# Dual Axis Solar Tracking System With Weather Monitoring Using IOT

**[1] Ch pavan Kumar , [2]Giddanti Sateesh, [3]Shaik Akhil, [4]Shaik Sameer, [5]Yatham Venkatesh , [6] M Vineeth**

[1]Assistant professor, [2,3,4,5,6] Student, [1]Dept.of ECE, [2]Dept.of ECE, [3]Dept.of ECE, [4]Dept.of ECE, [5]Dept.of ECE, [6]Dept.of ECE Visvodaya Engineering College, Kavali, Nellore District

**ABSTRACT:**

Solar power is the fastest growing means of renewable energy. The project is designed and implemented using simple dual axis solar tracker system. In order to maximize energy generation from sun, it is necessary to introduce solar tracking systems into solar power systems. A dual-axis tracker can increase energy by tracking sun rays from switching solar panel in various directions. This solar panel can rotate in all directions. This dual axis solar tracker project can also be used to sense weather, and it will be displayed on LCD. This system is powered by Arduino, consists of DC motor, Motor Driver Board, rain drop sensor, temperature and humidity sensor and LCD. The sensors data will be uploaded to the cloud server through Node MCU.

**Keywords**: Arduino, Rain drop sensor, DHT11, LDR sensor, Solar panel, LCD, Motor drive,DC motor ,Node MCU

## I.INTRODUCTION:

With the unavoidable shortage of fossil fuel sources in the future, renewable types of energy have become a topic of interest for researchers, technicians, investors and decision makers all around the world. New types of energy that are getting attention include hydroelectricity, bioenergy, solar, wind and geothermal energy, tidal power and wave power. Because of their renewability, they are considered as favourable replacements for fossil fuel sources. Among those types of energy, solar photovoltaic (PV) energy is one of the most available resources. This technology has been adopted more widely for residential use nowadays, thanks to research and development activities to improve solar cells' performance and lower the cost. According to International Energy Agency (IEA), worldwide PV capacity has grown at 49% per year on average since early 2000s. Solar PV energy is highly expected to become a major source of power in the future.

## II.LITERATURE SURVEY:

**1.Nader Barsoum, Global Journal on Technology, Vol.01, 1985-9406-**states thatresearch has proved that solar tracking systemwith single-axis freedom can increase energy output by approximately 20%, whereas the tracking system with doubleaxisfreedom can increase the output by more than 40%. Therefore, this work was to develop and implement a solar tracking system with both degree of freedom and which detects the sunlight using sensors. This Peripheral Interface Controller was the brain of the entire tracking system, and it was programmed to detect the sunlight through the sensors and thenactuate the motor to position where maximum sunlight could beilluminate the surface of the solar panel. This is programmed to detect the sunlight using the photocells and then actuate the motor to position the solar panel where it can receive maximum sunlight.

**2.Tiberiu Tudorache, U.P.B. Sci. Bull, Vol.74, ISSN 11454-234-**discussed the performance of a single axis solar tracking PV panel designed andexecuted by University Politehnica of Bucharest in cooperation with Technosoft International SRL. The performance of the equipment was experimentally tested in comparison with a fixed PV panel. This paper deals with the performance estimation of a solar tracking PV panel of single axis type. The studied device automatically searches the optimum PV panel position with respect to the sun by means of a DC motor controlled by anintelligent drive unit that receives input signals from dedicated light intensity sensors. The recorded data on day proved that the solar tracking PV panel produced more energy than the fixed one with about 57.55%. Considering the own energy consumption of the tracking mechanism, the mobile PV panel becomes less attractive than the fixed one, the tracking mechanism being oversized. If higher power PV panels are driven by the same tracking mechanismthey may produce more energy than the fixed ones e.g. about 38% more energy in case of a 100 Wp PV panel, under the same experimental conditions.

**3.J. Rizk, World Economy of Science Engg. & Tech. Vol.41-** states the potential system benefits of simple tracking solar system using a stepper motor and light sensor. A solar tracking system is reportedly designed, implemented and experimentally tested. The design details and the experimental results are discussed. A solar tracker is designed employing small solar cells to function as self-adjusting light sensors, providing a variable indication of their relative angle to the sun by detecting their voltage output. By using this method, the solar tracker is found to be successful in maintaining a solar array at a sufficiently perpendicular angle to the sun. The power increase gained over a fixed horizontal array was more than 30%.

