IoT based dual axis solar tracker system

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Abstract: *Solar energy is fast becoming a very important means of renewable energy resource. With solar tracking, it will become possible to generate more energy since the solar panel can maintain a perpendicular profile to the rays of the sun. Even though the initial cost of setting up the tracking system is considerably high, there are cheaper options that have been proposed over time. Light Dependent Resistors (LDRs) are used for sunlight detection. The solar panel is positioned where it is able to receive maximum light. As compared to other motors, the servo motors are able to maintain their torque at high speed. The trackers can either be dual or single axis trackers. Dual trackers are more efficient because they track sunlight from both axes. This project is designed for low power and portable application. Therefore, it's suitable for rural area usage. Moreover, the effectiveness of output power which collected by sunlight are increased.*
Key Words: Solar, Servo Motor, Raspberry Pi, LDR Sensors, Drivers, Ultraviolet sensors.

1. INTRODUCTION

In the past decade of years there is increase in demand for reliable and abundant electrical energy derived from renewable energy sources renewable energy plays important role in energy crisis of country. The government started to decrease the usage of conventional energy sources and encouraging people to use renewable energy sources like hydro and solar. One such example of renewable energy is solar power. Solar energy is a very large, inexhaustible source of energy. A solar tracker is a device used for orienting a photovoltaic array solar panel or for concentrating solar reflector or lens toward the sun. In this project, it's divided by two categories; hardware and software. In hardware part, light dependent resistor (LDR) has been used to trace the synchronize of sunlight by detecting brightness level of sunlight. For rotation part, standard servo motor has been selected. In software part, the code is constructed in C programming and inserted in Raspberry Pi. This project is designed for low power and portable application. Therefore, it's suitable for rural area usage. Moreover, the effectiveness of output power which collected by sunlight are increased.

2. LIERATURE SURVEY

In[1]" Arduino Based Two Axis Solar Tracking by Using Servo Mechanism "V.Brahmeswara Rao, K.Durga Harish Kumar, N.V.Upendra Kumar , K.Deepak this paper mentions about the variation in the solar energy occur daily due to variation in day night cycle and also because of seasonal variations throughout the year. Population of the world is increasing very rapidly. From past decade of years the non renewable energy sources like coal and oil are extinguishing and so it become serious problem for providing he reliable energy to the world. But solar energy plays important source of primary energy. In this project we propose dual axis solar tracking system by which it is possible to catch maximum amount of solar energy by using Arduino as main processing unit.

In [2] "Designing a Dual Axis Solar Tracking System for Maximum Power" Vijayalakshmi K Mentions The main purpose of this paper is to present a control system which will cause better alignment of Photo voltaic (PV) array with sun light and to harvest solar power. The proposed system changes its direction in two axis to trace the coordinate of sunlight by detecting the difference between position of sun and panel. Hardware testing of the proposed system is done for checking the system ability to track and follow the sunlight in an efficient way. Dual axis solar tracking system superiority over single axis solar tracking system is also presented.

In [3] "The implementation of solar tracker using arduino with servomotor" P.Ramya1, R.Ananth The aim of this paper is to consume the maximum solar energy through solar panel. A Solar Tracker is a device onto which solar panels are built-in which tracks the motion of the sun ensuring that maximum amount of sunlight strikes the panels all over the day. Power output from a solar cell will be maximum when it is facing the sun i.e. the angle between its surface and sun rays is 90 degree. Solar tracking allows more energy to be produced because the solar array is able to remain aligned to the sun. The components used for its construction are servo motor, Arduino and LDR. The active sensors continuously monitor the sunlight and alternate the panel towards the direction where the intensity of sunlight is maximum.

In[4] "Solar tracker for solar panel" Oloka Reagan Otieno this paper mentions In this project a single axis solar tracking system has been developed by which more energy from the sun can be harnessed. In this project, an Arduino Uno, which is an Atmel microcontroller-based board, has been used as the main controlling unit. To detect the position of the sun on the sky, two LDRs have been used and to rotate the orientation of the Solar PV panel a servo motor has been used.The sensors and servo motor have properly been interfaced with the Arduino board. The servo motor has

