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Solar Power Control & Monitoring Using IoT & Automatic Stret Light Control

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ABSTRACT: As technology is advancing, cost of renewable energy equipments is decreasing which has resulted in a massive increase in solar photovoltaic installations. Most of these installations act as auxiliary power source. A majority of these are installed in inaccessible locationsas close as a rooftop to as far away as a dessert. Hence they require sophisticated systems for remote monitoring of these installations using wide area networks. In this paper we will discuss a low cost IOT based embedded Solar PV Monitoring system which will make use of WI-FI module and a low cost microcontroller to send the data measured at the production end on the internet, which can then be accessed anywhere on the globe. This will provide us real time information of the installation which will help us in its maintenance, fault detection and will give us a record of all the data at fixed intervals,as well as we use street light application automatic control based on intensity.

I. INTRODUCTION

This project IOT based solar power Monitoring and control system is a very innovative system. which will help to keep the power regulation as we need. This system monitors the voltage, current and power and informs about the level via a thing speak server. For this the system uses voltage sensor, current sensors placed over this project. Also, this system can operate automatic street light with intensity control. The system makes use of Arduino board/ AT mega 328 microcontrollers, LCD screen, wi-fi module to send data over thing speak server. The system is powered by a 12V solar panel. The LCD screen is used to display the status of the voltage, current, power of respective sensor collected.

The data on things speak in graphical/ bar graph format consists with reading, related to all temperature sensors (boilers). The LCD screen shows the status of the sensor. The system puts on LCD screen continuously monitoring of sensor with Arduino board. Thus, this system helps to keep the power maintain by informing about the sensor levels of the boiler by thing speak server.

IOT Thing speak to transmit solar power parameters over the internet to IOT Thing speak server. It now displays these parameters to the user using an effective GUI and also alerts user when the output falls below specific limits. This makes remotely monitoring of solar plants very easy and ensures best power output.

II. LITERATURE SURVEY

Kabalci, Ersan, Gorgun A. and Kabalci Y, 2013.is said that introduction to an instant monitoring infrastructure of renewable energy generation system that is constituted with a wind turbine on current and voltage measurements of each renewable source. The related values are measured with the developed sensing circuits and processed by 18F4450 microcontroller of Microchip. The processed parameters are then transmitted to personal computer (PC) over universal series bus (USB) to be saved in database and to observe the system instantly. The Coded visual interface of monitoring software can manage the saved data to analyses daily, weekly and monthly values of each measurement separately [1].

In this pepergoto, Yoshihirao, by this system is monitor & controlled started operations as well as manage & monitor remotely telecommunication power plants integrated system.This system used to operate & maintain rectifiers, inverters, UPS's in the telecommunication power plats.this system operate on single system & improves user interfaces[2].

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In this methodJiju K. et. al, 2014saidfor renewable energy source development of online control & monitoring is depend on android system. So in this system use Bluetooth interface connection to android system for communication purpose[3].

In this peper Xi Chen, Limin Sun, Hongsong Zhu, Yan Zhen, Hongbin Chen, said that important of internet of things.by use of internet of thing we can secure the data & also record the data[4].

S.V. Tresa Sangeeta, Dr. S. Ravi, Dr. S. Radha Rammohan said To cope up with rapidly changing technology, IOT is the best solution for monitoring of solar installations. IOT based remote monitoring of the Solar PV installation will also save energy [5] and man-labour.

III. PROPOSED SYSTEM

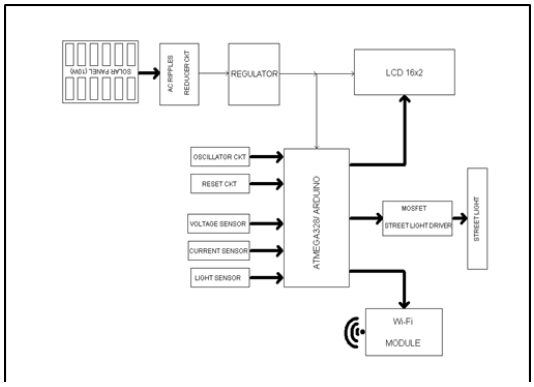

Fig. 1 block diagram of solar poer control & monitoring using iot& automatic street light intensity control.

