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A Smart Methodology for MPPT and Enabling Load Control Using IOT

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Abstract
In these days, the use of internet has occupied a large space in the field of Technology. We are constantly dependent on Internet for various applications in our day to day lives. The internet activity among people is booming from child to adults. It has changed our way of livelihood of how we handle things and access certain facilities. Today, even a small money based transactions are done using the internet and long distant money transfer is made possible by the internet. We here use the Internet as a medium to control loads, acquire data for data monitoring purposes. This enables an instant monitoring of data and appliance control residing from anywhere in the world. MPPT algorithms are necessary because PV arrays have a nonlinear voltage-current characteristic with a unique point where the power produced is maximum. This point depends on the temperature of the panels and on the irradiance conditions. Both conditions change during the day and are also different depending on the season of the year. Furthermore, irradiation can change rapidly due to changing atmospheric conditions such as clouds. It is very important to track the MPP accurately under all possible conditions so that the maximum available power is always obtained.

Keywords- PV, Solar, LDR, MPPT, IOT.

INTRODUCTION

Partial shading in a PV system is a condition whereby only a certain portion of the PV module (or array) is shaded, while other parts are remained uniformly irradiated. It is typically caused by shadow from the nearby buildings, trees, poles, chimney, overhead cables etc. When the array is subjected to partial shading, considerable amount of energy is lost because the shaded module is short-circuited by its respective bypass diode, thus forcing its voltage (and power) to zero. As a consequence, multi-modal P-V curve, with several local and a global peak is generated. To extract the maximum power from the array, the maximum power point tracker (MPPT) algorithm has to initiate a searching mechanism to differentiate between the local and global peak. In the past years numerous MPPT algorithms have been published. They differ in many aspects such as complexity, cost or efficiency. A number of MPPT algorithms have been proposed in the literature, including perturb-and-observe method, open- and short-circuit method, incremental conductance algorithm, fussy logic and artificial neural network.
However, it is pointless to use a more expensive or more complicated method if with a simpler and less expensive one similar results can be obtained. This is the reason why some of the proposed techniques are not used. The main technical requirements in developing a practical PV system include which an optimal control that can extract the maximum output power from the PV arrays under all operating and weather conditions.

EXISTING SYSTEM

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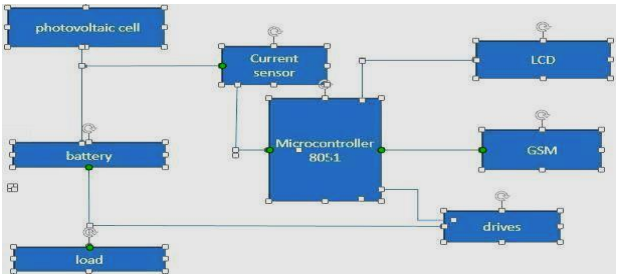
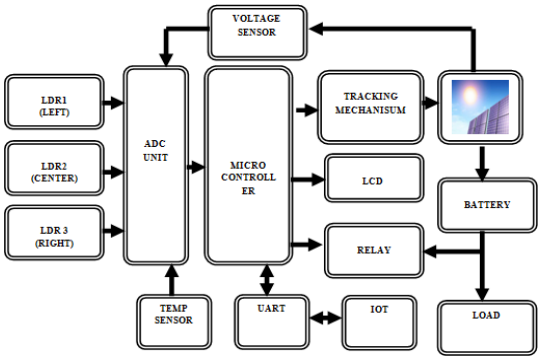


Fig 1: Existing system block diagram

PROPOSED SYSTEM

BLOCK DIAGRAM

This paper presents the hardware design and implementation of a system that ensures a perpendicular profile of the solar panel with the sun in order to extract maximum energy falling on it. Renewable energy is rapidly gaining importance as an energy resource as fossil fuel prices Fluctuate. The unique feature of the proposed system is that instead of taking the earth as its reference, it takes the sun as a guiding source. Its active sensors constantly monitor the sunlight and rotate the panel towards the direction where the intensity of sunlight is maximum. Temperature sensor is used to differentiate between the day light and solar rays. The three LDR's are used to track the intensity of solar rays. Based on the values of the LDR the robot rotates to a certain angle and energy is stored to the battery. The energy produced by the solar panels are monitored and updated through IOT. The relay used here can control the load



connected to the controller. The load controlling can be done using the IOT module.

