SMART SUN TRACKING WITH LDR USING ARDUINO

N.Uthayabanu[1],S.Snega[2], T.Sivasakthi[3], S.Arunkumar[4] & S.Amirtha [5]

[1](Assistant professor , Sree Sakthi Engineering college, Coimbatore -641 104, Tamilnadu, India, uthayanedumaran@gmail.com)
[2](UG scholar, Sree Sakthi Engineering college, Coimbatore -641 104, Tamilnadu, India, snegaeee99@gmail.com)
[3](UG scholar, Sree Sakthi Engineering college, Coimbatore -641 104, Tamilnadu, India, siva26151@gmail.com)
[4](UG scholar, Sree Sakthi Engineering college, Coimbatore -641 104, Tamilnadu, India, slarunkavi99@gmail.com)
[5](UG scholar, Sree Sakthi Engineering college, Coimbatore -641 104, Tamilnadu, India, samirthaece9797@gmail.com)

***Abstract**-- Sun powered vitality is advancing as a potential endless and non-contaminating vitality source to get the job done our ever-expanding vitality necessities. Arduino based model programmed sun powered following framework is essentially built by utilizing Arduino UNO Microcontroller, four LDRs and two stepper motors. The framework is worked by mix of equipment also, software programming. In equipment advancement, four light reliant resistors (LDRs) will be utilized for catching most extreme occurrence light. Three stepper engines are utilized to move the sun powered board as per the most extreme occurrence light constrained by LDRs. The program controls the vertical tilt edge and level turn of the sun oriented board. Subsequently it can follow the bearing of the sun, the vertical pivot as well as additionally the level turn as indicated by the episode daylight on the sun powered board. In this way this framework can accomplish most extreme enlightenment and can lessen the expense of power age by requiring least number of sun based boards with legitimate direction with the daylight. This paper focuses on the improvement of procedure to follow the sun and achieve most extreme productivity, utilizing Arduino Uno for putting away vitality. In this way, it's reasonable for rustic zone use.*

Keywords - Arduino UNO, Light Sensor, LDR, Stepper motor, Solar panel.

I. INTRODUCTION

Sun oriented vitality is an extremely huge, limitless wellspring of vitality. Sun oriented vitality has become an extremely alluring vitality source in the world because of the ascent of oil costs and the negative natural impacts that regular vitality creation cause. In photovoltaic frameworks, trackers help limit the point of occurrence between the approaching light and the board, which builds the measure of vitality. Sunlight based trackers must be calculated accurately to gather vitality. All concentrated sunlight based frameworks have trackers on the grounds that the frameworks don't deliver vitality except if coordinated effectively toward the sun. A sun based tracker is a gadget utilized for situating a photovoltaic exhibit sun based board or for concentrating of most extreme episode light. The Solar Tracker is a demonstrated double pivot following innovation that has been specially crafted to coordinate with sun based modules what's more, lessen framework costs. Along these lines, it's reasonable for provincial territory use. Also, the viability of yield power which gathered by day light are expanded .Sun is an ample source of Strength and this solar electricity can be harnesses successfully using solar photovoltaic cells and Photovoltaic effect to transform energy into electric energy. The look at Revealed that use of stepper motor permits correct monitoring of solar and LDR resistors used to decide the solar mild depth. its function hence to maximize the energy output. The LDR incorporated on sun panel helps to locate sunlight which in flip moves the panel accordingly. A mechanical shape for sun powered trackers which applied two stepper engines thoroughly free pivot on X and Y hub the pivot become brilliantly constrained by utilizing Arduino UNO, which offers straight forward programming approach by means of C language.

II. LITERATURE SURVEY

[1] Solar energy is rapidly gaining the focus as an important means of expanding renewable energy uses. Solar cells those convert sun's energy into electrical energy are costly and inefficient. Different mechanisms are applied to increase the efficiency of the solar cell to reduce the cost. Solar tracking system is the most appropriate technology to enhance the efficiency of the solar cells by tracking the sun. A microcontroller based design methodology of an automatic solar tracker Presented in this Paper. Light dependent resistors are used as the sensors of the solar tracker. The designed tracker has precise control mechanism which will provide three ways of controlling system. A small prototype of solar tracking system is also constructed to implement the design methodology presented here. The ATMEGA32 microcontroller has been used in the prototype.

