Advanced Solar System With Safety Features

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Abstract- *This paper represents innovative solutions for safety features for solar system and provide Dual-Axis solar Tracking. This system will always check if the sun has risen. As the sun rises, all the hidden solar panels will come out. Special LDR sensor array designed and built. This season used for Tracking sun. Different respective sensor used for Rain and hailstorm to avoid any damages. An algorithm developed by different tests and minimized coding. This algorithm provides features for system completely automatically. As a perspective and findings there should be more research on the weight of the structure before proceeding to building of products or prototype.*

I. INTRODUCTION

At present various fuels are being used for power generation. Most of that fuel comes from natural fuel sources. These natural fuel reserves are running out. This means that various types of losses are being caused due to current power generation. There is a dearth of energy sources at present. More and more fuel is being wasted for energy generation day by day. As these energy sources are depleted day by day, it is necessary to address them. A few decades ago, people realizedthat The sun is an excellent source of energy. But that energy is not used properly. If we carefully observe, we will find that the equipment used to generate electricity at the solar power stations is very expensive as compared to energy outcomes. If we use our skills to find a solution to this, the waste of natural fuel in the whole world will be reduced. The students in our group read the research paper very carefully and came up with solutions. We made a notice that, where solar energy is being used, it is not possible to take full advantage of it. Because we know that sunlight changes throughout the day, and solar energy generators can't produce as much energy as they should. That's why we are trying to come up with a solution.

With this solution, we desired to produce approximately 20-30 percent more energy than that of current generation at power stations with same number of solar panels. At the same time, we think that the security of the entire system is important. Since solar panels are very expensive, they need special care. We need to think of all the possible damage and find solutions. Since the entire system is in an open environment, it is at high risk of rain, hail and dust,which can cause severe damage. We want to create different systems as a solution to this, so that we can minimize the damage caused by natural disasters and give fast response to avoid damaging.

II. SUMMARY OF LITERATURE SURVEY

The power readings of the fixed solar panel and the implemented tracking solar panel were taken hourly for three days in the year 2017. Results taken on different days show the difference in efficiency between the fixed solar panel and the implemented solar tracker. They found that the tracking system is more efficient (10%).

The study findings showed that the use of low power servo motors carefully designed to move the tracking device hub substantially reduced the power required by the tracking system. Arduino board which belongs to a family of low-cost control system was also found to be extremely energy efficient. Multiple-axis solar tracking algorithm improved the power generated by the solar panel with an efficiency improvement.

III. METHODOLOGY

- Designing structure having metal geared motor to track position of Sun. which will cover Horizontally 360 and ° and vertically 180° of total 3D area around center of structure.
- Designing sensors which will work more efficiently than existing sensors. We are designing unique mount for sensors which will track sun effectively and also protect sensors from damages.
- Providing rain sensor for protecting solar panels from rain damage as we know during cloudy season low power is produced by solar system,
- Providing sensor to detect hailstorm which can damage system.
- Providing cleaning mechanism to clean solar panels daily

IV. SPECIFICATIONS OF THE SYSTEM

Specifications	Quantity
Required area to place system	96000 cubic cm.
Total weight	2.7 kg
Supply	12 volt
Power Generation	80 watt per day
Horizontal maximum possible tracking angle	360°
Maximum possible vertical tracking angle	290°