**4.S. Abdallah Desalination ELSEVIER 220 669-676-**has presented a computerized sun tracking device for rotating the solar still with the movement of the sun. A comparison between fixed and sun tracked solar stills showed that the use of sun tracking increased the productivity to around 22%, due to the increase of overall efficiency by 2%. It showed that the sun tracking is more effective than fixed system and is capable of enhancing the productivity. Using the sun tracker increases the water temperature while it decreases thermal capacity of the water. This increases the evaporation rate and hence the distillation rate.**III.EXISTING SYSTEM:**

In past we do not have any automatic technologies for rotating the solar panel. It was not provide sufficient output continuously. It is difficult to rotate solar panel every time on the day manually at plant. So power is not sufficient for all the time. Traditionally cleaning system was done manually. The manual cleaning has disadvantages like risk of staff accidents and damage of the panels, movement difficulties, poor maintenance etc.

**DRAWBACKS FOR EXISTING METHOD**

- The manual cleaning has disadvantages like risk of staff accidents and damage of the panels, movement difficulties, poor maintenance etc.

## IV.PROPOSED METHOD:

Solution for this drawback of the manual controlling of the solar panel direction every time on the day is microcontroller based two-axis solar tracking system. In this system we have LDR's for changing the direction of the solar panel according to sunlight. In this proposed project we are using Arduino, Motor Driver, Motors. To monitor weather, we are using raindrop sensor and DHT11 Sensor. Here we are using NodeMCU to upload the sensor data to the cloud server.

**BLOCK DIAGRAM FOR PROPOSED METHOD**

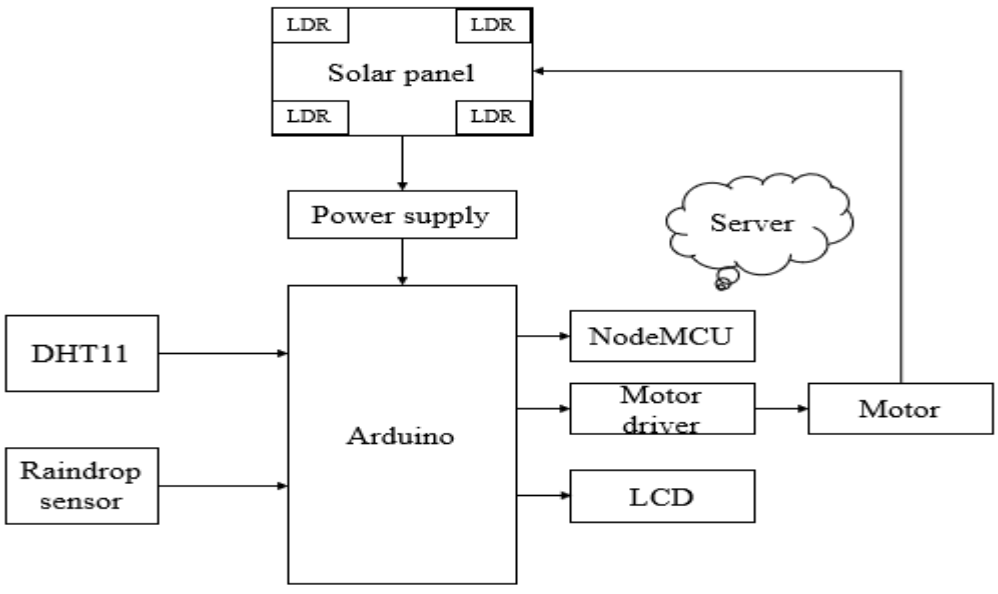



**Fig: Block Diagram of Proposed Method**

**ADVANTAGES:**

- Low power consumption
- More reliable
- More compatible
- Less cost

**APPLICATIONS:**

- Useful in monitoring the humidity in nature
- Useful to find the humidity in form**V. COMPONENTS DESCRIPTION:**

**HARDWARE COMPONENTS REQUIRED:**

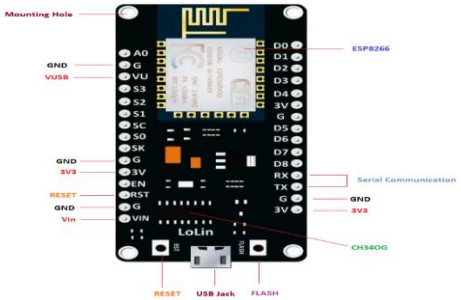
**5.1ARDUINO UNO:**

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources.

This is what the Arduino board looks like.