A.VOLTAGE& CURRENT SENSOR

Voltage sensor is used to sense the voltage generate by the solar panel. we know that solar panel voltage is 12v but microcontroller operate only 5v supply so with help of voltage divider rule we operate microcontroller. Voltage sensor work on the principle of voltage divider rule.

i.e. voltage divider rule,

Vout=R1/R1+R2*Vin

Current is sensed using Hall Effect Current Sensor. Hall Effect is the generation of potential difference due to a current carrying conductor in a perpendicular magnetic field [6]. Hall Effect current sensors work on this principle.

B. LIGHT SENSOR

It is a device which converts light energy of various wavelengths from infrared to uv into the electrical energy. It is used for the street light application for sensing the light intensity & street light operation.

C.WIFI MODULE (ESP8266)

The ESP8266 WIFI Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WIFI network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

D.LIQUID CRYSTAL DISPLAY (LCD)

We get the definition of LCD from the name “Liquid Crystal Display” itself. It is actually a combination of two states of matter – the solid and the liquid. They have both the properties of solids and liquids and maintain their respective states with respect to another.

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E.ATMEGA328

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip.

IV. RESULT OF SOLAR POWER MONITORING SYSTEM USING IOT

F.THINK SPEAK SERVER RESULTS :-

Internet of Things (IoT) platform integrates data from the different solar panels and applies analytics to share the most valuable information with applications built to address specific needs. These powerful IoT platforms such as Thing speak, Microsoft Azure and Google cloud platform etc. can pinpoint exactly what information is useful and what can safely be ignored. This information can be used to detect faults, make recommendations, and detect possible problems before they occur. The information picked up by connected sensors enables to make smart decisions based on real-time information, which helps save time and money. Here we add only one graphical format of result.we can use different graphical format for dsplayresult.The results shown in below fig.4.1.

Fig. 4.1 Think Speak Server Output Screen

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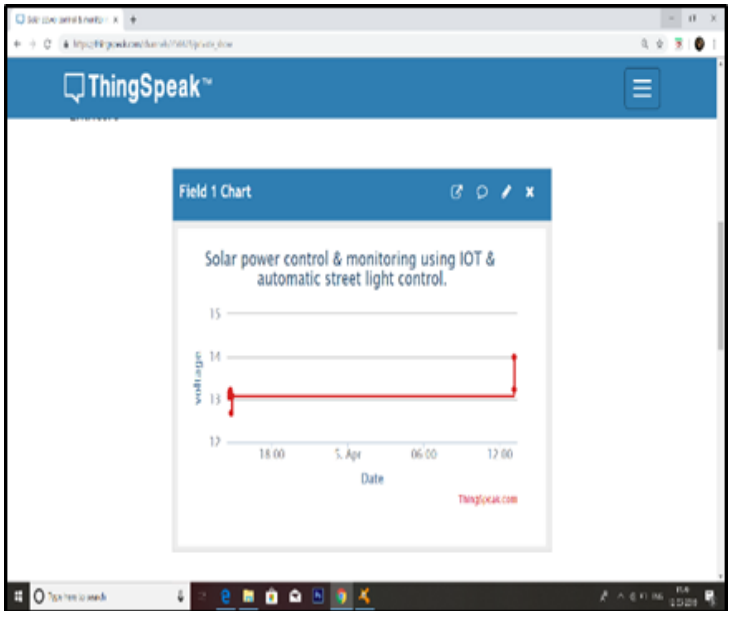

Fig. 4.2 Voltage Reading In lineGraphical Format.

