

MPPTRACKER FOR PV SYSTEM USING REMOTE LOGGER

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Abstract - The main aim behind this paper is to detect the losses in the middle of usage of our PV energy by solar panel. Here we introduce a maximum-power-point-tracking (MPPT) controller for a photovoltaic (PV) energy conversion system. Nowadays, PV generation is more and more used as a renewable energy source. Maximum power point tracking (MPPT) must usually be integrated with photovoltaic (PV) power systems so that the photovoltaic arrays are able to deliver the maximum power available. Here we use a Voltage sensor to sense the voltage and current values coming from the pv system and these are integrated to the microcontroller to detect the faulty systems. Here we are using a battery to store the voltage and current coming from the panel and stored for external usage and also connected for a load. Thus, the MPPT (Maximum Power Point Tracking Technique) together with the battery energy storage is necessary in order to obtain a stable and reliable maximum output power from a PV generation system. Here we are using a remote data logger to obtain the information about the performance of the solar panel by comparing the results coming out from the pv system.

Key Words: Photovoltaic, MPPT, Lithium-ion battery etc...

1. INTRODUCTION

Significant progress has been made over the last few years in the research and development of renewable energy systems such as wind, sea wave and solar energy systems. Among these resources, solar energy [1] is considered nowadays as one of the most reliable, daily available, and environment friendly renewable energy source. However, solar energy systems generally suffer from their low efficiencies and high costs [2] [4]. In order to overcome these drawbacks, maximum power should be extracted from the PV panel using MPPT techniques to optimize the efficiency of overall PV system. MPPT [3] is a real-time control scheme applied to the PV power converter in order to extract the maximum power possible from the PV panel. The MPPT working principle is based on the maximum power transfer theory. The power delivered from the source to the load is maximized when the input resistance seen by the source matches the source resistance. Therefore, in order to transfer maximum power from the panel to the load the internal resistance of the panel has to match the resistance seen by the PV panel. For a fixed load,

the equivalent resistance seen by the panel can be adjusted by changing the power converter duty cycle. The literature is rich with various MPPT techniques based on different topologies and with varying complexity, cost, and overall produced efficiency.

Photovoltaic generation is the technique which uses photovoltaic cell to convert solar energy to electric energy. Nowadays, PV generation is developing increasingly fast as a renewable energy source. However, the disadvantage is that PV generation is intermittent because it depends considerably on weather conditions. This paper proposes an intelligent control method for the maximum power point tracking (MPPT) [2] of a photovoltaic system under variable temperature and solar irradiation conditions. In this paper, a simulation study of the maximum power point tracking (MPPT) for a photovoltaic system using an artificial neural network is presented. The system simulation is elaborated by combining the models established of solar PV module and a DC/DC Boost converter. Finally performance comparison between artificial neural network controller and Perturb and Observe method has been carried out which has shown the effectiveness of artificial neural networks controller to draw much energy and fast response against change in working conditions

2. EXISTING SYSTEM

In the existing method we are uses a performance ratio to detect the losses in our PV energy generation and these performance ratio can be calculated by observing simulation results generated from the pv system for I-V in different environmental conditions. In previous work for MPPT uses a SIMULINK/MATLAB [5]. The performance ratio gives a measure of the output AC power delivered as a proportion of the total DC power which the solar modules should be able to deliver under the ambient climatic conditions. Here we detect the light absorption losses, mismatch, cable voltage drop, conversion efficiencies, and other parasitic losses based on this performance ratio we detect the solar panel which is not delivering the exact output.

Here uses two methods for maximum power point tracker by using a fuzzy logic and a neural network approach for photovoltaic (PV) module. the Neural Network approach can deliver more power and provides a response time from the tracking system from the point of maximum

power and pics lower than the fuzzy logic control. However, its main drawback is that PV generation is intermittent because it depends on shading conditions consequently irradiance value.

3. DESCRIPTION OF THE PROPOSED TECHNIQUE

In the proposed method we are using a MPP to detect the inefficient solar panel by the current and voltage characteristics. We are using a voltage sensors it gives the reference voltage for the MPPT to detect the characteristics of the Solar panel. By this method we are collecting information through the remote data logger this information can directly reaches to the controller who do the actions regarding this. Here we are using a Li-ion battery to store the voltage and current coming from the pv system. By all this we can check the condition of that panel and also does the replacing of the panel.

