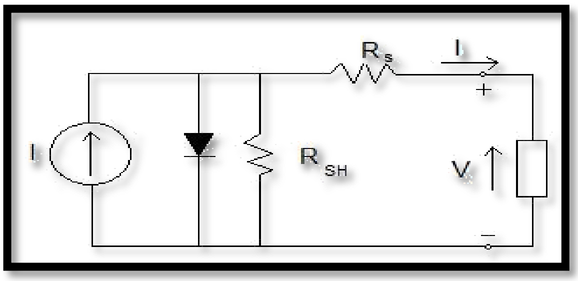


Figure 5.1: Single diode model of a PV cell

In this model, we consider the current source (I) with diode and serial (Rs) resistance. The RSH in parallel is very high, having little effect and can be neglected. Current output of photovoltaic assembly is

$$I = Isc - Id \qquad (5.1)$$

Where, I_o is the reverse saturation current of the diode, q is the electron charge, V_d is the voltage across the diode, k is Boltzmann constant ($1.38 * 10^{-19}$ J/K) and T is the junction temperature in Kelvin (K) From eq. 5.1 and 5.2

$$I = I_{sc} - I_o (e^{qV_d/kT} - 1)$$

Using suitable approximations,

$$I = I_{sc} - I_o (e^{q((V+IRs)/nkT)} - 1)$$

where, I is the photovoltaic cell current, V is the PV cell voltage, T is the temperature (in Kelvin) and n is the diode ideality factor. In order to model the solar panel accurately we can use two diode model but in our project our scope of study is limited to the single diode model. Also, the shunt resistance is very high and can be neglected during the course of our study.

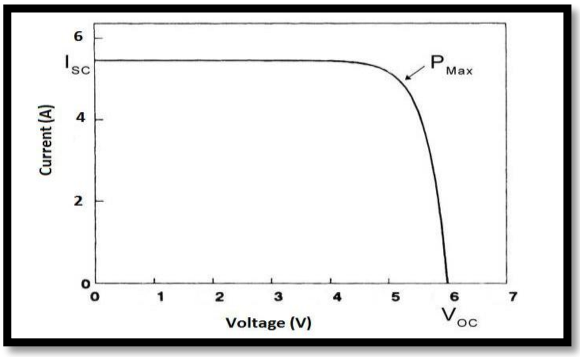


Figure 5.2: I-V characteristics of a solar panel

The I-V characteristics of a typical solar cell are as shown in the Figure 5.2.When the voltage and the current characteristics are multiplied we get the P-V characteristics as shown in Figure below.

5.4 The point indicated as MPP is the point at which the panel power output is maximum.

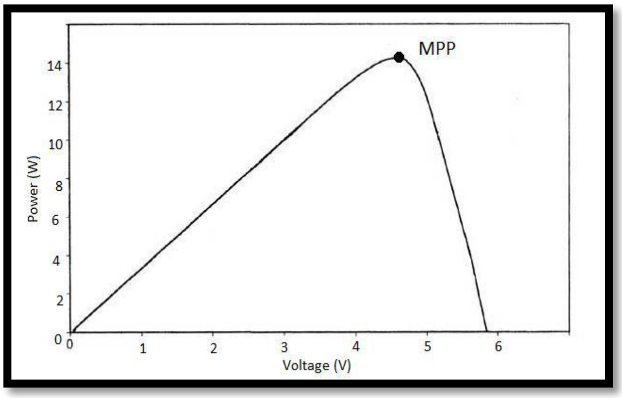


Figure 3.3: P-V characteristics curve of photovoltaic cell

5.5 Boost Converter

As described in the introduction, the tracking of the maximum energy is basically a problem matching the load. To change the input impedance of the panel to match the load resistance (changing the operating cycle), the DC must be converted to DC. It has been studied that the efficiency of the DC to DC adapter is the maximum of the AC adapter, then for the converter of the impulse and the minimum of the pulse converter, but since we intend to use our system to connect it to a network or to a water pump system that requires 230 volts at the end of the outlet.

