Solar Power Plant Parameter Monitoring using Arduino

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ABSTRACT

There are Power Stations for Maintaining or Monitoring the Power Circuits or Parameters related to Solar Panel. Parameters like Voltage, Temperature, Light Intensity and Current, which are important to monitor. The Monitoring of these parameters are also important in Households too. So, here we discuss on how to Monitor Solar Panel Parameters.

Keywords: Arduino ATMega328p

I.INTRODUCTION

The designed project measures different solar cell parameters like light intensity, voltage, current and temperature by using multiple sensor data acquisition. The project uses a solar panel to monitor sunlight and Arduino board which has ATmega family microcontroller attached to it. The project requires an LDR sensor for measuring light intensity, a voltage divider to measure voltage and a temperature sensor to measure the temperature. These measurements are then displayed by the microcontroller to a LCD screen. Thus this system allows user to effectively monitor solar parameters using this system.
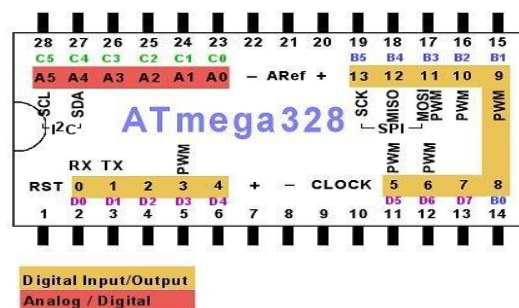
II.ARDUINO MICROCONTROLLER
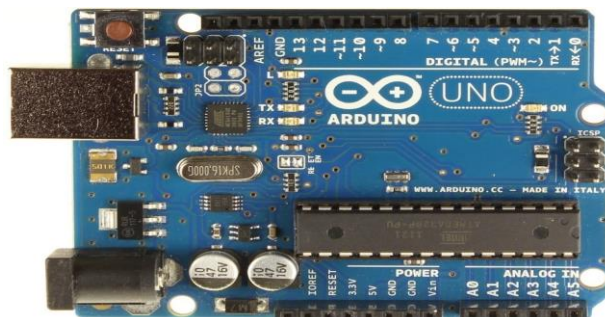
Arduino is open source physical processing which is based on a microcontroller board and an incorporateddevelopment environment for the board to be programmed. Arduino gains a few inputs, for example, switches or sensors and control a few multiple outputs, for example, lights, engine and others. Arduino

program can run on Windows, Macintosh and Linux operating systems (OS) opposite to most microcontrollers' frameworks which run only on Windows. Arduino programming is easy to learn and apply to beginners and amateurs. Arduino is an instrument used to build a better version of a computer which can control, interact and sense more than a normal desktop computer. It's an open-source physical processing stage focused around a straightforward microcontroller board, and an environment for composing programs for the board. Arduino can be utilized to create interactive items, taking inputs from a diverse collection of switches or sensors, and controlling an assortment of lights, engines, and other physical outputs. Arduino activities can be remaining solitary, or they can be associated with programs running on your machine (e.g. Flash, Processing and Max MSP.) The board can be amassed by hand or bought preassembled; the open-source IDE can be downloaded free of charge. Focused around the Processing media programming environment, the Arduino programming language is an execution of Wiring, a comparative physical computing platform.

Atmega328 pin out

Technical Specifications of Arduino

Sr. No.	Component	Details
1.	Microcontroller	ATmega328P
2.	Operating Voltage	5V
3.	Input Voltage (recommended)	7-12V
4.	Input Voltage (limit)	6-20V
5.	Digital I/O Pins	14 (of which 6 provide PWM output)
6.	PWM Digital I/O Pins	6
7.	Analog Input Pins	6
8.	DC Current per I/O Pin	20 mA
9.	DC Current for 3.3V Pin	50 mA
10.	Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
11.	SRAM	2 KB (ATmega328P)

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12.	EEPROM	1 KB (ATmega328P)
13.	Clock Speed	16 MHz
14.	LED_BUILTIN	13
15.	Length	68.6 mm
16.	Width	53.4 mm
17.	Weight	25 g

III.LDR
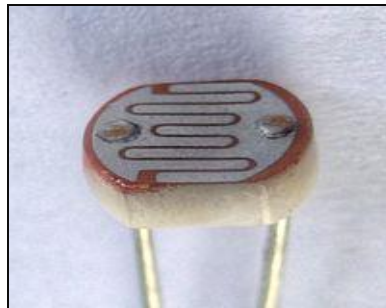
A photo resistor or Light dependent resistor is a light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits.

APPLICATION OF LDR

LDR's have low cost and simple structure. They are often used as light sensors. They are used when there is a need to detect absences or presences of light like in a camera light meter. Used in street lamps, alarm clock, burglar alarm circuits, light intensity meters, for counting the packages moving on a conveyor belt, etc.

IV. LCD (LIQUID CRYSTAL DISPLAY)

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements .The 16×2 LCD display is a very basic module commonly used in project and prototype circuits. The 16×2 translates to a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

V. SOLAR CHARGE CONTROLLER

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life. The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery charger.
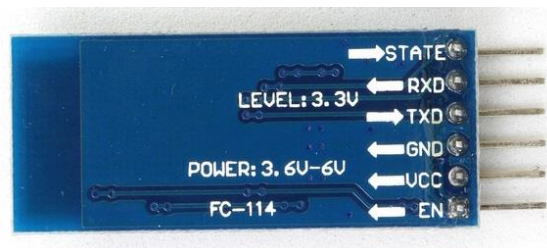
VI.BLUETOOTH MODULE

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).
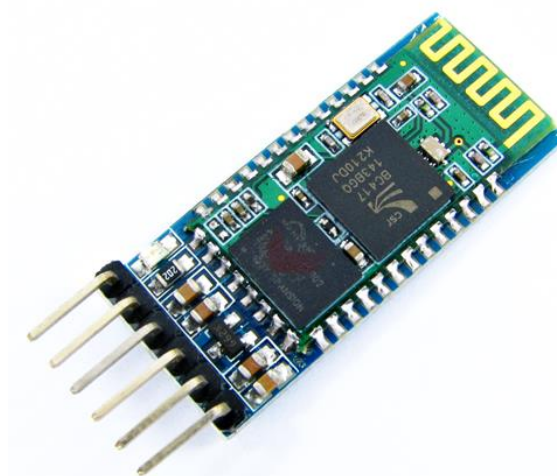
The Bluetooth module HC-05 is a MASTER/SLAVE module. Bydefault, the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project.

VII. PINOUT

PIN FUNCTION

1. Vcc:

Supply Voltage 3.3V to 5V

2. GND:

Ground pin

3. TXD & RXD:

These two pins acts as an UART interface for communication

4. STATE:

It acts as a status indicator. When the module is not connected to / paired with any other Bluetoothdevice, signal goes Low. At this low state, the led flashes continuously which denotes that the module is not paired with anotherdevice. When this module is connected to/paired with any other Bluetoothdevice, the signal goes High. At this high state, the led blinks with a constant delay say for example 2s delay which indicates that the module is paired.

5. BUTTON SWITCH or Enable:

This is used to switch the module into AT command mode. To enable AT command mode, press the button switch for a second. With the help of AT commands, the user can change the parameters of this module but only when the module is not paired with any other BT device. If the module is connected to any other Bluetooth device, it starts to communicate with that device and fails to work in AT command mode.

VIII. CONCLUSION

We have to work on design and development of solar panel parameter reading using arduino for environmental monitoring, the node is enough to provide information about environment parameter like light intensity,voltage,current.

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