

## SMART SOLAR TRACKER USING IOT: Engineering College Prospective

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### Abstract

Solar energy with solar tracking, will become possible to generate more energy since the solar panel depends on 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 control circuit is ATmega 328P microcontroller. 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. They are also more efficient with efficiencies in the range of 80-90%. Most of the panels still operate at less than 40%. As a result, most people are forced to either purchase a number of panels to meet their energy demands or purchase single systems with large outputs. One of the ways to increase the efficiency of solar panels while reducing costs is to use tracking. Through tracking, there will be increased exposure of the panel to the sun, making it increased power output. The trackers can either be dual or single axis trackers. Dual trackers are more efficient because they track sunlight from both axes.

**Keywords:** — *solar tracker, IOT,*

### Introduction

1. Smart tracker aims to provide an innovative way to increase the efficiency of the solar panel and to ensure maximum

usage of the solar energy. As the existing system did not track the movement of the sun, also it did not maintain any records of the energy being saved and consumed. The process of collecting the data using sensors and storing as well as displaying the same is called as Automatic Meter Reading (AMR). This technique can be very useful in hugely populated countries such as India. In India employees are hired to

go from house to house and collect the reading from the energy meters. India uses a slab- based model of pricing to charge the customers for the usage of electricity.

This method is basically used in order to reduce the burden on the poor people. But if ever an error occurs in this process then it can cause a huge loss to the companies providing power. In order to reduce this risk Automatic Meter Reading can be used, it can also be called as the cheap solution. It also prevents the manual labour required to collect data of each meter. The vital thing behind this approach is that it increases the efficiency of the conventional panel as well as it provides a cheap solution for reducing the manual labour and the possibility of error in the manual labour.

## II.EXPLORATORY DATA ANALYSIS (EDA)

To study and observe the behaviour of data, attributes ,relationship between attributes and target variable are graphically visualized ,so that pattern of data is keenly studied and to explore the dependency and weightage of attribute so as to extract reliable features to develop a reliant model with robust features. The primary plots that are visualized:

- Individual attributes plot against its frequency [to observe the data].
- Attributes against target variable(„FinalGrade“)[to study the dependency and weightage]

## III. LITERATURE SURVEY

Much research has been done in order to maximize power generated from solar panel as Renewable Energy is one of the needs now a days.

Aashish Tiwari, Mayuri Vora, Prajkta Shewate, Vrushali Waghmare have presented a new approach by which the energy efficiency of the solar panel increases as we implement dual axis tracking. In the dual axis tracking maximum irradiance can be obtained on the solar panel thus more will be current generated from the panel.[1].

A Kaseem and M. Hamad have presented a new approach.

The PV systems basically consists of PV arrays that converts radiations to electrical energy and the inverter converts the dc energy obtained from the PV array into AC which can be used to run home appliance such as TV, radio etc. The energy from the PV array can be fed back to the grid or can be fed to a battery which can act as a storage media in case of power outage.The solar inverter is microcontroller based, it uses a microcontroller based driver, switching circuit, setup transformer & filter. The microcontroller-based driver generates PWM signal. This signal has a fixed frequency and duty cycle. [2]

#### IV. OBJECTIVE

The objective of this project is to control the position of a solar panel in accordance with the motion of sun. Brief Methodology: This project is designed with solar panels, LDR, ADC, Microcontroller, Stepper Motor and its driving circuit. In this project two LDRs are fixed on the solar panel at two distinct points. LDR (Light Dependant Resistor) varies the resistance depending upon the light fall. The varied resistance is converted into an analog voltage signal. The analog voltage signal is then fed to an ADC. ADC is nothing but analog to digital Converter which receives the two LDR voltage signals and converts them to corresponding digital signal. Then the converted digital signal is given as the input of the microcontroller. Microcontroller receives the two digital signals from the ADC and compares them. The LDR signals are not equal except for normal incidence of sunlight. When there is a difference between LDR voltage levels the microcontroller programme drives the stepper motor towards normal incidence of sunlight.

#### V. PROPOSED SYSTEM

The proposed Solar Tracking system can track the movements of the sun; thus, it would always face the direction of radiation. Also, conveniently measure the energy used.

Fig 1. Block Diagram

The process followed by the sun tracking solar panel is as follows.

##### 1. Solar Tracker

A standard solar panel consists of a layer of silicon cells. It also consists of a metal frame, a glass casing and various wiring to allow the current to flow from the silicon cells. As the solar panel faces the sun it absorbs the energy given by the sun and the silicon cells convert this energy into electricity. The solar panel is available in various shapes and sizes.

In order to implement tracking of the sun movement additional improvements are done in the normal solar panel. LDRs are used, they are light dependent resistors.

Their function is to sense the direction of light. The LDRs can be placed in various methods on all four corners of the panel or on all four sides of the panel. Besides this a DC motor is used to move the solar panel when light is detected. PIC microcontroller is used in order to control the movement of the tracker. The LDRs detect the maximum light, and the PIC is accordingly programmed to move in the direction of maximum light. Two motors are used to drive the tracker, one is for the tilt movement of the panel while the other is used for base rotation movement.[2]. Dual axis solar panel that has both the movements that is rotation from base as well as tilting is implemented.[1]

Fig 2. Solar Tracker Circuit Diagram

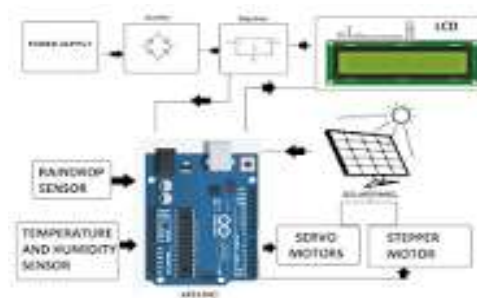
## 2. INVERTER

The supply from the solar panel is then given to the inverter. The energy converted to electricity by the solar panel basically, in the form of DC. But in order to drive various loads AC power is needed using an inverter. This converts the DC power received from the solar panel into AC. Before the supply is given to the inverter it is also passed through the charge controller. The basic function of the charge controller is to regulate the supply. The energy converted is uneven, so in order to regulate or smoothen it a charge controller is placed.