4. BLOCK DIAGRAM

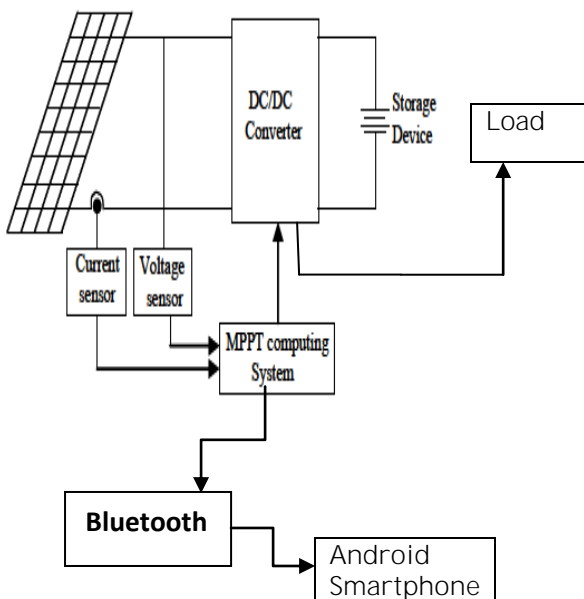


Fig-1: Block diagram

A maximum power point tracking algorithm is absolutely necessary to increase the efficiency of the solar panel as it has been found that only 30-40% of energy incident is converted into electrical energy [1] [8]. Due to the growing demand on electricity, the limited stock and rising prices of conventional sources (such as coal and petroleum, etc.), photovoltaic (PV) energy becomes a promising alternative as it is omnipresent, freely available, environment friendly, and has less operational and maintenance costs. Therefore, the demand of PV generation systems seems to be increased for both standalone and grid-connected modes of PV systems. Therefore, an efficient maximum

power point tracking (MPPT) technique is necessary that is expected to track the MPP at all environmental conditions and then force the PV system to operate at that **MPP point**. MPP refers to PV's unique operating point delivering maximum power giving highest efficiency of array. It varies with solar insolation and temperature & needs to be monitored through tracking techniques. The operating characteristics of a solar cell consist of two regions as represented in Fig 1, the current source region and the voltage source region. In the current source region, the internal impedance of the solar cell is high and this region is located on the left side of the current-voltage curve. The voltage [6] source region, where the internal impedance is low, is located on the right side of the current -voltage curve. As per Maximum Power Transfer Theorem, Maximum Power is delivered to load when source internal impedance matches load impedance.

