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Sun Tracking Solar Panel Using Iot

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Abstract- *This project discusses the implementation of IoT (Internet of Things) for manoeuvring and remote monitoring the orientation of the solar panel from anywhere. Solar energy is clean, abundant, eco-friendly and it is a renewable type of energy. In order to maximize the efficiency of the solar panel, it should be perpendicular to the solar rays emitted from the sun. It can be achieved by rotating the solar tracker along with the sun throughout the day. Sun's position is determined by its Azimuth and Elevation angles. Nowadays the world is moving towards a new era called the Internet of Things and everything can be found on the internet. These angle data can be also found on the Internet, which makes this solar tracker precise, cheap, and accurate for tracking. It also makes monitoring the solar tracker position from anywhere at any time.*
Key Words*: SOLAR PANEL, IoT ARCHIETECTURE, ARDINO ETC.*

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I. INTRODUCTION

A solar tracker is a device for orienting a solar photovoltaic panel, day lighting reflector or concentrating solar reflector or lens toward the sun. Solar power generation works best when pointed directly at the sun, so a solar tracker can increase the effectiveness of such equipment over any fixed position. The solar panels must be perpendicular to the sun's rays for maximum energy generation. Deviating from this optimum angle will decrease the efficiency of energy generation from the panels. A few degrees of misalignment will only cause 1% to 5% of energy loss, while larger angles of 10° to 20° will significantly decrease the energy generation of up to 35%. Although, this loss is also dependent on the material and pattern of the protective glass that covers the solar panel. An active tracker uses motors to direct the panel toward the sun by relying on a sensing circuit to detect light intensity. There are two main ways to mount a solar panel for tracking; single axis and dual axis. Single axis trackers usually use a polar mount for maximum solar efficiency. Polar trackers have one axis aligned to be roughly parallel to the axis of rotation of the earth around the north and south poles. When compared to a fixed mount, a single axis tracker increases the output by approximately 30% The second way is a two-axis mount where one axis is a vertical pivot, and the second axis is the horizontal. By using a combination of the two axes, the panel can always be pointed directly at the sun. This method increases the output by approximately 36% compared to stationary panels. An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.

II. LITERATURE SURVEY

The construction of a prototype for solar tracking system with two degrees of freedom, which detects the sunlight using photocells.

The control circuit for the solar tracker is based on a Arduino. This paper is about moving a solar panel along with the direction of sunlight ,it uses a dc motor to control the position of the solar panel. Light dependent sensors are used to track the sun and to start the operation. This auto-tracking system is controlled with one 12V,3W DC motors. The single –axis solar tracking system is constructed with both hardware and software implementations.

III. BLOCK DIAGRAM

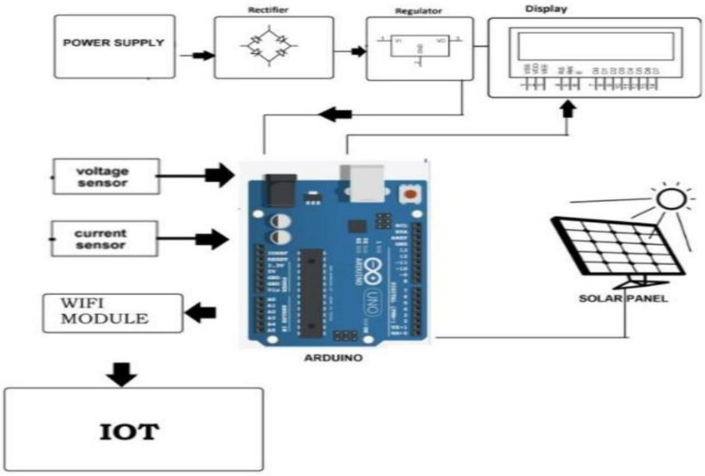

Fig -1: Block Diagram

IV. HARDWARE COMPONENTS

- Solar panel
- LDR'S
- Servo motor
- Current sensor
- Voltage sensor
- Battery
- ESP8266 Wi-Fi Module
- LCD
- Arduino

