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# A Review on Weather forecasting with smart security system solar based street light

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**ABSTRACT -** In the current era the world wants less power consumption, Efficiency, Cost Efficient, Automation in the technology and use of the design which reduces human efforts. Using devices like Solar panel, LED's, Infrared Sensor, Nodemcu, LDR which are not very expensive so the model serves as a cost-efficient model, and to provide an eco-friendly smart Solar based street lighting system that is less power consumable and also reduces the manpower. This Model is based on smart street lights using solar panels with moving tracker system and to adjust the intensity of the light according to the environment and which makes it less consumer of power and a weather forecasting system to continuously show data on an OLED, it also contains a smart IOT based system that informs you when someone try to steal or wants to damage the lights it will send a notification which works on the Blynk Cloud Protocol and it also send its data to the web servers so you can easily see data.

**KEYWORDS** – Solar Tracker, IOT Network, MQTT Server.

## I. INTRODUCTION

Population and Pollution in the world is increasing day by day and continuously affects our environment in many ways. Due to this our natural resources or fossil fuels are decreasing in a large amount and the one of the best way to save them is by renewable energy and solar energy is playing a great role in the modern energy production systems and this model also used this energy to not using the energy directly from the power lines and to reduce the uses of fossil fuels. When using the power in the street lighting system solar energy can be very useful and there are many advantages like it decrease the dependencies from the grids and the power supply lines and second thing is that the solar panels are generally one time investment and does not need so much of maintenance and they can that run on the renewable energy and use weather forecasting technology the technique used the Solar radiation be used like approx. 20 - years and after that time their efficiency is nearly 80% to the new develop a solar street light that run on the renewable energy and use weather forecasting technology the technique used the Solar radiation to charge the batteries from the solar panel because the main consideration in the current time is to use a that type of system that is less with Less Power consumption, Automation, Cost effectiveness and also focus on to reduce the manpower. Sun controlled energy is the most reassuring. Sun controlled energy is the most reassuring and fundamental fuel source to make power in a current based street light that run on the renewable energy and use weather forecasting technology the technique used the Solar radiation Automation, Cost effectiveness and also focus on to reduce the manpower. Photovoltaic cell is a device that converts sun radiation energy (sun -based energy) in to electric energy. Right when the light falls on the sun arranged board, it strikes honestly to the daylight- based cell, this cell ingests the sun - controlled radiation.

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## II. HARDWARE REQUIREMENTS

1. IR Sensor
2. Arduino UNO
3. Nodemcu
4. Dc Motor
5. Relay
6. Solar Panel
7. Led Lights
8. Chargeable Battery
9. Connecting wires

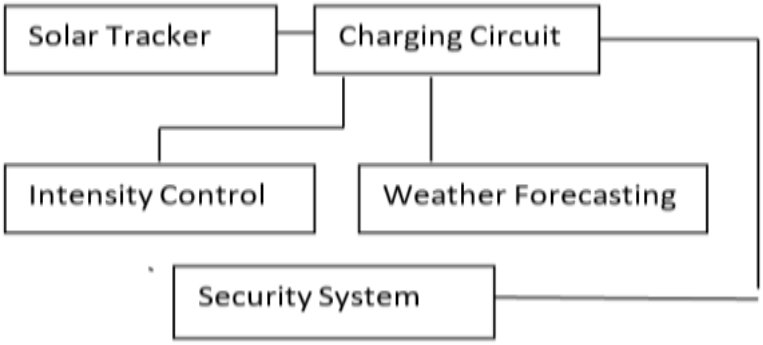


Figure 1 System Design

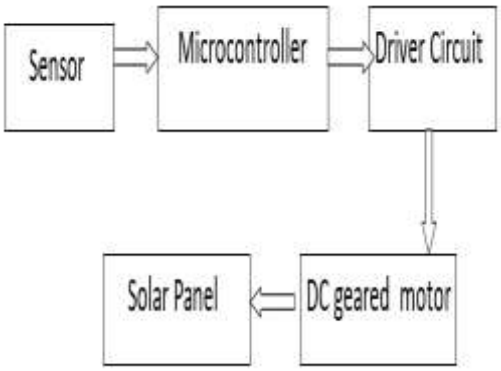


**Figure 2 Solar Tracker**

## III. SYSTEM DESCRIPTION

The designed system works on multiple technologies First there is a solar tracker (single axis solar tracker moves in the direction of east to west this system is implemented to increase the efficiency of the system. Second there is battery charging circuit that uses relay which charges the battery when there is a sunlight and it automatically turn ON and OFF the LED circuit and then there is an Auto-Intensity control to increase the intensity of LED lights when the IR sensor detects something going under the Street light and after then dim the light this is also a very convenient method to save the energy that rotates with the sun to trap the maximum sun light and it moves in the direction of east to west. Then the fourth method is the weather forecasting system which shows the temperature and weather on the OLED with the help of Nodemcu and MQTT server and the last one is the Security system that sends the notification to the Smartphone of the owner when there is someone beneath the sensor when someone tries to defect it or stole it.

