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DUAL AXIS SOLAR TRACKER WITH HUMIDITY SENSOR AND WEATHER SENSOR

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***Abstract*—Because of the high demand for green and sustainable energy, exploration on solar energy harvesting has come one of the most popular engineering exploration motives, particularly on renewable energy. numerous exploration studies are devoted to the design and development of effective and reliable solar power systems. Solar Tracking and control have the most important factors of a solar power system for perfecting and optimizing effectiveness of solar energy absorption. This design's thing is to estimate the performance of a dual- axis solar tracking system. It's made up of three major structures the inputs, the regulator, and the output. The LDRS provides input, the Arduino serves as the regulator, and the servo motor serves as the output. The main regulator in this design, the Arduino, receives analog input from LDRs and converts it to a digital signal using an analog- to- digital (A- D) motor. The regulator also sends the signal to the servo motor to determine the position of the solar panel.**

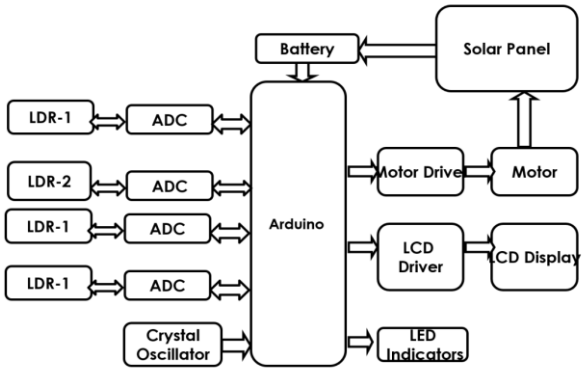
Keywords—Arduino NANO, Servo motors, LDR, Rain Sensor, Humidity Sensor, Analog to Digital Converter

I. INTRODUCTION

Solar trackers are used to orient photovoltaic panels toward the sun. Dual- axis trackers dual- axis trackers have two degrees of freedom that act as axis of rotation.the design and construction of a solar tracker system with a dual-axis sensor and controller, including the system architecture, hardware design, and control algorithm.[1] Then we've peak sun position into five areas and those are East, West, North, South, Centre. LDR 'S are used as the main light detectors. The system includes a microcontroller-based control unit that uses light-dependent resistors (LDRs) to track the sun's position and adjust the solar panel's orientation accordingly[2] Two servo motors are used to hold the solar panel. The program of Arduino, Matlab is uploaded to micro regulator LDR 'S sense the quantum of sun light falling on them. Four LDR 'S are divided into top, nethermost, left and right. the design of a dual-axis solar tracker based on astronomical equations, which calculates the position of the sun based on its altitude and azimuth angles[3] For east- west shadowing, the analog values from two top LDR 'S are compared and if the top set of LDR 'S admit further light, the perpendicular servo will move in that direction. If the bottom LDR 'S admit further light, the servo moves in that direction. For angular deviation of the solar panel, the analog values from two left LDR 'S and two right LDR 'S are compared. still, the vertical servo will move in that direction, If the left set of LDR 'S admit further light than the right set.

II. METHEDOLOGY

This is basically deals with the solar power energy system which would include a module to convert solar energy to electrical energy



A. *LIGHT DETECTING UNIT*

It consists of four light detecting resistors each forming a brace of two. It measures the light intensity and converts it into analog voltage and gives the input to the regulator. One brace of LDR trace the position of sun in east- west direction and the other brace senses in the north- south direction. Resistance is equally commensurable to intensity of light and hence it decreases with increase in light intensity. The relationship between light intensity and resistance is given in the equation RL = 500/ LUX .

B. *MONITIORING UNIT*

Arduino is the main monitoring unit of the entire outfit as showed in fig.LDR is connected to the first four legs of Arduino i.e. A0-A4.Arduino takes the input from the LDR and

grounded on that it gives instructions to servomotors to rotate either in vertical or perpendicular directions.

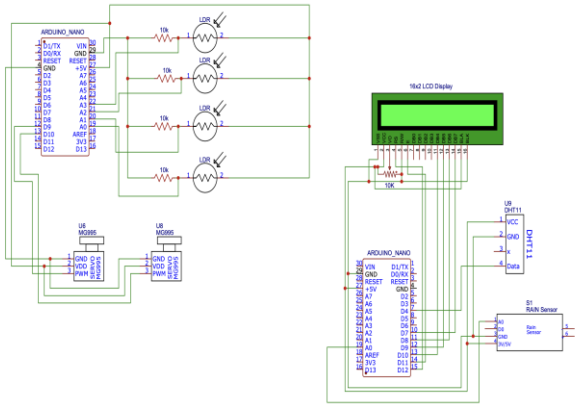
C. WEATHER SENSOR

It comprise of a rainfall seeing unit in which Arduino is used as an interfacing device and indicates the girding temperature conditions and moisture which is displayed on TV display device.

D. MOVEMENT CONTROLLING UNITs

The movement controlling unit comprises of two servo motors. The Arduino gives an affair of 5v which is used to drive the servo motor which can be driven by an input of about4.5 volts. One of the motor controls the vertical gyration while the other controls the perpendicular gyration. Only one motor functions at a time so as to reduce the power consumption.