V. SOFTWWARE REQUIREMENTS

- Arduino

VI. CIRCUIT DIAGRAM

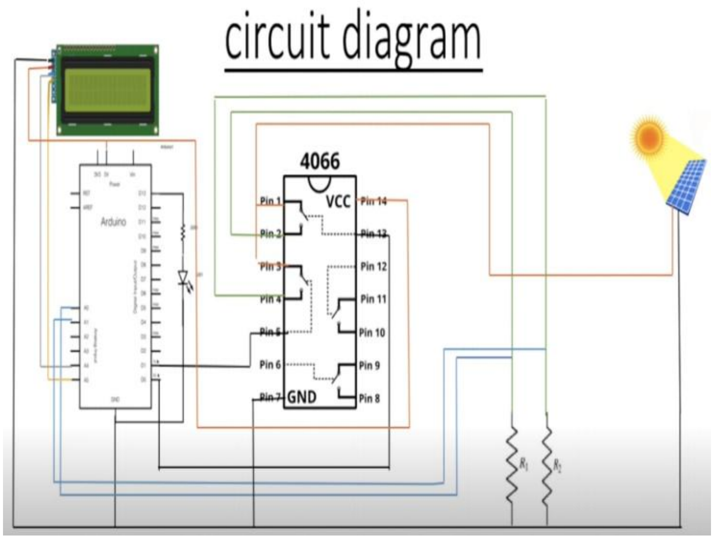

Fig 2 : Circuit Diagram

VII. WORKING

Solar panel uses photovoltaic cells (PV cells).The PV cells detect the light intensity and according to that, the tracker adjusts the direction that a solar panel to the position of the sun. Every time, the tracker adjusts the panel perpendicular to the Sun so more sunlight strikes the solar panel, less light is reflected. Hence, it absorbs more energy which can be converted into power.

In this prototype, we are using the LDR sensor to detect the light intensity and servo motors for automatic rotation of the panel using Arduino microcontroller. Arduino Uno board uses to control the motor as per the output of the LDR sensor. You can use potentiometer also to operate this panel manually.

