Automatic Solar Tracking and Monitoring System

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Abstract- *Nowadays the demand for energy is constantly increasing. The sources of energy are reducing day by day. Hence it is necessary to renew and reuse the sources of energy. The major source of energy is Sun. Solar energy is the energy produce by the sun. The proposed application is use to monitor the energy produce by sun, using an android application. To monitor the solar energy, the values of different parameters of sunlight get calculated. The major parameters of sunlight are light intensity, voltage, temperature and current. To get the values of this parameters different sensors are used. All the data about the solar energy is stored on the cloud so that large amount of data can be store. For proper utilization of solar energy servo motor is used which rotate the solar panel in the direction where sunlight is more. In various areas where need of electricity is more at that places this system can be implemented to use the natural energy in efficient way. The applicability of the proposed application will be very useful in the conservation of solar energy.*

Keywords- Current, Voltage, Intensity, Temperature, Servo motor.

I. INTRODUCTION

This is solar tracking and monitoring system which can be used as a power generating method from sunlight. If Solar energy used efficiently then it will not only meet the power shortage but also reduce the burden on other resources like thermal and nuclear plants. For this it is important to monitor the solar panels efficiently and track maximum sunlight. The purpose of this project is to develop a system which monitors a remote solar panel based on the values of different parameters of sunlight. This system provides better utilization of solar energy by rotating solar panel into the direction where sunlight is more using Servo Motor.

II. LITERATURE SURVEY

In paper PV solar cell real time data monitoring using labview and DAQ[1], investigated that design process involved in building a monitoring and data acquisition system for a rooftop photovoltaic facility. An important part of the project is dedicated to current measurement and data acquisition systems dedicated for monitoring PV systems. Applied solutions and experimental results are discussed in terms of accuracy and optimization needs of the operation. Second paper is solar tracking:An efficient method of impoving solar plant effi- ciency[2]. This paper evaluates effect to enhance the overall efficiency of solar panels by keeping them aligned along with the sun position, Solar tracking system is used nowadays. Inthis paper, a study of various types of solar tracking systems has been presented.

In addition a new scheme of efficient street light system using single axis solar tracking with 89S51 microcontroller has been proposed. Next paper is The Design of Two Axis Solar Tracking System Based on Fuzzy Logic Control and Efficiency Analysis[3]. In that paper, two-axis solar tracking system with microcontrollers of fuzzy logic control was designed to increase the efficiency output obtained from solar energy and it was compared with the fixed system.In the moving system, mini PV panels are used as sensors to find the real position of the sun and that geared DC motors in the mechanism with PWM signals obtained from the fuzzy logic controllers were conducted in an intelligent way.

III. METHODOLOGY

The main objective of proposed system is to monitor the solar panels. There are some systems already available but proposed system provides the most accurate information with a user friendly Graphical Interface. User enters into the system with login credentials given to him at the time of registration. User requests about the data he wants know. User can view data at the current movement as well as past records. Data upto five years can be store into the database.

A. System Architecture

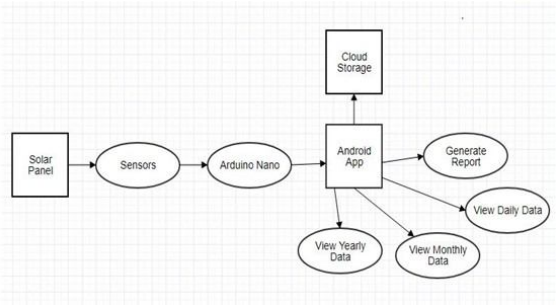

Fig. 1. System Architecture

The different types of sensors are placed on panel which are used to calculate the values of different parameters of sunlight like temperature, light intensity, voltage and current. These calculated values are store on cloud. Advantage of storing the data at cloud is that large data can be store without having the overheads of managing all the data at local workstations. Servo motor rotates solar panel into the direction where sunlight is more. This direction is decided from the value of light intensity which is calculated from LDR sensors. Proposed system architecture is as shown in fig 1.

B. Rotation

There are two Servo Motors connected to solar panel, one is connected at above the panel i.e. Top Servo Motor and another at below the panel i.e. Down Servo Motor. Two Light Dependent Registers are use to get light intensity values. LDR1 connected to top servo motor and LDR2 connected to down Servo Motor.

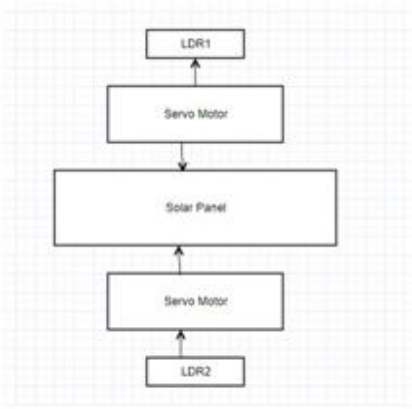

Fig. 2. Structural Diagram

Working of rotating solar panel is described in fig. 3 . Values of the LDR are used to rotate the panel. If value of LDR1 is greater then value of LDR2 panel is moved in the direction where LDR1 is placed. If value of LDR2 is greater then value of LDR1, then panel is moved in the direction where LDR2 is placed.If the values from all the LDR are equal then panel will be stable.

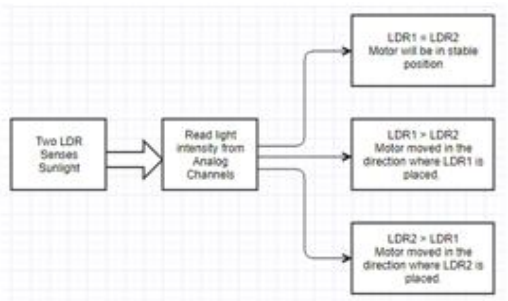

Fig. 3. Structural Diagram

C. Hardware and Software Specifications

Different kind of hardware and software are needed for this system.

1) Arduino Nano: The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Ar- duino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It works with a Mini-B USB cable instead of a standard one.
2) LDR: An LDR GL205 is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits.
3) WAMP server: WampServer refers to a software stack for the Mi-crosoft Windows operating system, consisting of the Apache web server, OpenSSL for SSL support, MySQL database and PHP programming language.
4) Net Beans: NetBeans is a software development plat- form written in Java.
5) Android Studio: Android Studio is the official integrated development environment for Googles Android operating sys- tem, built on JetBrains IntelliJ IDEA software and designed specifically for Android development.
6) Bluetooth Module: Serial Interface between Sensors and Arduino. Bluetooth Interface between Solar Panel and Android application.
7) Servo Motor: Servo motor is used to Rotates the solar panel according to the light intensity.

IV. DISCUSSION

This solar tracking and monitoring system is totally android based application. It allows user to view the data about panel. The application runs from any mobile device having android version 5.0 and above. All the features implemented works perfectly on the devices with faults and no system crashes. The cloud based real-time storage is reliable and dynamic. It can store large amount of data. we have stored data about last 5 years. Different sensors are used for getting the values of sunlight. Values provided by sensors are accurate so the results are correct. This application provides reliabilty as well as security to users.

V. CONCLUSION

The proposed solar tracking and monitoring system is an efficient system. Various sensors are used so the data provided to the users is accurate. Rotation is done using light

dependent register sensors through which maximum sunlight is captured and stored. For storing data cloud is used so that all infor- mation about solar panel can be stored. System satisfies the functional and non-functional requirements. This is secured as well as reliable system for users.

VI. FUTURE SCOPE

Solar panels are placed in open environment so they may get dust and dirt on them. So feature of cleaning panels using duster can be implemented. This duster can clean the panel after specific time delays