Fig 2: Block diagram of Transmitting Section

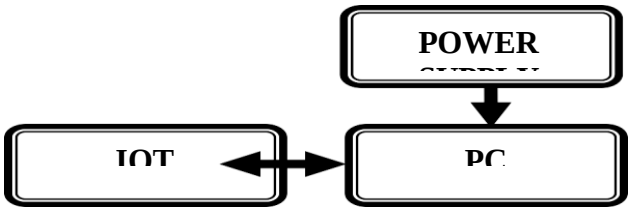


Fig 3: Monitoring section

SOFTWARE REQUIREMENT

The software used is

- EMBEDDED C
- MPLAB IDE

A.CIRCUIT DIAGRAM

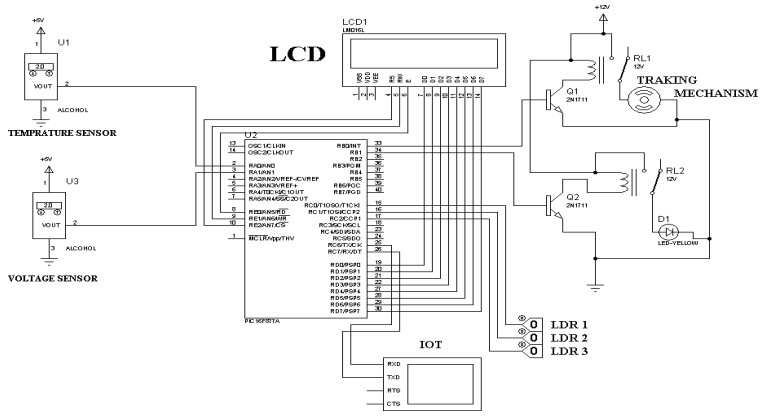


Fig 4: Circuit Diagram

B.SIMULATION CIRCUIT

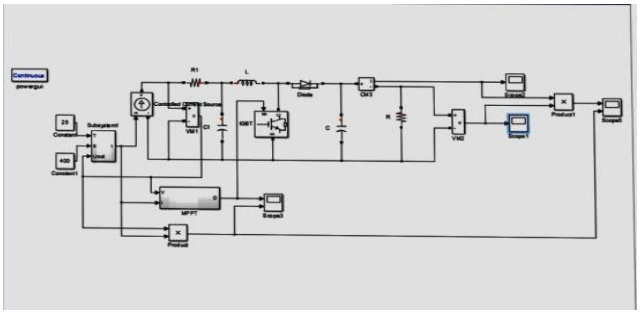


Fig 5: Simulation Diagram

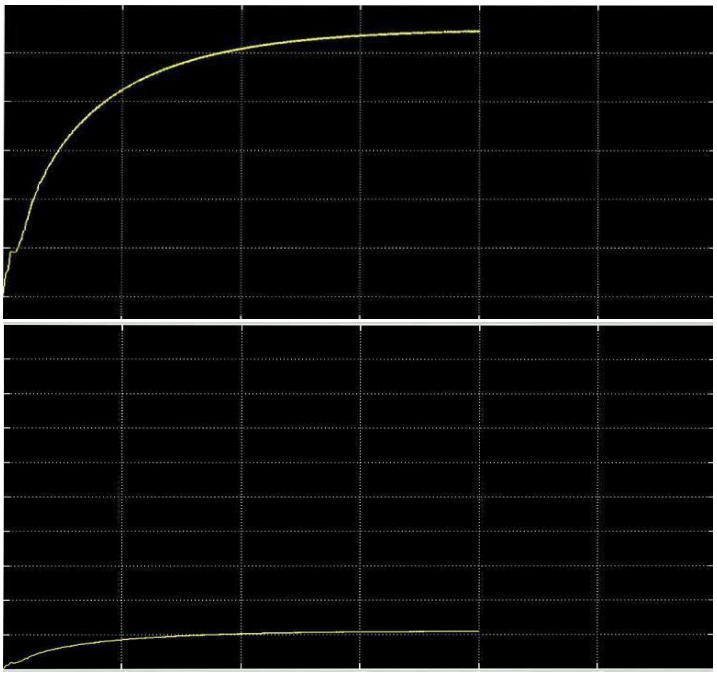


Fig 6: Simulation Output

HARDWARE DESCRIPTION

In very basic terms, a solar panel (PV module) is a device that will produce a flow of electricity under sunlight. This electricity can be used to charge batteries and, with the aid of an inverter, it can power normal household electrical devices, or "loads". PV modules can also be used in systems without batteries in grid-tie systems. Most PV modules are framed in aluminum, topped with tempered glass, and sealed by a waterproof backing. Sandwiched between the glasses and backing layers are the photo-reactive cells themselves, often made of silicon. On the back of the module is a junction box that may or may not have two cables coming out of it. If the junction box has no cables, it can be opened to access the electrical terminals where wires can be attached to conduct the generated electricity away from the module. If there are cables already in place, the junction box is usually sealed and not user-accessible. Sealed junction boxes are more common.