[2] Solar energy is a clean, easily accessible and abundantly available alternative energy source in nature. Getting solar energy from nature is very beneficial for power generation. Photovoltaic panels must perpendicular with the sun in order to get maximum energy. The methodology employed in this work includes the implementation of an Arduino UNO based solar tracking system. Light Dependent Resistors (LDRs) are used to sense the intensity of sunlight and hence the PV solar panel is adjusted accordingly to track maximum energy. The mechanism uses servo motor to control the movement of the solar panel. The microcontroller is used to control the servo motor based on signals received from the LDRs. The result of this work has clearly shown that the tracking solar panel produces more energy compared to a fixed panel.

[3] Photovoltaic vitality creation is the best case of the exponential developing rates at the most recent years. Be that as it may, the yield control gave through the photovoltaic change process relies upon sun based illumination, and the day by day and occasional developments specifically influence the force of radiation got in the sun oriented gatherers. Keeping in mind the end goal to enhance the vitality creation, this paper depicts the advancement of a minimal effort, double tomahawks sunlight based tracker (DAST) with low power utilization. The work envelops the outline, development, get together of the whole mechanical structure, electrical frameworks and gadgets and the elaboration of the control rationale in charge of all the development of the module to look through the situation of greatest sun based illumination. The following is composed using LDR sensors in charge of giving the info flag to a microcontroller.

[4] This project employs a solar panel mounted to a time-programmed stepper motor to track the sun so that maximum sun light is made incident upon the panel at any given time of the day .The sun to generate maximum energy. This is achieved by using a programmed microcontroller to deliver stepped pulses in periodical time intervals for 12 hours for the stepper motor to rotate the mounted panel in one direction and then return to the start point for next day light as desired. The Arduino controller used in this project is from the Arduino family. The Stepper motor is driven by an interfacing IC as the controller is not capable of handling the power requirements of the stepper motor. Furthermore, this project can be enhanced by using an RTC (Real Time Clock) to follow the sun. This helps in maintaining the required position of the panel even if the power is interrupted for some time.

[5] Solar tracking system using Arduino UNO is designed and built. This system collects free energy from the sun and stores it in the battery and then converts this energy to the respective alternating current. It is makes the energy usable in normal homes as an independent power source. This system is designed to react to its environment in the shortest amount of time. Any errors at software and hardware will be controlled or eliminated. Our system is tested for its real-time responsiveness, reliability, stability and safety. Our system is designed to be resistant to weather, temperature and some minor mechanical stresses.

[6] Solar energy is rapidly advancing as an important means of renewable energy resource. It is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis. Trackers direct solar panels or modules toward the sun. These devices change their orientation throughout the day to follow the sun's path to maximize energy capture. The use of solar trackers can increase electricity production by around a third, and some claim by as much as 40% in some regions, compared with modules at a fixed angle. In any solar application, the conversion efficiency is improved when the modules are continually adjusted to the optimum angle as the sun traverses the sky. This paper presents the designing of a solar tracking system which is based on Arduino UNO and which provides movement of solar panel in the direction of maximum sun light intensity.

[7] The main objective of this research is whether a static solar panel is better than solar tracker or not. This work is divided into two parts hardware and software system. In hardware part, four light dependent resistors (LDR) is used to detect the utmost light source from the sun.

Two servo motors conjointly used to move the solar panel to maximum light source location perceived by the LDRs. In software part, the code is written by using C programming language and has targeted to the Arduino UNO controller. The outcome of the solar tracker system has analyzed and compared with the fixed or static solar panel found better performance in terms of voltage, current and power. Therefore, the solar tracker is proved more practical for capturing the maximum sunlight supply for star harvesting applications**.**

[8] In this paper presents a proposed technique for dual axis solar tracking system using fusion based approach of an astronomical based estimation and a visual sensor based feedback to locate and track sun position continuously time by time. The astronomical based calculation is used to estimate azimuth and elevation angles of a dual-axis solar power plant with respect to the time and location of the plant. Meanwhile, the visual based correction is used to localize the sun on the captured image when the camera can detect the sun (i.e. at sunny).The main purpose of this designed method is to improve efficiency of a dual-axis solar power plant system in absorbing sun energy continuously time by time with stable performance in various weather conditions.

[9] Solar energy is a promising technology that can have huge long term benefits. Solar cells convert the solar energy into electrical energy. Solar tracking system is the most suited technology to improve the efficiency and enhance the performance by utilizing maximum solar energy through the solar cell. In hardware development we utilize LDR's as sensors and two servomotors to direct the position of the solar panel. The software part is implemented on a code written using an Arduino Uno controller.