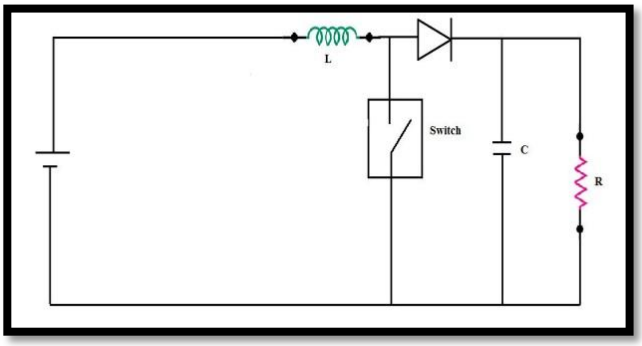
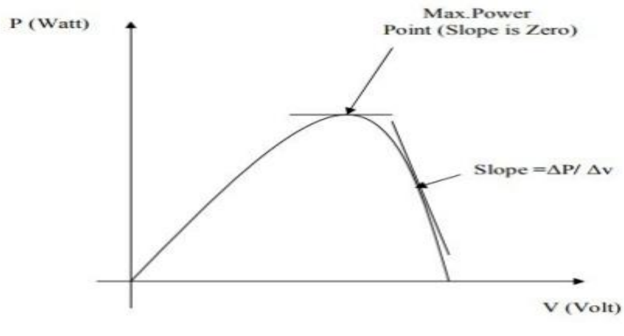


Figure 5.4: Circuit diagram of a Boost Converter

5.6 Climbing Hill Algorithm

The climbing algorithm determines the maximum power point when linking changes in power to changes in the control variable used to control the matrix. This system includes an alarming and exhaustive algorithm proposed by Xiao et al (2004). Climbing algorithm involves a disturbance in the working relationship of power inverter. In the case of a PV array connected to a system, the disturbance of the working relationship of the energy inverter disturbs the current of the PV array and therefore it corrupts the voltage of the PV array. The figure below illustrates the properties of a PV array curve. In this mode, when the voltage is increased, the power at the left of the MPP increases and the power decreases when it is to the right of the MPP. Therefore, if there is an increase in 102 powers, subsequent disturbances are maintained at the same point to reach the MPP and if there is a decrease in force, the disturbance is reversed.



VI. SIMULATION & RESULT

H-C algorithm along with incremental transconductance will provide better tracking system for achieving the high gain through Stand Alone PV System.

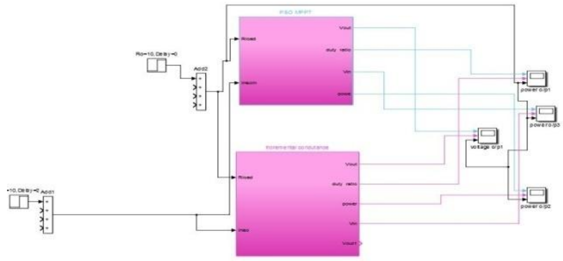


Figure 6.1 Basic GUI of proposed work

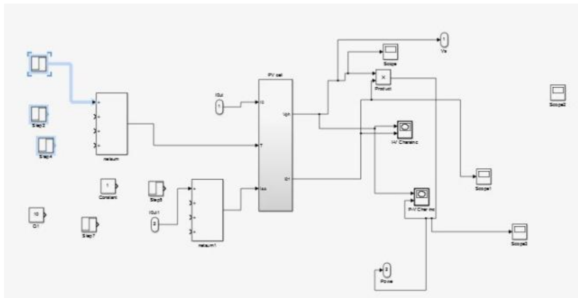


Figure 6.2: Incremental Conductance added in front layout.

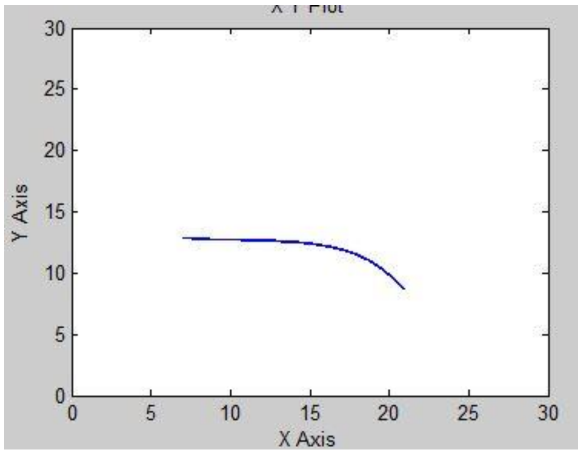


Fig 6.3: Simulative Result

These were compared and tested dynamically according a recently issued standard. PO-MPPT with incremental transconductance is proposed, which overcome their poor performance when the irradiation changes continuously. The dynamic MPPT efficiency tests require long simulations and if detailed models of the power converter are used they can take a lot of memory and computation time.

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