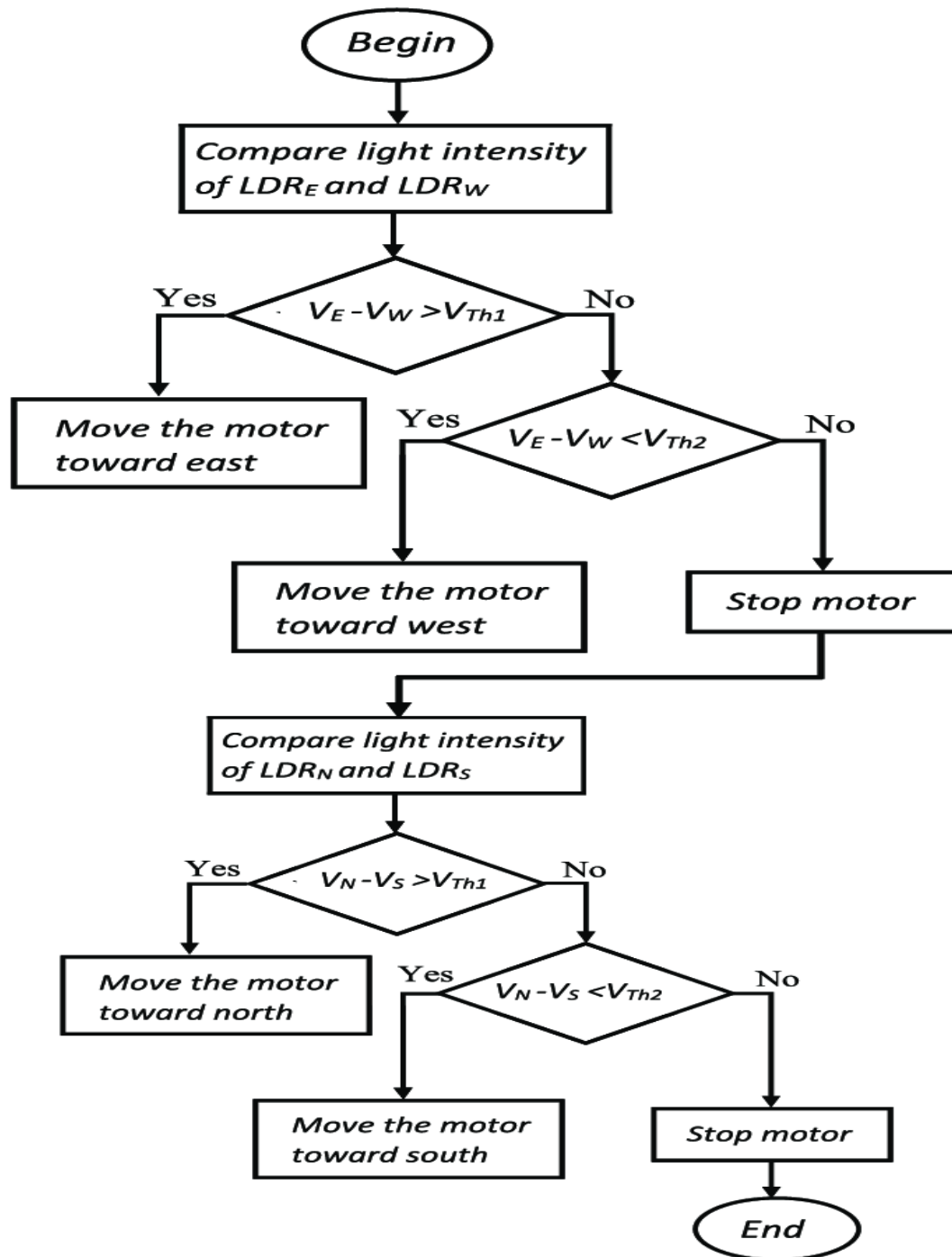
## 3. Battery

In order to save the energy generated a battery is placed in the system. The battery also has a function of supplying to the load that is to be driven. A specific amount of charge is needed to drive the load connected. Hence the battery is first charged and then the charge is used to drive the load. It is also useful for storing the extra charge or unused charge. One alternative to the battery is the AC mains supply.

## VI. ARCHITECTURE DIAGRAM



## VII. FLOW CHART REPRESENTATION



## VIII. CONCLUSION

This approach increases the efficiency massively as compared to the current system. As the panel tracks position of the sun throughout the day maximum output is extracted from this system. The maximum energy absorbed from the sun is converted to electrical energy. Due to continuous tracking the overall efficiency is increased. The performance management provided by this system is very useful in order to keep a track of the whole system. The energy being used and consumed is uploaded. Any error if present is known faster. The provision of saving the amount of unused energy and sending it back to the MSEB is very innovative. It is an amazing step so as to prevent the wastage of energy.

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