

Perigon Automatic Solar Tracking System

Submitted in partial fulfilment of the requirements for the award of Bachelor of
Engineering Degree in Electronics and Communication Engineering

By

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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL 2021



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of Srivishnu. R (37130396) and Stoney Edward Antony. C (37130398) who carried out the project entitled **“Perigon Automatic Solar Tracking System”** under the supervision from September 2020 to April 2021.

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DECLARATION

We, **Srivishnu. R (37130396)** and **Stoney Edward Antony. C (37130398)** hereby declare that the Project Report entitled “**Perigon Automatic Solar Tracking system**” done by us under the guidance of **Mr. L. JEGAN ANTONY MARCILIN M.Tech.**, is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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ABSTRACT

Solar panel has In recent years, it has become more common to use solar energy to generate electricity. The earth receives 84 Terawatts of energy, while our planet uses only 12 Terawatts daily. To get the maximum The solar panel should be oriented towards the sun in order to receive the maximum amount of energy. When the solar panel is positioned towards the east it produces its maximum power only in the time period of morning to afternoon, after that the sun goes to the other side of the panel and the solar panel will not produce its maximum efficiency. The aim of this project is to create an automated tracking device that can determine the sun's location. The monitoring device keeps the solar panel perpendicular to the sun at all times for optimum energy consumption. We use IR sensors to find the maximum power producing side, and an ARDUINO to control the sensors. Then a 10rpm motor is used to rotate the solar panel. This will help the solar panel to produce it's maximum output at all the time. Our The system can produce up to 40% more energy than solar panels that do not have tracking systems.

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LIST OF SYMBOLS AND ABBREVIATIONS

IREC	International Renewable Energy Congress
LDR	Light Dependent Resistor
PV	Photovoltaic
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
AVR	Advanced Virtual RISC
EEPROM	Electrically Erasable Programmable Read Only Memory
SRAM	Static Random Access Memory
VCC	Voltage Common Collector
ALU	Arethmetic Logical Unit
ICUE	International Conference and Utility Exhibition
CPU	Central Processing Unit
BLD	Bit Load
BST	Bit Score
MCUCR	MCU Control Register
ROM	Read Only Memory
PC	Program Counter
TX	Transmitting Data
RX	Receiving Data
LPM	Local Program Memory
UART	Universal Asynchronous Receiver transmitter
PWM	Pulse Width Modulation

CHAPTER 1

INTRODUCTION

Environmentally friendly power is energy which begins from characteristic source like daylight, tides, wind downpour, wave and so on Sunlight related the energy that comes as a result of sun rays a specific type of energy. sun powered radiation. Sun based energy is an extremely huge, limitless wellspring of energy. Today sun powered energy is the major eco-accommodating and contamination less technique for creating the power. The earth's resistance to the sun's force is approximately 1.8×10^{11} MW, which is a massive number of times greater than the current consumption rate of all business fuel sources on the planet. The fundamental goal of this paper is to improve sun powered tracker. Sun oriented Tracker is gadget that allows you to keep track of your location. follows the development as the sun moves from east toward the west daily. Utilizing sunlight based trackers upswings the measure of sun powered energy which is gotten by the sun oriented energy gatherer and builds up the energy yield of the warmth/power which is created. The sunlight based tracker can be utilized for in excess of a couple of utilizations, for example, sun oriented day lighting framework, sun based cells and sun powered warm clusters. The business tirelessness of sunlight based tracker is rise sun powered board yield, most extreme productivity of the board, ready to grap the energy for the duration of the day.

CHAPTER 2

LITERATURE SURVEY

Aditya sawant , Sourav Joshi, Designment of automatic solar tracking system (2016)

Second Worldwide Meeting on Mechanical Mechatronics and Robotization In this article, we set forward another technique for designment of the programmed global positioning framework of sun based energy dependent on one-chip PC and independent force. The technique utilizes silicon photograph cell and store power gear's as force; Hardware revolving actuator changes the heading of sun based board naturally as indicated by the bearing of the daylight, follows the sun consequently and improves the utilization proficiency of the sun based proficiently.

siddharth makhija , Aishwarya khatwani , Design and implementation of two axis solar tracking system (2017)