**5.2 NODE MCU:**

The firmware is based on Lua – A scripting language that is easy to learn, giving a simple programming environment layered with a fast scripting language that connects you with a well-known developer community.



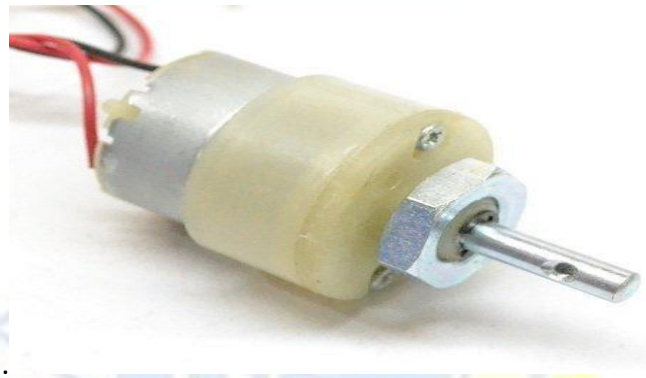
### 5.3 SOLAR PANEL:

A solar panel, or photo volataic (PV) module, is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sun light as a source of energy to generate direct current eletricity. A collection of PV modules is called a PV panel, and a system of panels is an array. Arrays of a photo volataic supply solar electricity to electrical equipment.

### 5.4 DC MOTOR:

A machine that converts D.C power into mechanical power is known as a d.c. motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The direction of this force is given by Fleming's left hand rule and magnitude is given by;

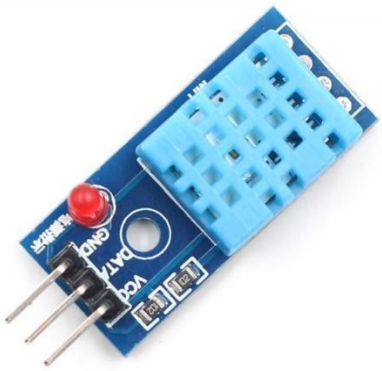
F = BIl newton's



.

### 5.5 DHT11 SENSOR (TEMPERATURE/HUMIDITY):

The DHT11 is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds



### 5.6 LCD DISPLAY:

LCD (Liquid Crystal Display) is the innovation utilized in scratch pad shows and other littler PCs. Like innovation for light-producing diode (LED) and gas-plasma, LCDs permit presentations to be a lot slenderer than innovation for cathode beam tube (CRT). LCDs expend considerably less power than LED shows and gas shows since they work as opposed to emanating it on the guideline of blocking light.


### 5.7 LDR SENSOR:

A **Light Dependent Resistor** (also known as a photoresistor or LDR) is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light-sensitive devices. They are also called as photoconductors, photoconductive cells or simply photocells.

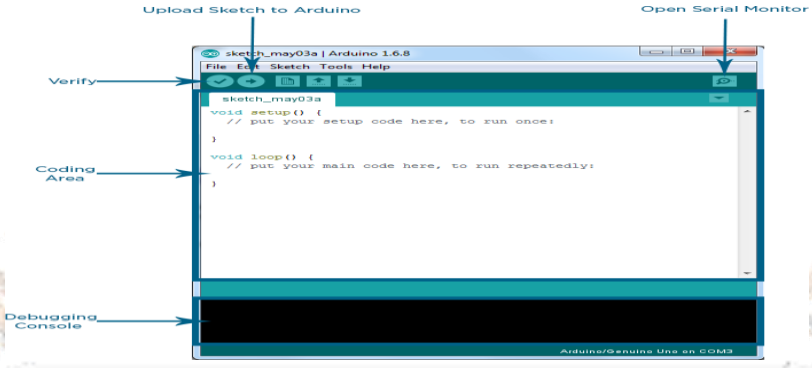
### 5.8 RAINDROP SENSOR:

**Raindrop sensor** is basically a board on which nickel is coated in the form of lines. It works on the principal of resistance. **Rain Sensor** module allows to measure moisture via analog output pins and it provides a digital output when a threshold of moisture exceeds.