III. PROPOSED METHOD

3.1 BLOCK DIAGRAM:

Arduino is based following framework utilizing LDR and Stepped Engine .Right now fundamentally formed into three sections, Construction of equipment, Tracking System and Arduino Handling Unit. This sun oriented following framework utilizes the Arduino UNO board, 2 stepper engine, 4 LDRs to pivot the sun oriented board towards the sun or a wellspring of light. The sunlight based trackers have the benefit of expanding the proficiency of catching sun oriented vitality as the earth proceeds with its honourable development. The four LDRs are functioning as light identifiers. They are put at every side of sun powered board and two stepper engines are utilized to pivot the sun powered board. In the event that a similar sum of light falls on LDRs, at that point stepper engines won't pivot. Sun powered board will consistently follow the daylight and will consistently face towards the sun to get charge constantly and can give the stock greatest force. The most extreme force can be gotten from a stationary cluster of sun based boards at a specific time**.**

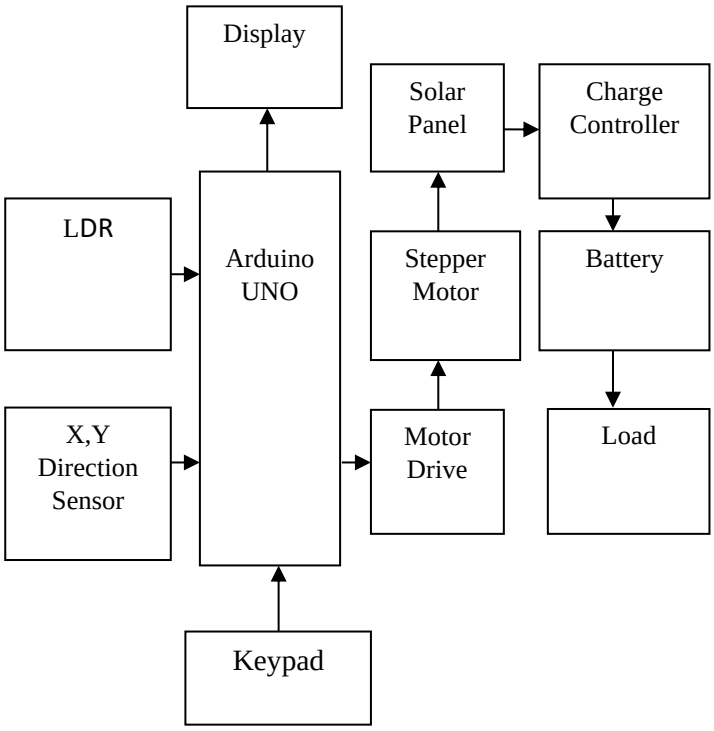

Fig.1: Block diagram

3.2 ARDUINO UNO:

The Arduino Uno board is a microcontroller dependent on the ATmega328. It has 14 computerized input/output sticks in which 6 can be utilized as PWM yields, a 16 MHz earthenware resonator, an ICSP header, a USB association, 6 simple information sources, a force jack and a reset catch. This contains all the necessary help required for microcontroller. The Arduino Uno is customized utilizing the Arduino Software (IDE), our Integrated Development Environment basic to every one of our sheets and running both on the web and disconnected. Arduino is an open-source gadgets stage dependent on simple to-utilize equipment and programming. Arduino sheets can understand inputs - light on a sensor, a finger on a catch, or a Twitter message - and transform it into a yield - initiating an engine, turning on a LED, distributing something on the web.

In this chapter, we will learn about the different components on the Arduino board. We will study

the Arduino UNO board because it is the most popular board in the Arduino board family. In addition, it is the best board to get started with electronics and coding. Some boards look a bit different from the one given below, but most Arduinos have majority of these components in common.

Fig.2: Arduino UNO board

3.3 STEPPER MOTOR:

Fig.3: Stepper motor

Stepper motors are commonly used in precision positioning control applications. Five characteristics of the stepper motor have been considered while choosing stepper motor for the solar tracker prototype. Stepper motor is brushless, load independent, has open loop positioning capability, good holding torque and excellent response characteristics. The stepper motor that has been used in the prototype has the specifications of 12 volts, 4 phase and Half stepping rotation is considered for the tracker to control position accurately with sun's rotation. A stepper engine is an electromechanical gadget it changes over electrical force into mechanical force. The engine's position can be controlled precisely with no criticism component, as long as the engine is painstakingly measured to the application. Stepper engines are like exchanged hesitance engines. The 2 stepper motors are used at 45 rpm, 12V geared stepper motor to move the panel.

