IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

DESIGN THINKING BASED DESIGN OF SOLAR PANEL WITH SOLAR TRACKING SYSTEM WITH LESS POWER COSUMPTION

KIRUTHIKA.R[1], PRABHA. R[2], AKSHAYA. S[3], REVANTH. M[4], SARAN. B[5]

[2]ASSOCIATE PROFESSOR,[1345]ELECTRONICS AND COMMUNICATION ENGINEERING,

[12345]SNS COLLEGE OF TECHNOLOGY, COIMBATORE, TAMILNADU, INDIA

ABSTRACT(EMPATHY)-

To be reserved for the future is the prime aim of today. We use natural resources abundantly such that our future generation may or may not have the chance of living with nature and leading a resourceful life . 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. But the power consumed by these dual axis solar trackers are so large such that the entire power generated is consumed by itself and do there is no benefit of these systems. In order to minimise the power consumption, we introduce the concept of IOT and automation in which the sun's position can be tracked by the resistance value of LDR (Light Dependent Resistor). The values are recorded using thingspeak and IFTTT and using these recorded values, the panel's position can be changed according to the sun's position only when we are in need of larger electricity supply .This solar panel can rotate in all directions. This system is powered by Arduino, consists of servo motor ,LDR, rain drop sensor, temperature and humidity sensor and power . Hence using this system the sun's energy can be utilised fully to generate power and for other applications.

Keywords: sustainable, dual axis , solar trackers, LDR, recorded values

I. INTRODUCTION

We make use of Solar energy for many applications like solar panels, solar water heater, solar cookers etc. But the problem here is that as the earth revolves around the sun causing the occurrence of day and

night, the side of the earth that is slightly away from the sun cannot use the sun's energy. Solar power is the fastest growing means of renewable energy.

II. THE IDEATE

The solar tracker system which is used to change the orientation of the solar panels can be of dual axis or single axis. Single axis trackers turn the solar panel in only one axis whereas the dual axis trackers turn the panels in both east-west and north south directions making the panels to harness maximum energy from the sun . If the panels are designed with dual axis solar trackers, then they can move accordingly with the direction of sunlight but the major drawback is the power consumed by them to turn the orientation of the panels. The technological stacks used in our proposed system are IOT and automation. These proposed ideas overcome the disadvantages of the existing systems and also provides improved performance. The cloud platforms associated with the internet of things used by us are far more privacy concerned and well suited for our applications.

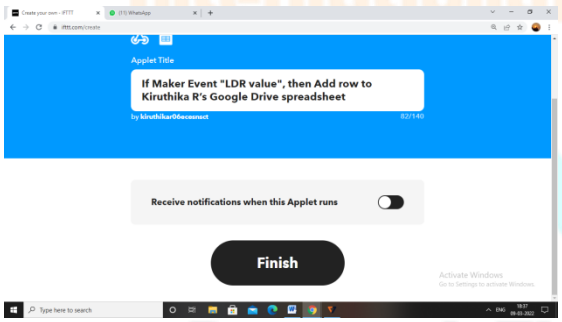

Figure 1: IFTTT webhooks for LDR values

The ideal solution for this problem statement would be to design a solar tracking system such that it consumes less power than earlier. The system design includes Arduino UNO as the main microcontroller which controls the function and activities of the entire system and takes input from the light dependent resistors that are placed in various parts in the system. The wifi module is also used in order to communicate these data through the IOT cloud platforms and proceed the action accordingly. This will be a novel approach to automate the system to turn the panel's orientation only when needed. If we do so , the power consumed will be minimised and at the same time it can meet the demand of energy production.

III. THE PROTOTYPE

The prototype part of the system consists of Arduino Uno as the microcontroller that controls the entire functioning. It contains four Light dependent Resistors, whose value of resistance changes in accordance to the intensity of light. Hence by using the resistance value, we can find out the direction where the intensity of light is higher. The four light dependent Resistors are placed on all the east, west , north and south direction and the value of the resistances are recorded instantly throughout the day. With the help of EsP8266 wifi module, the system is connected to the cloud platform of the Internet of things. This cloud platform called the "IFTTT" which stands for If This Then That , stores the value of resistances and produces an action based upon the trigger. The IFTTT webhooks have been created with the event name- ldr value. This stores all the recorded values of the resistance in the Google spread sheet of the drive of the linked email address. If the extension of the spread sheet reaches 2000 rows, a new spread sheet will be created in the Google drive and then the values will be stored accordingly. With the system physically,

four LEDs are connected to indicate the presence of high intensity sunlight that glows because of the reduction of resistance value in the LDR.