been mechanically coupled with the PV panel. The driving program has been written using the Arduino IDE. The whole system has been assembled together and its performance has been tested. This tracker changes the direction of the solar panel based on the direction of the sun facing to the panel successfully. Single axis solar tracker tracks the sun on daily basis and makes the solar panel more efficient.
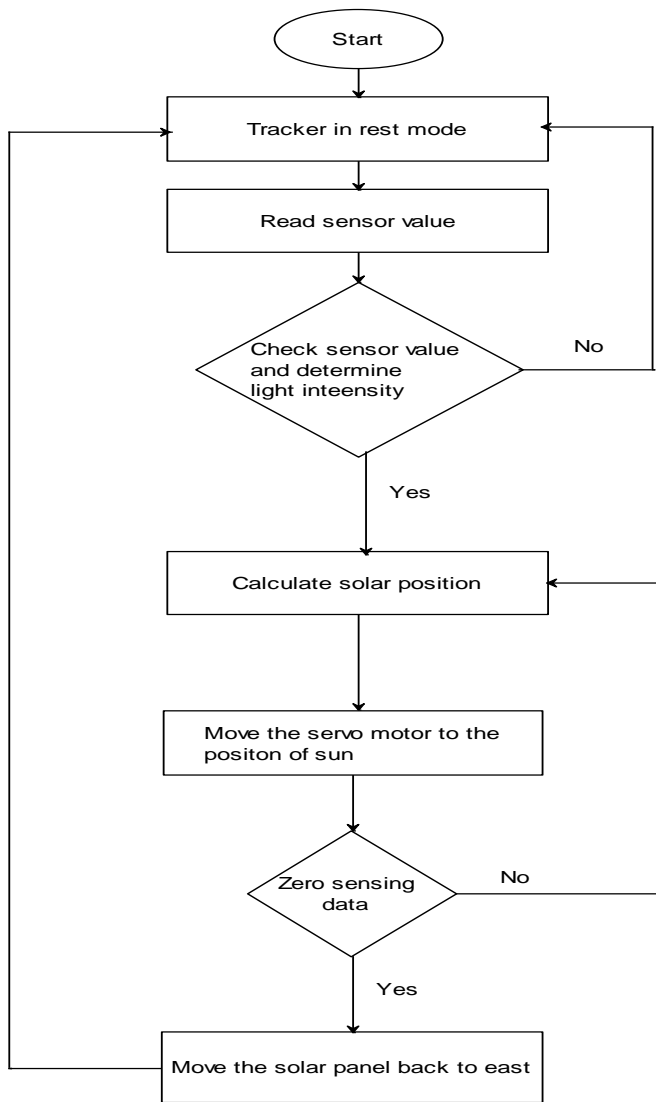
3. FLOWCHART

Fig: Flowchart

4. PROPOSED SYSTEM

In this article we are going to make a Sun Tracking Solar Panel using Raspberry Pi, in which we will use LDRs to sense the light and a servo motor to automatically rotate the solar panel in the direction of the sun light. This project is that Solar panel will always follow the sun light will always face towards the sun to get charge all the time and can provide the supply the maximum power.
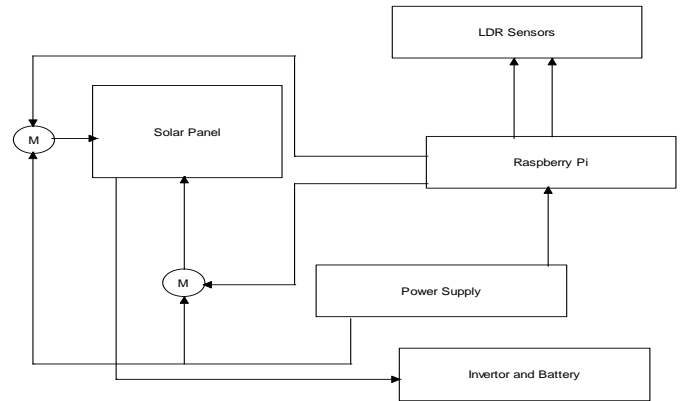

Fig: Block diagram

5. HARDWARE DETAILS

5.1 Solar panel

Solar energy is the photovoltaic cell which converts light energy received from sun into electrical energy. The name behind "solar" panel is they grab high powerful energy emitted from the sun.

5.2 Light Dependent Resistor (ldr)

Light Dependent Resistor (LDR)

Ldr are also named as photo conductors (or) photo resistors. This works on the principal of photo conductivity. Ldr resistance decrease with increase in light intensity and vice versa. Ldrs are mainly used for sensing purpose in order to catch the solar energy and provide analog input to arduino.

5.3 Servo motor

Servo motor is three wired dc motor which works on the principal of servo mechanism. Servo motor can rotate up to maximum angle of 180degrees.

5.4 Ultraviolet sensor

UV Sensor is used for detecting the intensity of incident ultraviolet (UV) radiation. This form of Electromagnetic radiation has shorter wavelengths than visible radiation.

5.5 Raspberry pi

6. CONCLUSION

The proposed dual axis solar tracker automatically tracks position of sun and maximize the solar power with help of Raspberry Pi. As compared to single axis, dual-axis system provides high abundant electrical energy output when compared to the fixed mount system. The Dual axis tracker is having more efficiency. The main aim of this work is to develop two axis solar tracker systems that use four sensors (ldr s) to predict the sun position.

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