III. CIRCUIT DIAGRAM



IV. HARDWARE COMPONENT DETAILS

A. AURDUINO NANO

Microcontroller	ATmega328 SMD Package
Operating Voltage (logic level)	5 V
Input Voltage (recommended)	7-12 V
Input Voltage (limits)	6-20 V
Digital I/O Pins	14
Analog Input Pins	8
DC Current per I/O Pin	40 mA
Flash Memory	32 KB
SRAM	2 KB
EEPROM	1 KB

NANO Version 3 is the open-source lowest Bedded Development board grounded on Atmega328 SMD Package Microcontroller. It's a face mount Breadboard Friendly board integrated with Mini USB Port. DC Power Jack isn't available on this Board, so power can be given through Mini USB Cable. It automatically senses and switches to the advanced implicit source of power, there's no need for the power select jumper.

B. MG995 SERVO MOTOR

MG995 metal Gear Servo Motor is a high- speed standard servo can rotate roughly 180 degrees used for aeroplane, helicopter, RC- buses and numerous RC model. Provides 10kg/ cm at4.8 V, and 12kgcm at 6V. It's a Digital Servo Motor which receives and processes PWM signal briskly and more. It equips sophisticated internal circuitry that provides good necklace, holding power, and briskly updates in response to external forces.

C. LCD DISPLAY

This is a introductory 16- character by 2 lines Alphanumeric display. Black textbook on Green background. Interface law is freely available. You'll need a Minimum of 6 general I/ O legs to interface to this TV screen. Includes LED backlight. workshop in 4- bit and 8- bit Modes

D. LDR SENSOR

Can detect ambient brightness and light intensity Adjustable sensitivity (via blue digital potentiometer adjustment) Operating voltage 3.3V-5Vht

E. DHT11 SENSOR

DHT11 is a moisture and Temperature Detector, which generates calibrated digital output This module makes is easy to connect the DHT11 detector to an Arduino or microcontroller as includes the pull up resistor needed to use the detector. Only three connections are needed to be made to use the detector- Vcc, Gnd and Output. It has high trustability and excellent long- term stability, thanks to the exclusive digital signal accession fashion and temperature & moisture seeing technology

V. RESULT TABLE

Thus, Experiment outcomes of the system were performed by placing it in the rooftop .This output voltage is collected from 8:00 AM to 6:00PM.

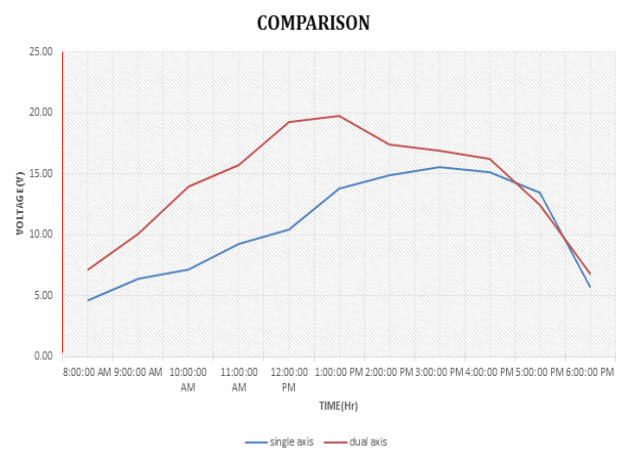
OBSERVATIONS OF SOLAR TRACKERS

TIME(Hr)	SINGLE AXIS	DUAL AXIS
8:00	**04.62**	**07.18**
9:00	**06.4**	**10.11**
10:00	**07.15**	**13.98**
11:00	**09.23**	**15.72**
12:00	**10.41**	**19.26**
13:00	**13.77**	**19.78**
14:00	**14.89**	**17.45**
15:00	**15.56**	**16.89**
16:00	**15.12**	**16.21**
17:00	**13.45**	**12.47**
18:00	**05.73**	**06.86**

OBSERVATION OF WHEATHER SENSOR

TIME(Hour)	TEMPERATURE(˚C)	HUMIITY (%)
16:00	33	65
19:00	29	78

GRAPHICAL ANAYLISIS



The graphical representation is also seen in the graph mentioned over. this system has high voltage capturing capacity. Graphical representation is showing the bettered solar energy conversion when compared to other systems. Other than this there are some other ways used for effective tracking of solar radiations similar as parabolic dish concentrator, parabolic trough concentrator, central receiver concentrator etc. but all these are very costly. So, as dual axis solar system is less costly, largely efficient than other .

VI. CONCLUSION

As solar energy is considered one of the main sources of energy in the near future, In this paper, we give a simple overview of the solar system which gain more solar energy, also the costs of the solar tracker operation and cost conservation is fairly low. In this paper, Design of two axis that Use in motor satellite dish to track the sun directly and use LDR detector to determine the intensity of falling sun. We set up that this solar system is more effective than the fixed solar panel. The energy gained from the solar panel with these model exceeds 35% of the energy gained from the fixed solar panel, In the data, the energy gained from the solar trackers is substantially in the morning and in the evening because at noon time there's little difference and this proves that the fixed solar panel is effective during noon time only. These system is effective as it can be placed anywhere and insure a high energy gain.

VII. ACCOWNOLLEGMENT

We avail this opportunity to express our gratitude to everyone who supported us for writing this project report. We are sincerely grateful to them for sharing their truthful views and thoughts related this project. The project title “DUAL AXIS SOLAR TRACKER WITH HUMIDITY AND WEATHER SENSOR” would not have been completed without the valuable guidance and encouragement of Mrs. Sayali Jawale Mam. We express my gratitude to Dr.S.L.Chavan sir (Head of Electrical Department) for his constant encouragement, cooperation and support. Finally, we would also like to thank our classmates for continuously inspiring us to complete this project.

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