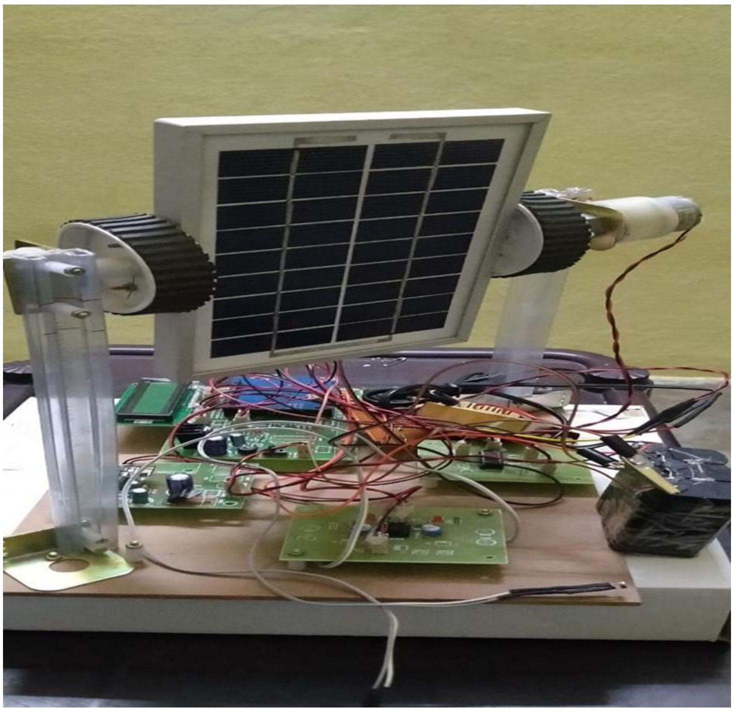

Fig 3: Project kit

VIII. RESULTS

Fig 4: Output 1

Fig 5: output 2

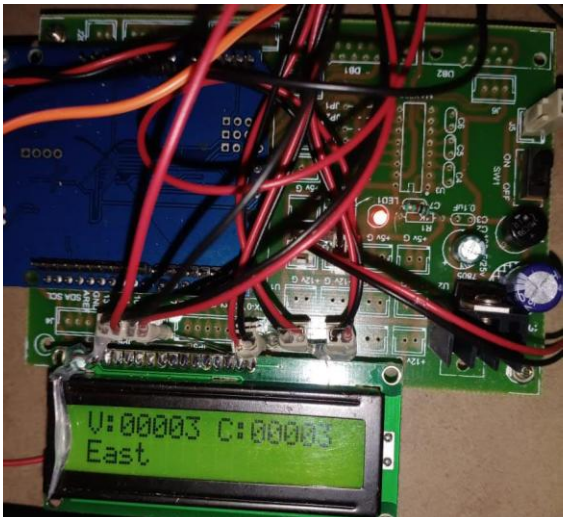

Fig 6: output 3

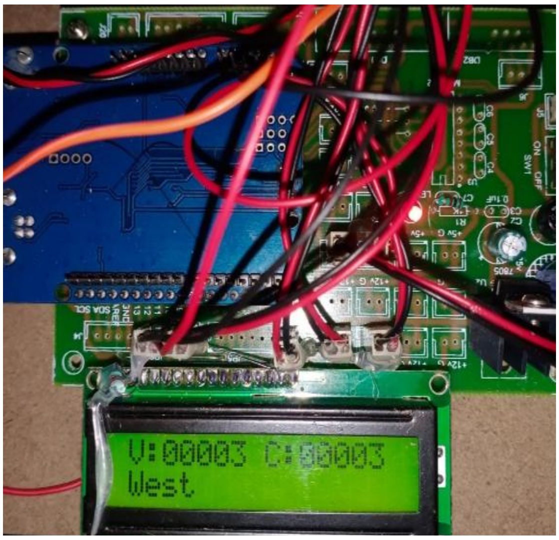

Fig 7: output 4

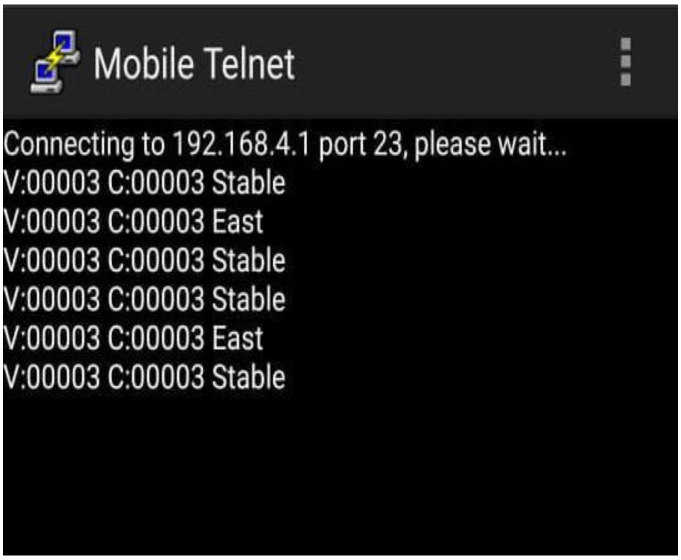

Fig 8: output 5

IX. CONCLUSION

This proposed solar tracker will be reliable and accurate throughout the operation and yields maximum output power when compared to the single-axis and static solar system. And the implementation of IoT can avoid human errors. It will be a good competitive solution for growing technology that uses solar energy for power. And it is expected to contest with other complex and expensive systems. As future work MPPT technique can be implemented for extracting maximum power from the photovoltaic module and high precision sensors can be used to increase precision.

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