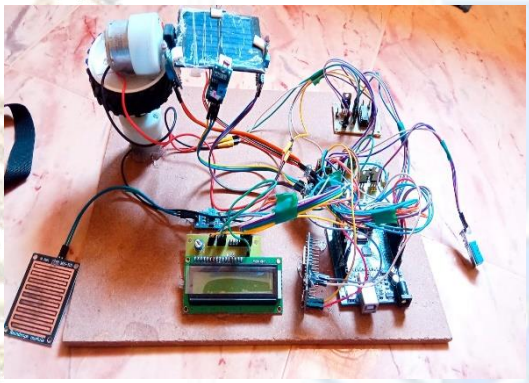
**SOFTWARE REQUIREMENTS**

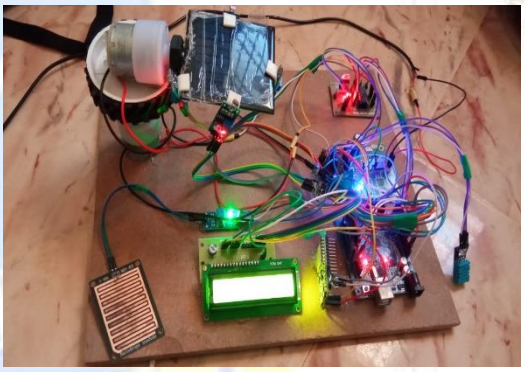
**5.9 Arduino IDE:**

**Arduino IDE** where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

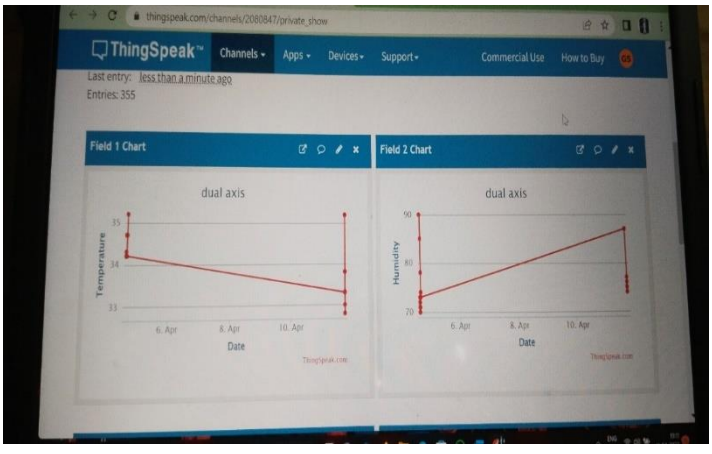



**V.RESULT AND DISCUSSION:**









A Dual axis solartracking system with weather monitoring is designed to track the movement of the sun and adjust the solar panels angle to maximize the energy output .The weather monitoring features allows the system to respond to environmental factors such as temperature and humidity sensor,raindrop sensor which is display on the LCD and also we can add the IOT it display values in the thingspeak website.finally,the main advantage of a dual axis solar tracking system is that it can siginificantly increase the energy output compared to a fixed panel system.

**VI.CONCLUSION:**

This project has presented a mean of controlling a sun tracking panel with an embedded microprocessor system. Specifically, it demonstrates working solution for maximizing solar cell output by positioning a solar panel at the point of maximum light intensity. The proposed solution for a solar tracking system offers several advantages concerning the dual axis movement of the solar panel: the high system stability; the control algorithm used has no searching phase; it calculates the position of the sun and moves the motors towards that sun immediately. No light sensors involved to determine the sun apparent position.

**VII.REFERENCE:**

[1] L. Ranghetti, L. Busetto, A Crema, "Testing estimation of water surface in Italian rice district from MODIS satellite data". International Journal of Applied Earth Observation & Geoinformation, vol. 52, no.7, pp. 284-295, Oct. 2016

[2] M. Campos-Taberner , F. J. García-Haro and R. Confalonieri, "Multitemporal Monitoring of Plant Area Index in the Valencia Rice District with PocketLAI". Remote Sensing, vol. 8, no. 3, pp. 192-209, Mar. 2016

[3] EA Chiaradia, A. Facchi, D. Masseroni and D. Ferrari, "An integrated, multisensor system for the continuous monitoring of water dynamics in rice fields under different irrigation regimes". Environmental Monitoring and Assessment, vol. 187, no. 9, pp. 586-603, Sep. 2015

[4] H. Luo, G. Li and W. Peng, "Real-time remote monitoring system for aquaculture water quality". International Journal of Agricultural & Biological Engineering, vol. 8, no. 16, pp. 136-143, Dec. 2015

[5] I. Heimann, V. B. Bright and M. W. Mcleod, "Source attribution of air pollution by spatial scale separation using high spatial density networks

of low cost air quality sensors". Atmospheric Environment, vol. 113, no. 11, pp. 10-19, Jul. 2015