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ARDUINO BASED SYSTEM TO MEASURE SOLAR POWER

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ABSTRACT

This project aims to develop a measurement of solar energy using Arduino Board technology. In this research, four parameters that been measured are temperature, light intensity, voltage and current. The temperature was measured using temperature sensor. The light intensity was measured using light dependent resistor (LDR) sensor. The voltage was measured using the voltage divider because the voltage generated by the solar panel is large for the Arduino as receiver. Lastly for the current was measured using the current sensor module that can sense the current generated by the solar panel. These parameters as the input value for the Arduino and the output was display at the Liquid Crystal Display (LCD) screen. The LCD screen display output of the temperature, the light intensity, the voltage and the current values. The purpose of Arduino to convert the analog input of parameter to the digital output and display via LCD screen. Other than that, this project also involve with a design to ensure that device case are easy to be carry around.

KEY WORDS: Solar photovoltaic, Measurement system, Light intensity, Temperature, Pressure, Voltage, Current

1. INTRODUCTION

Rising fossil fuel and burning fuel such as coal, global warming and severe weather conditions have compelled many nations to look for alternative sources to reduce reliance on fossil based fuels. Solar energy is one of the most promising renewable sources that is currently being used worldwide to contribute for meeting rising demands of electric power.[1] Solar power is a conversion of sunlight into electricity, sunlight was collecting either directly by using photovoltaic's or indirectly using concentrated of solar energy. [2] Photovoltaic's was initially use as a power source for a small and medium-size applications from the calculator powered by a single solar cell to a remote homes powered by an off-grid rooftop photovoltaic's system. As the cost of solar electricity has fallen, the number of grid-connected solar photovoltaic systems has grown into the millions and utility scale solar power station swith hundreds of megawatts are being built. Solar photovoltaic is becoming inexpensive, low-carbon technology to harness renewable energy from the sun. This paper presented by Arindam Bose etc. Describe a potential a solar system using two set of stepper motor, the light sensor and the concave mirror. The purpose of this project to improve the power collection efficiency 65% with developing the track of solar panel perpendicular. The solar photovoltaic (PV) energy system directly converts the sun photons energy to electricity through the solar cells. Solar cells are made from light sensitive semiconductors that use photon energy to dislodge electrons to drive an electric current. The two broad classifications of photovoltaic modules are the mono-crystalline and poly-crystalline. Polycrystalline solar cells are formed from

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multiple silicon crystals while mono crystalline solar cells are made from a single silicon crystal and they usually have higher efficiency.

The output of power generated from a solar cell largely depends on weather conditions most especially the solar irradiance and air temperature. The recent development in energy sector has shown that solar-energy market is one of the most rapidly expanding renewable energy markets in the world (Adib et al., 2015). Presently there is significant increasing in demands for remote monitoring and control equipment for solar-energy applications.

Types of Solar Plates:

Solar Cell Type	Efficiency Rate	Advantages	Disadvantages
Monocrystalline Solar Panels (Mono-SI)	~20%	High efficiency rate; optimised for commercial use; high life-time value	Expensive
Polycrystalline Solar Panels (p-Si)	~15%	Lower price	Sensitive to high temperatures; lower lifespan & slightly less space efficiency
Thin-Film: Amorphous Silicon Solar Panels (A-SI)	~7-10%	Relatively low costs; easy to produce & flexible	shorter warranties & lifespan
Concentrated PV Cell (CVP)	~41%	Very high performance & efficiency rate	Solar tracker & cooling system needed (to reach high efficiency rate)

2. DEVELOPMENT AND IMPLEMENTATION

Block Diagram:

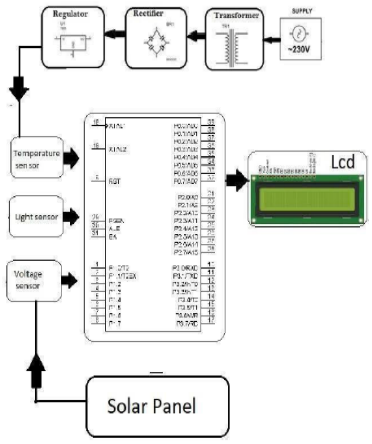

FIG.2.1. BLOCK DIAGRAM

Purposed system:

The purpose of Arduino to convert the analog input of parameter to the digital output and display via LCD screen. Other than that, this project also involve with a design to ensure that device case are easy to be carry around. The accuracy of the constructed device was ascertained by comparing the measured parameters with that of conventional standard measuring instruments which shows good agreement. The measured parameters show that the output energy generation from solar photovoltaic panel largely depends on the solar irradiance and temperature.

Advantages and Disadvantages of Arduino:

It is very good for carrying out a specific project you may have in mind, especially if you can find the right shield but it doesn't teach you much about microcontrollers and the AVR in particular. For quick results, it is great but it won't help you learn microelectronicsorprogramming.