3.4 LDR:

LDR sensor module is utilized to recognize the force of light .The more prominent the force of light, the lower the obstruction of LDR. The sensor has a potentiometer handle that can be acclimated to change the affectability of LDR towards light. The LDR Sensor Module is utilized to distinguish the nearness of light/estimating the force of light. The yield of the module goes high within the sight of light and it turns out to be low without light. The affectability of the sign recognition can be balanced utilizing potentiometer.

Fig.4: LDR

3.5 SOLAR PANEL:

Sun powered cell is a strong state electrical gadget that changes over the vitality of light straightforwardly into power by the photovoltaic impact. Gatherings of sun based cells are utilized to make sun powered modules which are utilized to catch vitality from daylight. The electrical vitality created from sun based modules, alluded to as sun oriented force, is a case of sun based vitality. Photovoltaic is the field of innovation and research identified with the down to earth use of photovoltaic cells in delivering power from light, through it is frequently utilized explicitly to allude to the age of power from daylight.

These are utilized for identifying light or other electromagnetic radiation close to the unmistakable range, for instance infrared indicators, or estimation of light force.

Polycrystalline solar panel is a lower price point. In addition, polycrystalline solar panels tend to have a blue hue instead of the black hue of mono crystalline panels.

Fig.5: Solar panel

Specifications:

Solar PV module 20WP

Max power	: 20WP
Open circuit voltage	: 216V
Short circuit current	: 1.26A
Max peak power current	: 1.10A
Max peak power voltage	: 18.5V
Efficiency	: 10.85 %
Max system voltage	: 600 VDC
Max fuse rating	: 10A

IV. HARDWARE SETUP

Fig.6: OFF Condition

V. WORKING

LDRs for decide the mild depth of solar panel. There are two LDRs are used for day tracking and two for seasonal tracking. Both the sensors send digital information about presence and absence of light intensity to the Arduino UNO. The Arduino decides the output signals for the motor driver so as to drive the motor direction and speed. X and Y sensor become brilliantly constrained by utilizing Arduino UNO. The stepper motor plays an important role in our project. it directed the panel towards the sun.

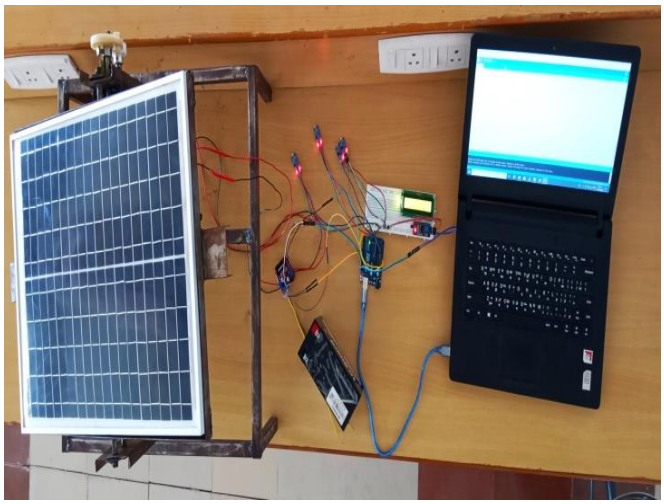

Fig.7: Day Tracking (50^0)

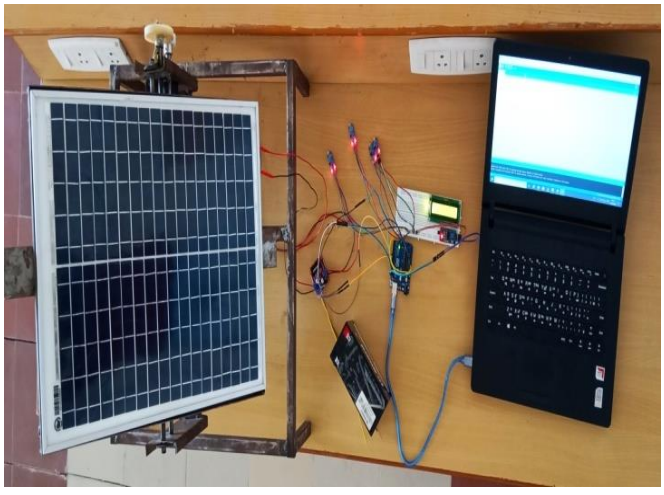

Fig.8: Day Tracking (130^0)

