SOLAR TRACKING SYSTEM USING MPPT ALGORITHM AND ARM 7 MICROCONTROLLER

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Abstract: ***To find the alternative source of the energy is very important now to reduce the pollution, the population is increasing day today is very much fast so by using solar energy. The solar energy is the alternative option for the cities where the power is much lack or huge shortages of power is observed. For getting maximum power the maximum peak power point tracking is is promising method, different methods used for the maximum power point tracking out of which perturb and observe method using buck boost convertor, the adjustment of the solar panel done until the maximum power obtained. When that knows the new maximum power point means the voltage obtained at which condition of the solar plate it will be stable.***

1. INTRODUCTION

The fastest increase in the requirement of the electricity and the increasing of the global warming there is need to find the new source of the energy. Solar panels are semiconductor devices which convert the solar energy power direct to electricity and their operational characteristics depend on incident sun light level and the surface temperature that developed on the cell surface as the insolation ambient temperature and current flow varies. Energy conversion using solar panels is considered one of the best promising techniques in the field of renewable energy sources since photovoltaic panels uses free and not exhaustible sunlight as the fuel. Due to pollution and maintenance free panels are getting increasing worldwide acceptance. panels where first used as a main power supply for satellites in outer space, later panels designed as stand-alone systems for applications as power supply for housing systems, storage systems, and long distance places where main electricity cannot reach, water pumping, electric vehicles, swimming pool heating systems etc. Stand-alone PV systems are normally equipped with storage batteries to maintain electricity for sunless hours. Grid connected systems that back up or supplement the grid power are also becoming popular. The MPPT is used to extracting the maximum power from the solar PV module and transfer the power to the load.

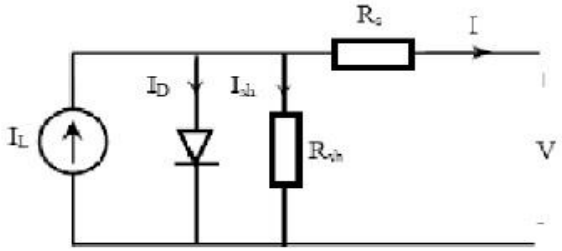
2. PHOTOVOLTAIC SYSTEM

A Photovoltaic system directly converts solar energy into electrical energy. The basic device of a PV system is the solar cell. Cells may be grouped to form arrays. The voltage and current available at the terminals of a PV device may directly connected to small loads like lighting appliances and DC motors or connect to a grid by using proper energy conversion devices. This photovoltaic system consists of main parts such as PV module, charger, battery, inverter and load.

EQUIVALENT MODEL

A Photovoltaic cell is a device used to convert solar radiation into electricity. It is consists of two or more thin layers of semiconducting material, most commonly silicon. At the time silicon is exposed to light , electrical charges are generated. A PV cell is usually shown by an electrical equivalent one-diode model shown in fig below

The model contains a current source, single diode, internal shunt resistance and a series resistance which represents the resistance inside each cell. The net current is the difference between the photo current and the normal diode current is given by the equation.



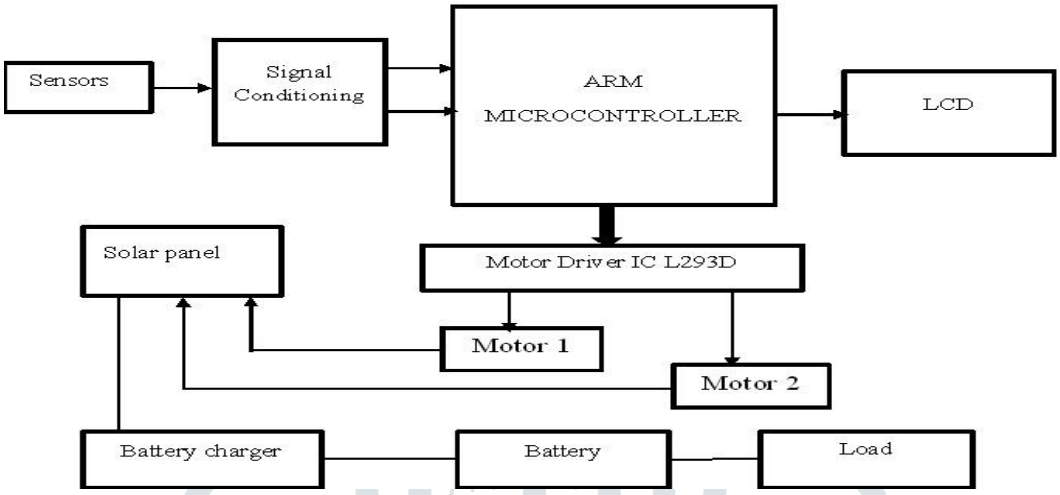
$ID=IO\left[e^{\frac{q(V+Rs}{KT}}-1\right]$……..(1)