Ninth Worldwide Sustainable power Congress (IREC) The fundamental objective of expanding the productivity is to get the greatest force from the sun oriented board. The task is to plan and execution basic and modest cost sun oriented tracker framework with two tomahawks (azimuth point just as height point) utilizing Light Ward Resistor (LDR) with genuine measurements the venture made out of sunlight based board, two-engine satellite dish and swiveling appendage. An electronic circuit and an LDR module. This venture is contrasted and fixed sunlight based board and the outcomes showed that sun oriented highr tracker yield power than the sun based board. Task are separated in 2 section equipment . Equipment side is commonly made out of sun oriented boardtwo DC engines, a gearbox, and an LDR sensor module The electric circuit to be the second component. The detection of the sun's location was carried out in two stages in this study. The first step, or direct detection, was carried out using a collection of LDR yield adjusting to control the azimuth and elevation points. The second point is that, whether the climate is shady, stale, or rainy, the global positioning

framework come to a halt. however as indicated by Kelly cosine connection the force will diminish as per this climate since we had around ten to fifteen stormy days that consistently two to four hours shady also downpour. Energy extricated from photovoltaic or sun oriented authority relies upon sunlight based illuminance. For greatest extraction the sun based gatherer board ought to consistently be typical to the occurrence radiation Sunlight based trackers moves the sun based authority to to keep an eye on the sun way and the direction of sun based authority at ideal slant point. Sun based global positioning framework improves significantly energy productivity of photovoltaic board. A programmed double pivot sun powered global positioning framework is planned and created utilizing Light Ward Resistor and DC engines on mechanic construction with the course of action. Outcomes showed in the programmed sun powered global positioning framework is more solid.

Aayush sharma , Varun Vaidya, Automatic sun tracking for the enhancement of efficient of solar energy system(2017)

Worldwide Gathering and Utility Display on Environmentally friendly power Energy for Manageable Turn of events (ICUE) Energy is the excellent part for the improvement of a country. Tremendous measure of petroleum derivatives, viz. coal, gas, oil, and so forth are extricated, changed over, dispersed and devoured by the general public on everyday schedule for different exercises. The restricted supply of petroleum products and its outcome as a dangerous atmospheric deviation constrained researchers to tackle energy from nonconventional assets. Sustainable power, like sun oriented, wind, geothermal, sea tsunamis are the best demonstrated wellsprings of energy. Sun based energy is quite possibly the most plentiful and modest assets among these. Sunlight based energy is changed over energy with the assistance of photovoltaic sun oriented boards. Sun based energy is augmented when the sunrays fall opposite on the board. The inflexible fixed sort traditional sun based boards have limitation to get greatest sunrays due to changing point of frequency. Programmed sun global positioning framework is the answer for tackle greatest sun powered energy by pointing toward the sun entire day.

Zhao xianlin ,sun yuwen, Forest fire prevention with all weather solar tracking system(2018)

The observing gear of timberland fire avoidance typically needs all-climate supply of electric force. However, the vast majority of sun oriented force frameworks applied in backwoods fire anticipation utilize fixed-mounted sunlight based boards. This issue brings about low productivity of power age. Along these lines the zone of sunlight based boards needs to increment to satisfy power need of the gear. An all-climate programmed sun powered following strategy was proposed, which consolidated the photoelectric identification and the sun based direction following modes. The technique utilized a daylight power sensor to gauge climate conditions first and foremost. At that point it used a sun powered position sensor and a sun oriented direction calculation to decide the progressions of sunlight based position. At long last, extraordinary following models were taken sun in radiant, overcast and blustery days. Through reproduction analyzes, this technique could adequately decrease the effect of climate change and guarantee to sun steadily and precisely all climate.

Krishnan , K.Sathyasekar, Design of automatic solar tracking utilization (2019)

This paper gave a specific portrayal of a following and fixation framework for sun oriented energy usage. A multi-glasses focus and following photovoltaic framework is planned. An exploration on the racking and focus framework for sunlight based energy use was made. A global positioning framework dependent on the hypothesis that sunlight based can be accumulated relying upon plane mirror reflecting was set up. Also, a carry out task of racking and focus framework for sun oriented energy use was advanced. Equipment and programming of the racking and fixation framework for sun powered energy use was planned. Incorporate of: the plan of rationale circuit control module, the plan of AC-electromotor driver module the plan of temperature identifying module. The consequences of the sort troubleshoot.