There are lots of ways to make use of solar electricity. One of the simplest is to charge small electronic devices, like cell phones and music players, with lightweight, portable PV modules. These small battery-charging solar panels are even being integrated into backpacks and clothing for maximum convenience. These panels can be used individually or wired together to form a solar array. For larger electrical loads, there are two main types of systems for providing electrical power to homes, cabins and offices, etc: stand-alone battery based systems (also called ‘off-grid' systems) and grid-tied systems (also known as utility-interactive). Decision should be taken which

system is best for use by reading more about both. The hardware requirements are as follows:

A. DC MOTORS

A 5V 3A DC Motor is used to run the load. This motor is controlled by L293d motor driver which is controlled by relay connected to microcontroller.

B. 12V/7.5 Ah BATTERY

Batteries can be charged manually with a power supply featuring user-adjustable voltage and current limiting. 12V 7.5Ah lead acid battery is a rechargeable battery that supplies electrical energy. These batteries are designed to release a high burst of current and then quickly recharged. Six cells are connected in series in this battery.

a) Features

- Output voltage: (12-12.6) V DC
- Current capacity: 7.5Ah
- Low self- discharge
- Long life

• 7.5Ah Large lithium iron phosphate rechargeable battery

b) Applications

- Automobiles
- UPS
- Perfect for motorcycle starter, 12V DC Power, medical equipment, LED light power supply, solar power
- This has plenty of power to start the smallest engine.

C. MICRO CONTROLLER

The microcontroller which is based on PIC16F877A comprises of 40 input/output pins, out of which 33 of them are I/O pins , 5 are I/O ports and 2 connections consists of VCC and ground .

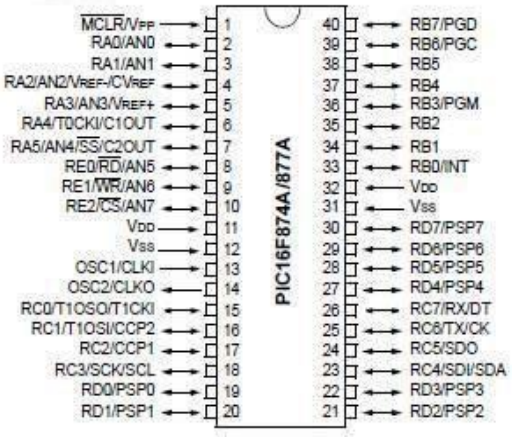


Fig 5: Pin Configuration

D. TEMPERATURE SENSOR

A temperature sensor is a device, a thermocouple or RTD, that provides measurement of temperature through an electrical signal. A thermocouple (T/C) is made from two dissimilar metals that generate electrical voltage in direct proportion to changes in temperature.

a) Features

- Input: 5V DC
- Output: Analog output
- Use: Measure the heat level

E. VOLTAGE SENSOR

Electrical voltage s e n s o r s measure AC and/or DC voltage levels. They receive voltage inputs and provide outputs as analog voltage signals, analog current levels, switches, or audible signals. They can also provide frequency and modulated frequency outputs.

Fig 6: Graph between length and Voltage

The relation between reflected rays and output voltage is shown.

a) Features

- Working Voltage: 5V DC
- Quiescent Current: <2mA
- Working Current: 15mA
- Detecting Range: 2cm - 4.5m
- Trigger Input Pulse width: 10uS
- Output: Analog values
- Use: Measure the voltage level

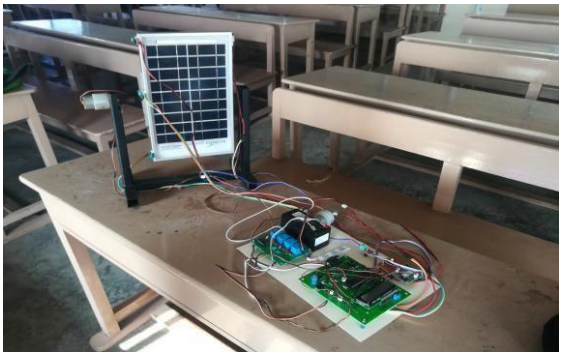


Fig 7: Hardware pic

CONCLUSION

In these paper accurate scheme to determine the occurrence of no shading is proposed these technique use LDR technique to get maximum power energy from sun without shading in solar panel thus the MPPT take the conclusive decision the precisely determine the constant voltage flow and determine constant voltage flow and determine stability of power flow without any transient occurrence. By this we acquire the efficiency of 35-40% .Hence in future enhancement the efficiency can be increased above 45% and also improves the stability of voltage level.

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