$I= IL-IO\left[e^{\frac{q(V+Rs}{KT}}-1\right]-\frac{V+IRs}{RSh}$ ……(2)

Where
I is the current of cell
Q is the electron charge
K is the Boltzmanns constant

T is the cell temperature
I_l is the the photo current
I_o is the diode saturation current
R_s R_{sh} are cell series and shunt resistances . V is the cell out voltage.

3. BLOCK DIAGRAM



3.1 Microcontroller Unit

The LPC2138 is Associate in Nursing ARM7TDMI-S based mostly superior 32-bit architecture Microcontroller with Thumb extensions 512KB on-chip Flash fixed storage with In-System Programming (ISP) and In-Application Programming (IAP), 2 8-ch 10bit ADC 32KB RAM, Vectored Interrupt Controller, Two UARTs, one with full electronic equipment interface. 2 I2C serial interfaces, 2 SPI serial interfaces 3 32-bit timers, Watchdog Timer, Real clock with ex gratia battery backup, Brown out find circuit General purpose I/O pins. The µC is that the final deciding body on the device. The logic is developed and so this method is burned within the microcontroller and therefore the alternative peripherals area unit accessed via microcontroller solely. The ARM7TDMI-S is a popular reason 32-bit microprocessor, which offers excessive-overall performance and really low electricity consumption. The ARM architecture is based on reduced instruction Set computer (RISC) and the guidance set and related decode mechanism are a good deal easier than those of micro programmed complex instruction Set computer systems (CISC). This simplicity effects in a high preparation throughput and extraordinary real-time interrupt response from a small and price-powerful processor middle. Pipeline strategies are hired so that all components of the processing and memory systems can function continuously.

3.2 Solar Panel

Solar panels are the light energy into electrical energy. They are called "solar" panels because most of the time the most powerful source of light available is the Sun, called Sol by astronomers. Some scientists call them photovoltaic which means, basically, "light-electricity." A solar panel is a collection of solar cells. Lots of small solar cells spread over a large area can work together to provide enough power to be useful. The more light that heats a cell and produces electricity, so spacecraft are usually designed with solar panels that can always be pointed at the Sun.

3.3 DC Motor

DC motors are wont to physically drive the applying as per the need provided in package. The dc motor works on 12v. To drive a dc motor, we'd like a dc motor driver known as L293D. This dc motor driver is capable of driving two dc motors at a time. so as to guard the dc motor from a back electrical phenomenon generated by the dc motor whereas ever-changing the direction of rotation, the dc motor driver have an inside protection suit. we will conjointly offer the rear electrical phenomenon protection suit by connecting four diode configurations across every dc motor Battery.

A dry cell could be a form of electricity-producing chemical cell, usually used these days for several home and transportable devices, typically within the variety of batteries. A dry cell uses a paste solution, with simply enough wet to permit current to flow. in contrast to a primary cell, a dry cell will operate in any orientation while not spilling, because it contains no free liquid, creating it appropriate for transportable instrumentality. By comparison, the primary wet cells were generally fragile glass containers with lead rods hanging from the open prime and required careful handling to avoid spillage. accumulator didn't reach the security and movableness of the dry cell till the event of the gel battery. Wet cells have continuing to be used for top drain applications like beginning burning engines, as a result of inhibiting solution flow tends to cut back this capability.