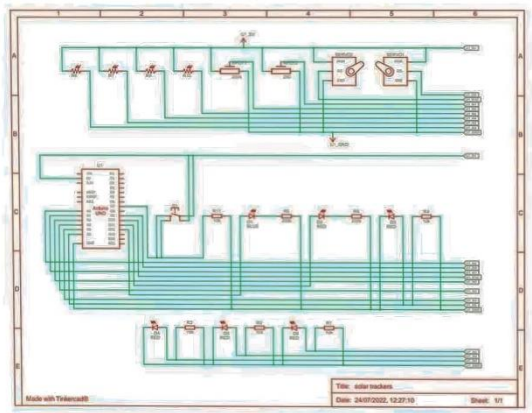

Figure 2: schematic layout of solar panel with solar tracking device with less power consumption

IV. TESTING

The testing of the proposed system is done with the help of the simulation software called tinkercad. There are two ways in which this system works. The first way is by knowing which side of the solar panel is receiving the highest amount of sunlight from the physical system. The second way is by calculating the direction of the brightest side of the sun with the help of the recorded values of the LDR value. There are four different light dependent resistors connected with the system that has their own LEDs and potentiometers. The potentiometer is used to change the direction of the motor by varying the resistance in it. So whenever we encounter an LED glowing we can know that the LDR from that side is receiving higher amount of sunlight so that the resistance of the LDR decreases and the LED glows. Fig1 shows the turning of the motor when one of the LED is glowing and the value of resistance in the potentiometer is varied.

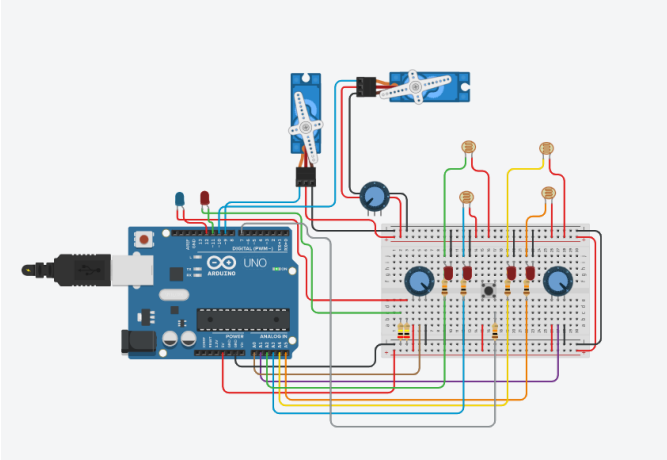

Figure 3: simulation of solar panel with solar tracking device with less power consumption

V. CONCLUSION

One of the biggest problems that solar energy technology possess is that energy is only generated while the sun is shining. That means night time and overcast days can interrupt the supply. Another concern is that solar energy may take up a significant amount of land and cause land degradation or habitat loss for wildlife. The placement and orientation of solar panels is just as important as which type of solar panel is used in a given situation. Ensuring that solar panels face the correct direction and have an appropriate tilt will help ensure that they produce maximum energy as they are exposed to the highest intensity of sunlight for the greatest period of time. The general rule for solar panel placement is, solar panels should face true south Depending on how solar panels are being used, it may also be beneficial to have a slight rotation away from due south. To meet these purposes solar tracking system is used which may be of single axis and dual axis. The dual axis solar trackers may be highly effective when compared to the changing of orientation but the matter of fact here is that it consumes a very large amount of power. Since it consumes high power , there is no use of fixing a tracker system to generate extra amount of electricity when all the power used by the

tracker will be far higher than the energy production.

VI. REFERENCES

1. *Ferdaus, R. A., Mohammed, M. A., Rahman, S., Salehin, S., & Mannan, M. A. (2014). Energy efficient hybrid dual axis solar tracking system. Journal of Renewable Energy, 2014.*
2. *Sidek, M. H. M., Azis, N., Hasan, W. Z. W., Ab Kadir, M. Z. A., Shafie, S., & Radzi, M. A. M. (2017). Automated positioning dual-axis solar tracking system with precision elevation and azimuth angle control. Energy, 124, 160-17*
3. *Jamroen, C., Komkum, P., Kohsri, S., Himananto, W., Panupintu, S., & Unkat, S. (2020). A low-cost dual-axis solar tracking system based on digital logic design: Design and implementation. Sustainable Energy Technologies and Assessments, 37, 100618*
4. *Abdollahpour, M., Golzarian, M. R., Rohani, A., & Zarchi, H. A. (2018). Development of a machine vision dual-axis solar tracking system. solar energy, 169, 136-143.*
5. *Sadyrbayev, S. A., Bekbayev, A. B., Orynbayev, S., & Kaliyev, Z. Z. (2013). Design and research of dual-axis solar tracking system in condition of town Almaty. Middle-East Journal of Scientific Research, 17(12), 1747-1751.*