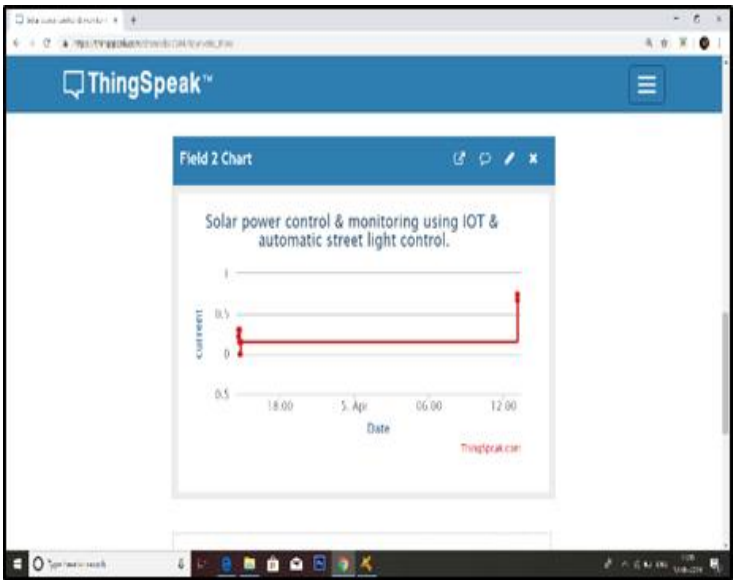

Fig. 4.3 Current Reading In lineGraphical Format.

G.STREET LIGHT APPLICATION RESULTS :-

4.4 On Day Timing :-

Street light is not on because of light intensity is large so light sensor command to MOSFET is off . the result shown in fig.4.4.

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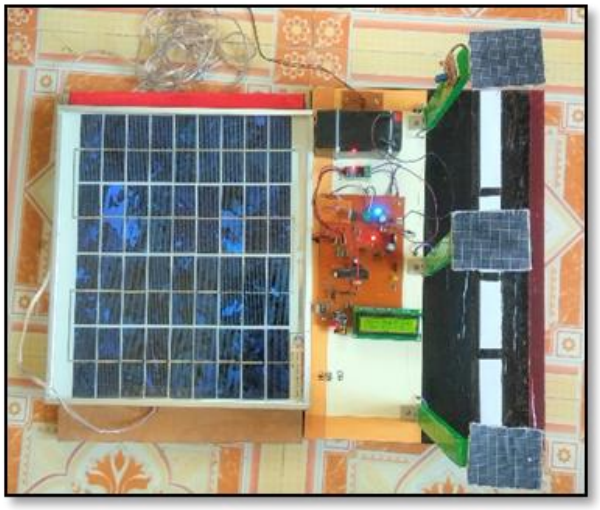

Fig.4.4 Street Light Is Off Condition In Day Timing

4.5. At Night Timing :-

Fig. 4.5 Street Light Is On Condition In night Timing

When the sun light are rise to sunset timing then light sensor sense the intensity of sun rays and command to MOSFET to on and street light is on & automatically street light on.The results shown in fig. 4.5.

V. CONCLUSION

To cope up with rapidly changing technology, IOT is the best solution for monitoring of solar installations. IOT based remote monitoring of the Solar PV installation will also save energy and man-labour. Because of the use of IOT in this proposed system, there is a large scope for future work. can add modern devices and sensors without the fear of compatibility. Flexibility of this system is its uniqueness. Adding more sensors, it can measure voltage and

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current output, power consumption of load, solar irradiance and corresponding output of the solar panels and a lot more. Further extremely useful for wireless IOT based monitoring and control to improve conventional solar based electrical vehicle system for converter design and the adoption of suitable Maximum Power Point Tracking (MPPT) techniques& we use different application by use of solar energy like street light.so in this project we conclude that solar power control & monitoring by IOT is very useful&safety. Street light is one application to use the stored energy in batteries.

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