V. BLOCK DIAGRAM

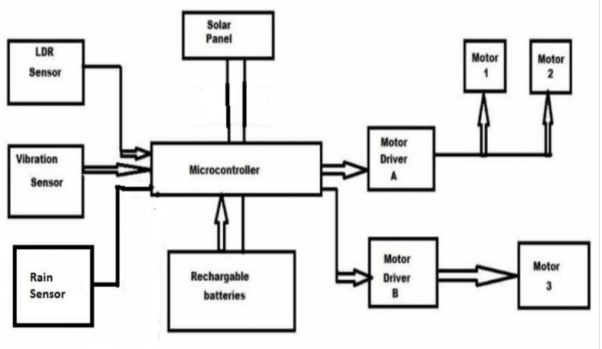

Fig 1: - Block diagram

VI. CIRCUIT DIAGRAM

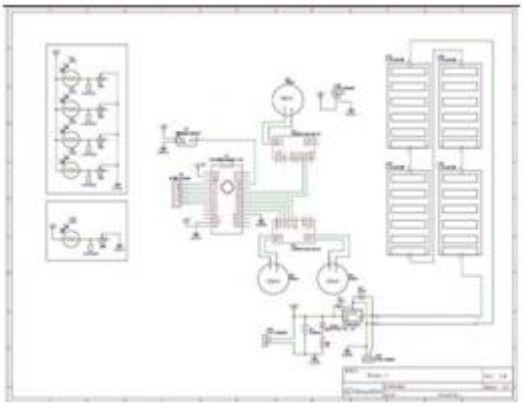

Fig 2: - Circuit diagram

VII. FLOW CHART

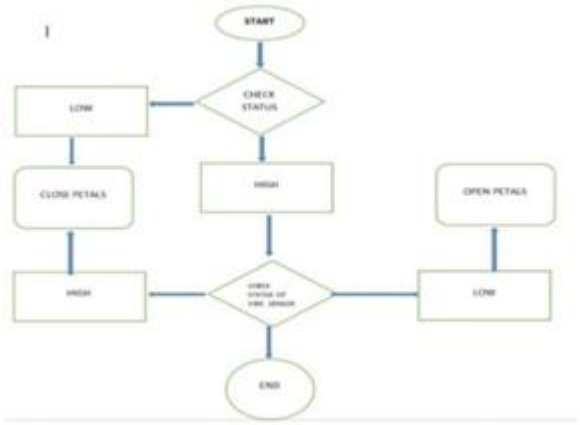

Fig 3: - Flow chart

As shown in flow chart it will continuously check status of sensor 'is sunlight available or not'. When sunlight detected it gives high signals and solar panels come out and system start tracking sun. During tracking sun vibrations sensor and rain sensor continuously check for any vibration or rain drops. I such instances happen solar panels get covered till this condition changed.

VIII. WORKING

System is designed for Solar tracking and avoid damaging. System will always check if the sun has risen. The sensor will detect it when the sun rises. As the sun rises, all the hidden solar panels will come out. The LDR sensor will then detect the exact location of the sun and send it to the microcontroller by giving analogue values. The microcontroller will take analogue values and insert them into a specific algorithm to determine the PWM signal and decide direction of rotation of the motors. The selected PWM signals will be given to respective motors and according to these PWM signals they will rotate the solar panel assembly towards the sun. The same will continue to follow the sun throughout the day if anything unwanted happen. If there starts to rain suddenly,the rain sensor installed on the system will detect the rain and immediately all the solar panels will be covered. The same thing happens with hailstorms or earthquakes, for which we have installed vibration sensors. When any disasters start all Solar panels will cover themselves an protect from damage. Solar panels are arranged in such a way that they will be cleaned by themselves in evening.

IX. TEST RESULTS

- Power generation 80-watt power per day.
- This is ha achieved Horizontal maximum possibletracking angle is 360°
- Maximum possible vertical tracking angle is 290°.

Thus, it can be able to produce 15% to 25% more power than fixed or single axis solar Tracking System with respect to atmospheric conditions and the place.

X. ADVANTAGES

- Easy to replace and fittings
- More power generation than fixed traditional solar system
- Cost effective for small plants
- Easily adoptable at electric vehicles charging station.
- Has high sensor calibration range
- Scalable according to used (design)

XI. CONCLUSION

- LDR putting in the shadows instead of in light, is more efficient
- We can use LDR sensor without opamp for cost reduction.
- Vertical tracking is hard to achieve as it has total weight of panel and panel holding structure
- It gives better performance that fixed solar system but little bit more work required on weight distribution of system
- Covering solar panels by additional motor is amazing advantage of system. Due to this system **we can introduce cleaning of panels at the time of covering them.**

In this project a multi axis solar system designed and built. This system can be able to track sun through the day precisely. During raining system protect Solar Panel form damage successfully. Vibration sensors executed protection process when anything hit him. We have implemented simple and cost-effective control. System have ability to move the two axes simultaneously within their respective ranges. Tracking accuracy of this system is adjustable. System is easily moveable as users' requirements. According to our test this technology has higher energy generation capabilities as comparing with both fixed solar panel and single axis solar tracking technologies. This system is able to generate 80-watt power per day. This is ha achieved Horizontal maximum possible tracking angle is 360° and Maximum possible vertical tracking angle is 290°. Thus, it can be able to produce15% to 25% more power than fixed or single axis solar Tracking System with respect to atmospheric conditions and the place.

XII. FUTURE SCOPE

As we have said before, the fuel used to generate electricity is running out day by day. We need to find new sources of energy as soon as possible. The world has come a long way in recent times. Scientists have done a lot of research on solar energy. Generating electricity on solar energy is becoming easier and cheaper day by day. Many solar power plants are being set up all over the world. Researchers are also working on ways to preserve existing power generation. Research is also underway on how to store solar energy. Researchers have also discovered various batteries to store thousands of watts of energy. So we think that if this project is implemented, it will help a lot in saving depleting energy. The depleted natural energy reserves will stop depleting

- This system can be adopted for domestic appliances Metallic structure can increase stability and power generation per module.
- With research this system can be used at electric vehicles charging stations.
- We can include windmill features in this structure using existing motor.
- By improving gear system Tracking can be more precise.
- Cleaning system can be improved using motors system.
- We can conduct detailed cost analysis by which one can calculate cost per module and compare with existing structure.
- For power generation DC-DC chopper and boost converter can be used for improvement of power generation.
- PLC can be added for monitoring and operating the system.
- Real time monitoring can be added to study power generation at different situations like place and weather

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