CHAPTER 3

EXSITING SYSTEM

In the given below it indicates the exsiting system

- It starts everyday facing the wrong direction from the site of sun so losing the site of the sun the power consumption will be very less in that time period
- it faces the direction of west and loses the sight of the sun rays, as we all now the sun rises from east to west so the panel must be in the east direction on initially so that we can get more power as soon as the sun rises in the east.
- Thus the panel reposition itself from west to east and consumes a lot of time where at that time we can consume a lot of power
- it takes time to reorient the panel from west direction to the direction of east, thus is an major drawback or we can say this as an major problem so that we loose a lot of power at this time period so this affects the whole efficiency of the solar tracker.
- The exsiting has motor less so it can rotate the panel only at 0 to 180 degree ,but the proposed methodology is motored and it can rotate upto 0 to 360 degree
- Thus these drawbacks must be corrected and the panel must be made to face the east direction initially so that the efficiency of the solar tracker will be more

CHAPTER 4

PROPOSED SYSTEM

- The proposed arrangement for this project is to design a programmed GPS that can determine the location of the sun.
- At all times, the global positioning framework will rotate the solar-powered board in the opposite direction of the sun for maximum energy consumption. We use IR sensors to find the maximum power producing side, and an adruino to control the sensors.
- Then a 10rpm motor is fixed to rotate this panel. This will help solar panel to produce it's maximum output at all the time.
- Our framework will yield up to 40% more energy than the sun based boards without global positioning framework