3.4 Battery Charger

Solar chargers convert light energy into DC current. They are generally portable, but can also be fixed mount. Fixed mount solar chargers are also known as solar panels. Solar panels are often connected to the electrical grid, whereas portable solar chargers are used off-the-grid.

3.5 ARM DC Motor Interface

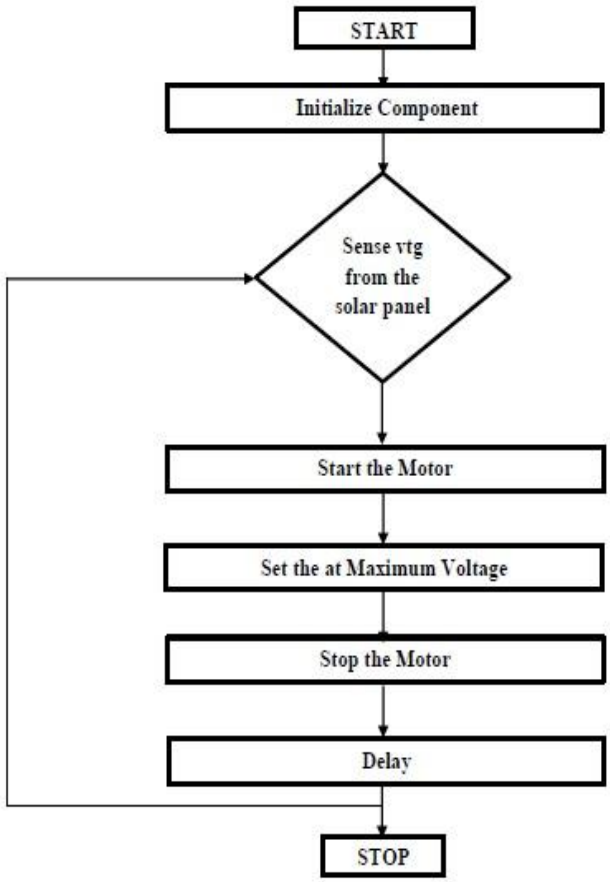
Here in our project we are using a 12v DC motor which is Bipolar, which means that the DC motor can rotate both the sides .For this we are using a DC motor driver IC L293D.This driver IC can drive 2 DC motors. In our project we are connecting only 1 DC motor so we are

connecting only the 1st pair of the DC motor.(in1 and in2 of L293D).The DC motor will be connected at OUT1 and OUT2 of L293D respectively.

4. WORKING OF SYSTEM

The PV system directly converts solar energy into electrical energy. The basic device of PV system is the PV cell. Cells may be grouped to from array. The voltage and current available at the terminal of a PV device may directly feed small loads such as lighting systems consist of main parts such as PV module, charger, battery, invertor and load. The main purpose of the project is to achieve the maximum peak power point of solar panel using ARM 7 microcontroller. The ARM 7 controller continuously tracks the sun and check the maximum output of the solar panel, by using the MPPT. According the output of the LDR the solar panel rotates get the maximum output then it gives to the battery or load. The maximum output of solar panel is continuously shows on LCD. The DC motor is used to rotate the solar panel in any direction. The inverter is used to charge the battery and drive the load.

5. FLOWCHART



Algorithm

1) Start
2) Initialize the components
3) Sense the voltage form solar panel
4) Start the motor
5) Set the maximum voltage
6) Stop the motor
7) Delay
8) If required repeat from step 3
9) Stop

6. ADVANTAGES

1) Maximum solar energy utilized and stored in battery
2) Minimum hardware requirement
3) Robust construction

7. APPLICATION

1) For street lights
2) Industries
3) School/colleges

8. RESULT

The solar panel rotates as per the direction of the sun and the intensity received from the panel is displayed on the displayed.

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