Advantages:

- Not much knowledge required to get started
- Fairly low cost, depending on shields you need
- Lots of sketches and shields available
- No external programmer or power supply needed

Disadvantages:

- No understanding of the AVR microcontroller
- Sketches and shields can be difficult to modify
- No debugger included for checking scripts

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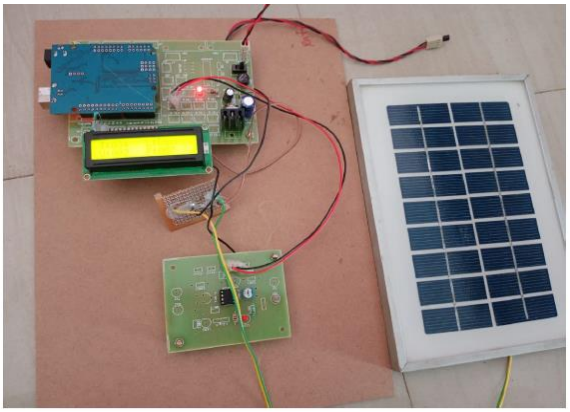
- You get no experience of C or professional development tools

SCHEMATIC DIAGRAM:



WORKING:

Come to the work of Arduino Based To Measure Solar Power it has panels mounted in a particular arrangement at an angle of 45 degrees in such a way that it can receive solar radiation with high intensity easily from the sun. The solar panels converts solar energy into electrical energy as studied earlier. This project is to consume maximum amount of energy from the sun. This project is based on two modes one is dark and the other light mode. When sun light falls on the solar panel the Lcd displays as light . At night mode the Lcd displays Dark.When sun light falls it increases the voltage.When it is in dark mode the voltage will be dreceases.

3. Problem Statement:

Problem associated with in the use of solar energy is that its availability varies widely with time. The variation in availability occurs daily because of the day night cycle and also seasonally because of the earth's orbit around the sun. To rectify these above problems the solar panel should be such that it always receive maximum amount of light.

4. RESULT

Thar Desert of India has best solar power projects, estimated to generate 700 to 2,100 GW, ii). The Jawaharlal Nehru National Solar Mission (JNNSM) launched by the Centre is targeting 20,000 MW of solar energy power by 2022, iii).Gujarat's pioneering solar power policy aims at 1,000 MW of solar energy generation, and Rs. 130 billion solar power plan was unveiled in July 2009, which projected to produce 20 GW of solar power by 2020. Apart from above, about 66 MW is installed for various applications in the rural area, amounting to be used in solar lanterns, street lighting systems and solar water pumps, etc. Thus, India has massive plan for Solar Energy generation that may not only fulfill the deficit of power generation but also contribute largely in Green Energy Production to help to reduce the Climatic Changes globally. As by the measuring,we can generate lot of energy by this solar power projects.

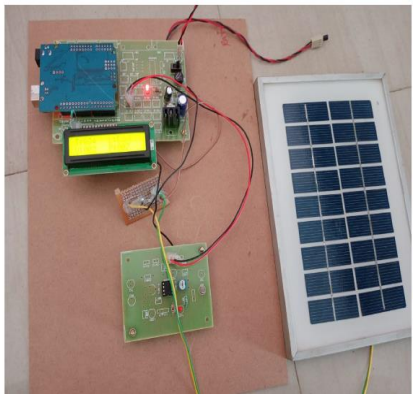


FIG 4.1.1 SCHEMATIC DIAGRAM OF SOLAR POWER SYSTEM

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FIG 4.1.3 WHEN SOLAR PANEL IN LIGHT MODE

5. CONCLUSION

In the conclusion, the project is achieve all of the objective are: to measure solar panel parameter such as the temperature, light intensity, voltage and current. Using the temperature sensor that sense the changes in surrounding temperature, for the light intensity parameter was by using the LDR sensor, for the voltage parameter was by using the voltage divider method in order to reduce the maximum value of the solar panel to the voltage value suitable for the Arduino of power supply and lastly the current parameter was by using the current sensor module. Next, to find the best position and time for the solar power effectively energize the electricity. An Arduino based solar power parameter-measuring system has been designed and constructed using the optimized simulated parameter from Proteus ISIS. This device was then used to acquire solar PV current, voltage, power, temperature, pressure and light intensity. The system can measure data from solar panel that can be used to evaluate the performance of solar energy generated for future energy generation prediction. Based on the measurement data, it was observed that the solar PV energy generation directly depends on the solar irradiance, temperature and air pressure.

6. FUTURE SCOPE

Generation of solar energy has tremendous scope in India. The geographical location of the country stands to its benefit for generating solar energy. The reason being India is a tropical country and it receives solar radiation almost throughout the year, which amounts to 3,000 hours of sunshine. This is equal to more than 5,000 trillion kWh. Almost, all parts of India receive 4-7 kWh of solar radiation per sq meters. This is equivalent to 2,300–3,200 sunshine hours per year. States like Andhra Pradesh, Bihar, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, and West Bengal have great potential for tapping solar energy due to their location. Since majority of the population live in rural areas, there is much scope for solar energy being promoted in these areas. Use of solar energy can reduce the use of firewood and dung cakes by rural household. Many large projects have been proposed in India, some of them are:

APPLICANCES:

- Its is used in solar water heating
- Solar thermal power production
- Solar drying of agriculture and animal products
- Solar cooking
- Solar green houses
- Solar heating of buildings
- Solar distillation

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