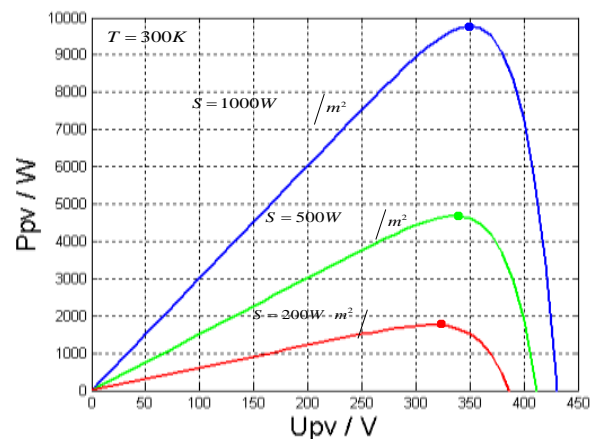


Fig-2: Variation of the PV output power with solar irradiance

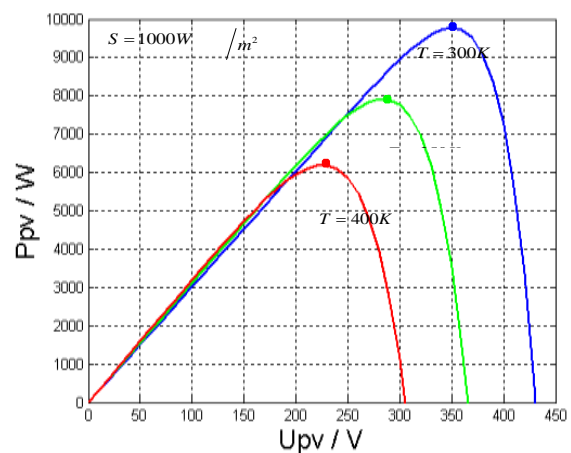


Fig-3: Variation of the PV output power with ambient temperature

4.1. CHARACTERISTICS OF A SOLAR MODULE

The solar array characteristics significantly influence the design of the converter and the control system, so the PV characteristics will be briefly reviewed here. Photovoltaic cell is the most basic generation part in PV system. Single diode mathematic model [5] [4] is applicable to simulate silicon photovoltaic cells, which consists of a photo current source, I_{ph} , a nonlinear diode, the internal resistances R_s and R_c , as shown in figure 4.

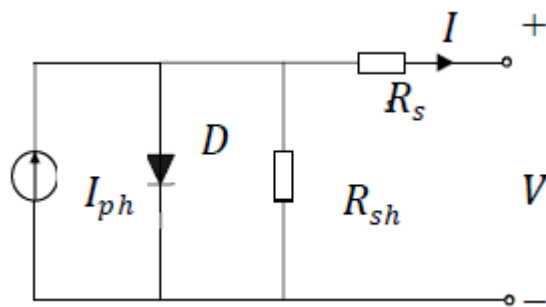


Fig -4: Mathematic model of a PV cell

The mathematic relationship for the current and voltage can be described as:

$$I = I_{ph} - I_s (e^{q(V+IR_s)/kT} - 1) - V - IR_s / R_{sh} \quad (1)$$

where, I_p is photocurrent; I_s is diode saturation current; q is coulomb constant ($1.602 \times 10^{-19} C$); k is Boltzman's constant ($1.381 \times 10^{-23} J/K$); (T) is cell temperature(K); A is $P-N$ junction ideality factor; R_s and R_c are intrinsic series resistances.

Photocurrent is the function of solar radiation and cell temperature described as:

$$I_{ph} = [S/S_{ref}] [I_{ph,ref} + CT(T - T_{ref})] \quad (2)$$

where, S is the real solar radiation (W/m^2); S_{ref} , T_{ref} , $I_{ph,ref}$ is the solar radiation, cell absolute temperature, photocurrent in standard test conditions respectively; CT is the temperature coefficient (A/K).

Diode saturation current varies with the cell temperature

$$I_s = I_{s,ref} [T/T_{ref}]^3 e^{qE_g/k[1/T_{ref} - 1/T]} \quad (3)$$

where, $I_{s,ref}$ is the diode saturation current in standard test conditions; E_g is the band-gap energy of the cell semiconductor(eV), depending on the cell material.

4.2. BATTERY MODEL

The battery model [8] is based on a lead-acid battery one. The lead-acid battery cells consist of two plates, positive and negative immersed in a dilute sulfuric acid solution. The positive plate, or anode, is made of lead dioxide (PbO_2) and the negative plate, or cathode, is made of lead

(Pb). There are two operating modes: the battery is in charge mode when the current into the battery is positive, and is in discharge mode when the current is negative. The terminal voltage of the battery is given by [3]:

$$V_{bat} = V_1 + I_{bat} * R_1 \quad (4)$$

Where V_1 and R_1 are deduced by a different set of equations depending on which mode of operation the battery is in. Values for the battery current (I_{bat}) are positive when the battery is in charge mode and negative when the battery is in discharge mode.