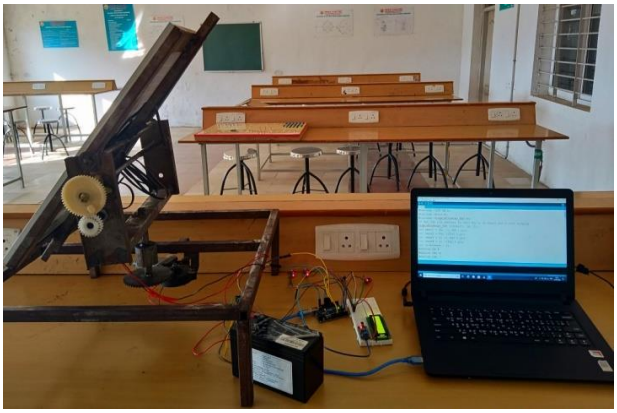

Fig.9: Seasonal Tracking (0^0)

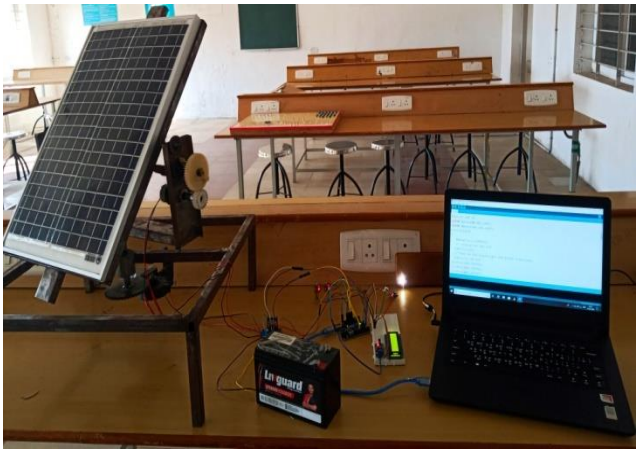

Fig.10: Seasonal Tracking (45^0)

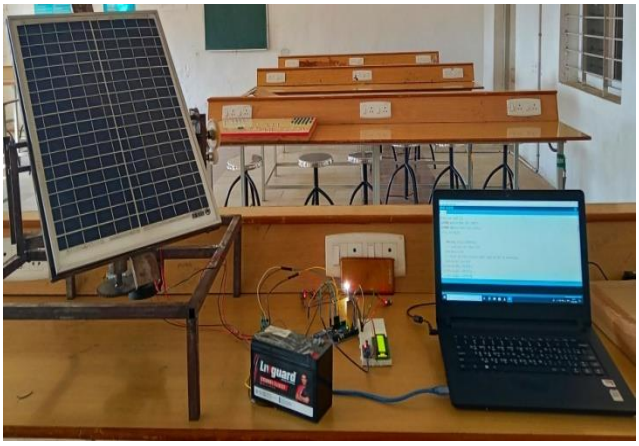

Fig.11: Seasonal Tracking (135^0)

Fig.12: Seasonal Tracking (180^0)

VI. CONCLUSION

An Arduino UNO sun based tracker was structured and built in the current work. LDR light sensors were utilized to detect the force of the sun oriented light occurrence on the photovoltaic cells panel. Conclusions of this task is abridged as, the existing following framework effectively outlined the light source. The expense and dependability of the sun oriented tracker makes it appropriate for the rustic usage. The reason for the sustainable power source from this paper offered new and propelled thought to support the individuals. Tracking accuracy is more. It reduces the usage of power grid. Efficiency is high compared to single axis tracking system.

VII. FUTURE WORK

In future, we can expand the system with automatic dust cleaning method.

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Snega.S currently pursuring B.E under the stream of Electrical and Electronics at Sree Sakthi Engineering College Coimbatore affiliated to Anna University Chennai, Approved By AICTE,-New Delhi, Accredited By NAAC, Karamadai, Coimbatore-641 104.

Sivasakthi.T currently pursuring B.E under the stream of Electrical and Electronics at Sree Sakthi Engineering College Coimbatore affiliated to Anna University Chennai, Approved By AICTE,-New Delhi, Accredited By NAAC, Karamadai, Coimbatore-641 104.

Arunkumar.S currently pursuring B.E under the stream of Electrical and Electronics at Sree Sakthi Engineering College Coimbatore affiliated to Anna University Chennai, Approved By AICTE,-New Delhi, Accredited By NAAC, Karamadai, Coimbatore-641 104.

Amirtha.S currently pursuring B.E under the stream of Electrical and Electronics at Sree Sakthi Engineering College Coimbatore affiliated to Anna University Chennai, Approved By AICTE,-New Delhi, Accredited By NAAC, Karamadai, Coimbatore-641 104.