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A. SOLAR TRACKERThe first technique implemented in this model is a solar tracker system that tracks continuously the sunlight and according to the position of the sun it traps the light and the working behind is obtained by using LDR, dc motor and a microcontroller. The solar tracker that is used in the model is single axis solar tracker which rotates from east to the west direction and is made up by using a single dc motor the advantages of single tracking solar tracker is that it is cheaper than the dual axis solar tracker, single axis solar tracker has more lifespan, they consume less power and are more reliable.

B.BATTERY CHARGING CIRCUIT

The Battery is charged with the help of the solar panel and with automatic power cut-off when the battery is fully charged, it uses the time delaying method with the help of the microcontroller so after the delay time that is set on the microcontroller the circuit breaks and the battery stop from charging. The code is simple as the blinking LED only you have to increase the delay time and by setting the pin to in HIGH mode i.e. On mode(5 volt) so, using a variable first, we set the value of the variable suppose our variable is ''TIME''= 7*3600*1000 milliseconds which is equal to 7 hours and after that time the battery stops charging and then setting the battery to LOW mode for the time when the LED' are ON.

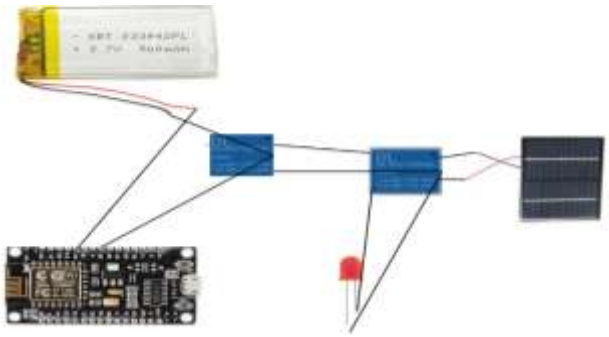

Figure 3 Charging Circuit

C. AUTO INTENSITY CONTROL

The following system consist of a microcontroller and an IR Sensor that is used to control the intensity of the LED when there is some moving vehicle or someone moving under the LED then the IR sensor detects the presence and send high to the microcontroller and then according to the program it sets the LED to the brightest mode and when no one is under the LED then the LED are set to the dim mode. These technologies are generally used now-days and are very convenient to save the energy. The different intensities can be controlled with the help of a technique PWM (Pulse Width Modulation) which is generally a delay in terms of microseconds.

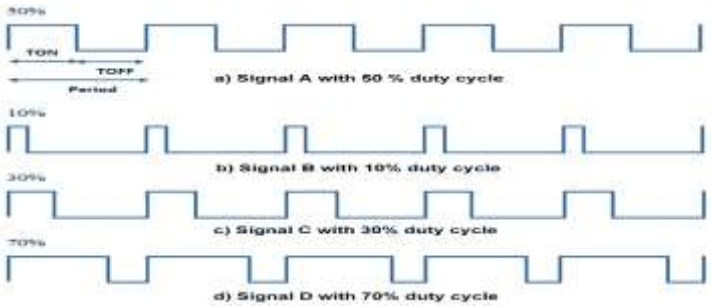


**Figure 4 Pulse Width Modulation**

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D. WEATHER FORECASTING SYSTEM

**Table 1 Components**

| Sr. no | Components | Quantity |
|---|---|---|
| 1. | Nodemcu | 1 |
| 2. | OLED Display | 1 |
| 3. | Breadboard | 1 |
| 4. | Connecting Wires | 1 |

In this system we are going to use the system that works with the help of the cloud platform -first the data on the website from the "open weather map.org " is uploaded on the cloud ..We use Nodemcu in this system as our microcontroller that act as a channel between our data and the OLED display.

With the help of the Arduino-IDE we will upload our code into the Nodemcu with the help of the following libraires -:

1. Ada-Fruit-GFX .h
2. Adafruit_SSD1306.h
3.Arduino-Json . h.

E. SECURITY SYSTEM

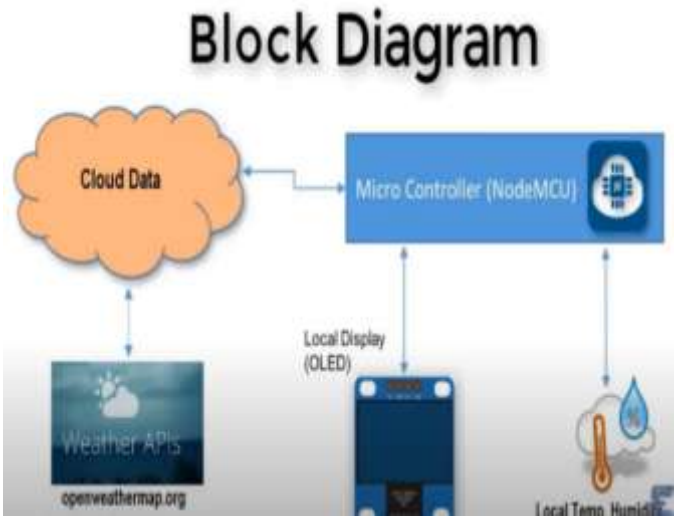


**Figure 5 weather Forecasting System**

IOT system to send the notification – This system basically works when someone tries to steal or want to defect your solar panels, LED, this system contains an IR sensor with a Nodemcu which uses the Blynk Protocol to send Notification to your phone only you have to set in the code when the value of the sensor is high it send the notification and put the value of your network SSID, Auth number and its Password so when it connect with that network it will send notification so for this model we can uses the Govt. Wi-Fi so it can easily works but the requirement for this that your Nodemcu module and your phone must be connected to an internet source for the working the

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of the Blynk protocol because it uses the Cloud Platform for data transmission. It can be used as a system to send the data to the browser when the IR sensor detects someone depends upon its value it can be possible

## IV. RESULTS

While performing on this module it gives a lot of information to maximize its efficiency and the one is that the angle of the Solar panel with respect to the sun to catch the maximum Solar irradiance as much it can so the solution is that to tilt the panel at an angle of 30 -40 degree towards the south.

From the Figure 1 we can easily see that the solar radiance or the insolation is maximum when the panel is tilted with an angle and the other thing about the efficiency is that the panel material or of which material the Solar panel is made up of. so, we must use that type of panel which is cost effective as well as has a good efficiency also so we use the polycrystalline silicon although CIGS have the greatest efficiency but it is very costly and used in satellites

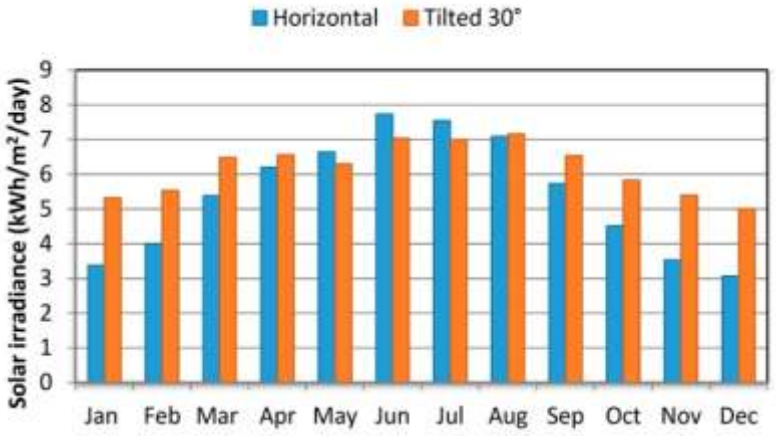


**Figure 7 Solar irradiation**

## V. CONCLUSIONS

The project is very useful, cost effective and eco-friendly and it can be used for many purposes commercially as well as for domestic purposes and it is totally safe for the environment because everything can be recycled and does not pollute the environment. The new thing that is introduced with the help of the project is the use of the anti-theft technique By, using the IOT technology form the Nodemcu to send you a notification when someone tries to stole it so, it reduces the cost of the cameras as well as their power consumption The main thing that has to implement in it is that at future, we can also introduce the net metering system to serve the Solar panel as a grid when the battery is fully charged. A small rotor can be attached near the Solar panel for cooling down of the temperature of the panel to increase its efficiency in al weather conditions.

## VI. APPLICATIONS

1. An Inverter can also be used for the domestic purpose to supply the power to the houses.
2. A wiper or roller type mechanism can also be used to prevent the loss of power due to the dusts.
3. Using Thing-Speak cloud to send the data from the sensor to the cloud with the help of Nodemcu it is an opensource cloud so it can be very useful for analysing the data on the sensors like temperature and weather.

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**Table 2 Material properties**

| | | | |
|---|---|---|---|
| **Monocrystalline Silicon Cells (MSC)** | made out of 1 crystal, high surface area, low electrical resistance, typical Voltage=.5 V, typical current= 3A | very efficient >20% | expensive process to make crystal structure |
| **Polycrystalline** | multiple grains, this disturbs light flow | less cost than MSC | less efficient than MSC |
| **Gallium Arsenide (GaAs)** | made of Gallium, used in space applications | most efficient 20-25% | very expensive |
| **Amorphous Silicon** | 2nd Generation | very cheap | less efficient (4-8%) in field |
| **Copper indium diselenide** | 2nd Generation | N/A | N/A |
| **Copper Indium gallium diselenide** | thin film, 2nd generation | Highest efficiency for thin film (~17% lab) | very expensive |

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