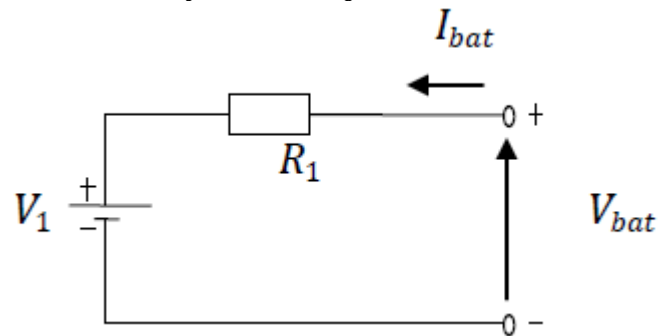


Fig-5: Battery model

Table-1: Parameters For PV Model

Parameters	Values
Referenced solar irradiance S_{ref}	$1000 W/m^2$
Referenced cell temperature T_{ref}	$298 K$
Cell numbers of a PV module m	36
Parallel numbers of the PV modules N_p	9
Series numbers of the PV modules N_s	20
Photocurrent at standard condition $I_{ph,ref}$	$3.35 A$
Band-gap energy E_g (eV)	$1.237 eV$
Cell internal resistance R_s	0.312Ω
$P-N$ junction ideality factor A	54
Temperature coefficient CT	0.065%

5. WORKING PRINCIPLE

This paper represents to detect the defective solar panel by using MPPT the ARM7 microcontroller is used to display the operation of the pv system and the working. This paper is mainly for fault detection in case of using a huge number of panels like solar power plants like that for all those this paper will supports. Here mainly we are using a voltage sensors and current sensors to sense the voltage and current coming from the solar panels and this send the result to the microcontroller to visible for detection. The voltage coming from the panel can be used to operate the electronic devices. For that here we are connecting a Load in this paper we are using a motor for operation conditions. Battery can also be used to store the voltage and current regretting from the panel.

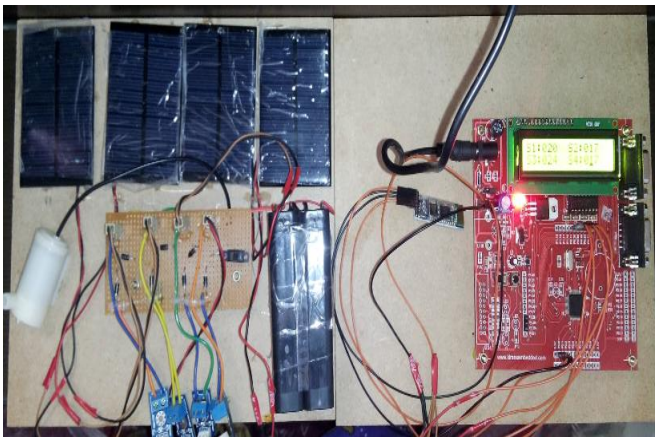


Fig-5: Mppt for pv system

In order for the microprocessor to control the duty cycle of the converter, it needs to obtain voltage samples from the solar panel input. This will be done through a very simple method of voltage sensing. Normally, [7] the microprocessor would be able to take voltage directly from a source to sense the voltage. However, the voltage coming from the solar panel will be much too large for the microprocessor to handle. The maximum amount of voltage that the microprocessor will take will be 5V. Any voltage larger than this amount to the microprocessor would risk destroying it, and the system would fail to monitor and maintain the peak power operating point all together. Knowing this, it is with great care that we implement the voltage divider in such a way that it will always output a voltage that is much less than the threshold voltage of what the microprocessor can handle. The constant voltage (CV) method uses empirical results, indicating that the voltage at MPP (VMPP) is around 70%–80% of the PV open-circuit voltage (VOC), for the standard atmospheric condition. Among the points of MPP (varying atmospheric conditions).

The solar panel can not be used in any conditions because it observes the solar energy and converts into electrical energy to operate the electronic devices. To detect the individual voltages we use diodes by this we can detect the individual voltages coming from the each panel. The voltage sensors are connected to ADC to convert the DC to AC to operate through the serial ports. In ARM7 microcontroller ADC can be inbuilt so through the serial ports we have to connect from sensors to microcontroller by this we have to connect for the LCD to display the voltage levels from each panel.

Here we are not only detect the faulty panel after detection we have to communicate to the operator to know the status of the system for that purpose we have to use a communication devices like GPS and Bluetooth but in this paper we are using a Bluetooth for communication by this we have to send the message to the operator if any

system will be detected as faulty one By this the operator will understand the system condition.

6. CONCLUSION

In this work we have presented the working conditions of the pv system to detect the faulty panels by using a communication device as Bluetooth. By this we will significantly enhance the performance of the system.

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BIOGRAPHIES



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