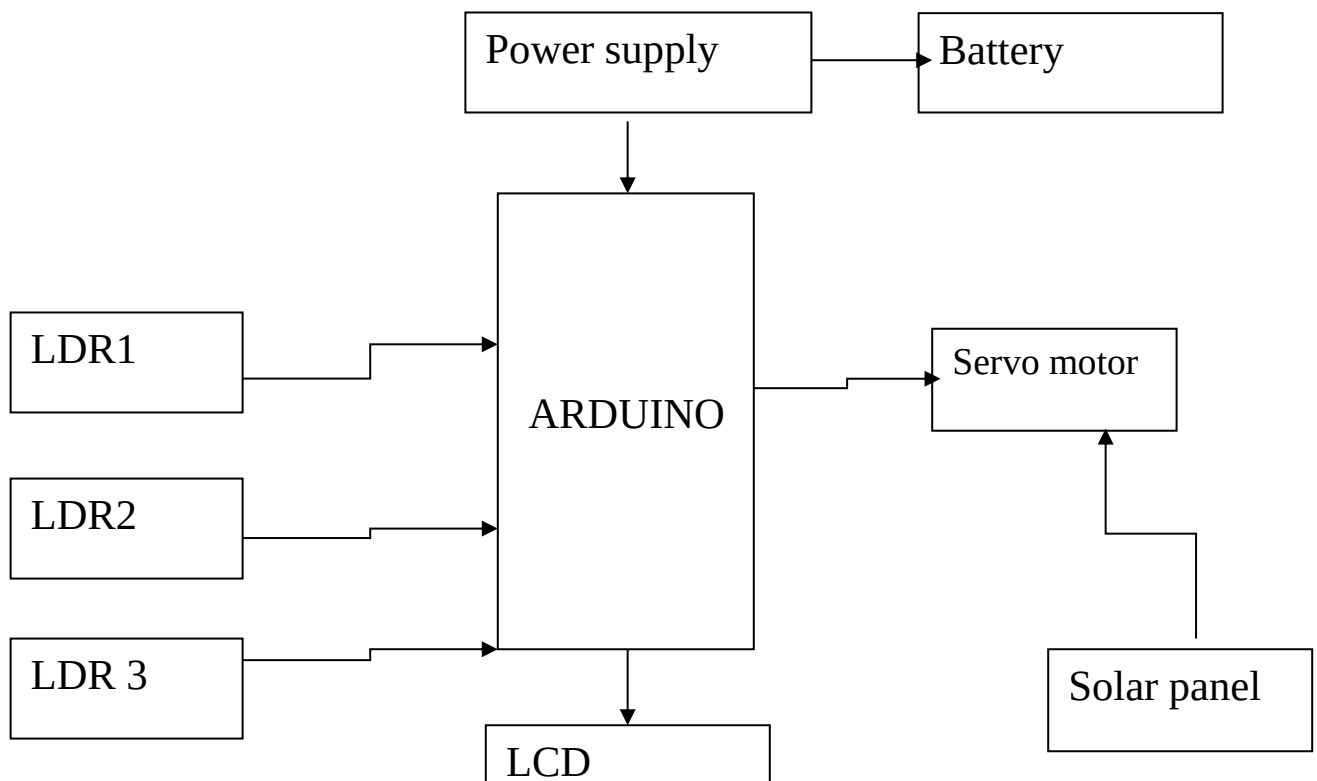


Fig : 4.1 : Blockdiagram of proposed system

4.1 HARDWARE REQUIREMENTS

- Arduino
- LRD
- LCD
- Servo motor
- Solar panel
- Battery

4.2 SOFTWARE REQUIREMENTS

- Mplab ,
- Embedded c

4.3 POWER SUPPLY UNIT

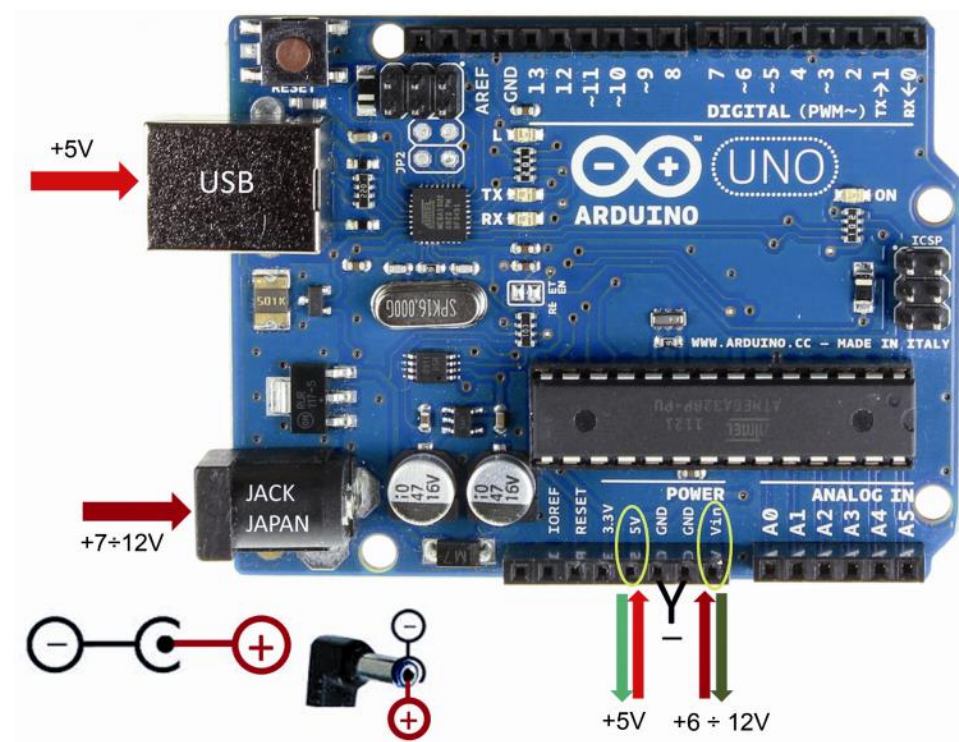


Fig : 4.2 : Arduino Chip

- It is a DC adapter
- It is in the range of 9v and 12v
- It is rated for 250mA minimum current output and also it will like to do something more ,for example 500mA or 1A output.
- It will give the necessary current to power to servo or 20 LED
- It should have a 2.1mm power plug at arduino end
- The plug should connect at the centre positive ,that is , the middle pin has to connect in the positive connection.

ATmega-328 is fundamentally a High level (AVR) miniature regulator. It upholds up to eight bits of information. 1KB Electrically Erasable Programmable Perused Only Memory on the ATmega 328 (EEPROM). This property indicates that the miniature regulator's electric inventory has been removed, despite the fact that it can store data and provide results after it has been given.. Different qualities will be clarified later. ATmega 328 has a few distinct highlights which make it the most well known gadget in the present market. These highlights comprise of cutting edge RISC design, great execution, low force utilization, genuine clock counter having separate oscillator, The ATmega-328 is commonly used in Arduino because it has six PWM pins

The ATmega328 is a miniature eight-bit regulator. It can handle data with a bit size of up to eight (8) bits. It's a miniature AVR-based regulator. Its internal memory is approximately 32KB. It operates with voltages ranging from 3.3 to 5 volts. In any case, when the electrical stock is removed from its system, it has the capacity to store the information. terminals for biasing Its outstanding features include cost effectiveness, low force scattering, programming lock for security, and genuine clock counter with discrete oscillator.

Atmega328

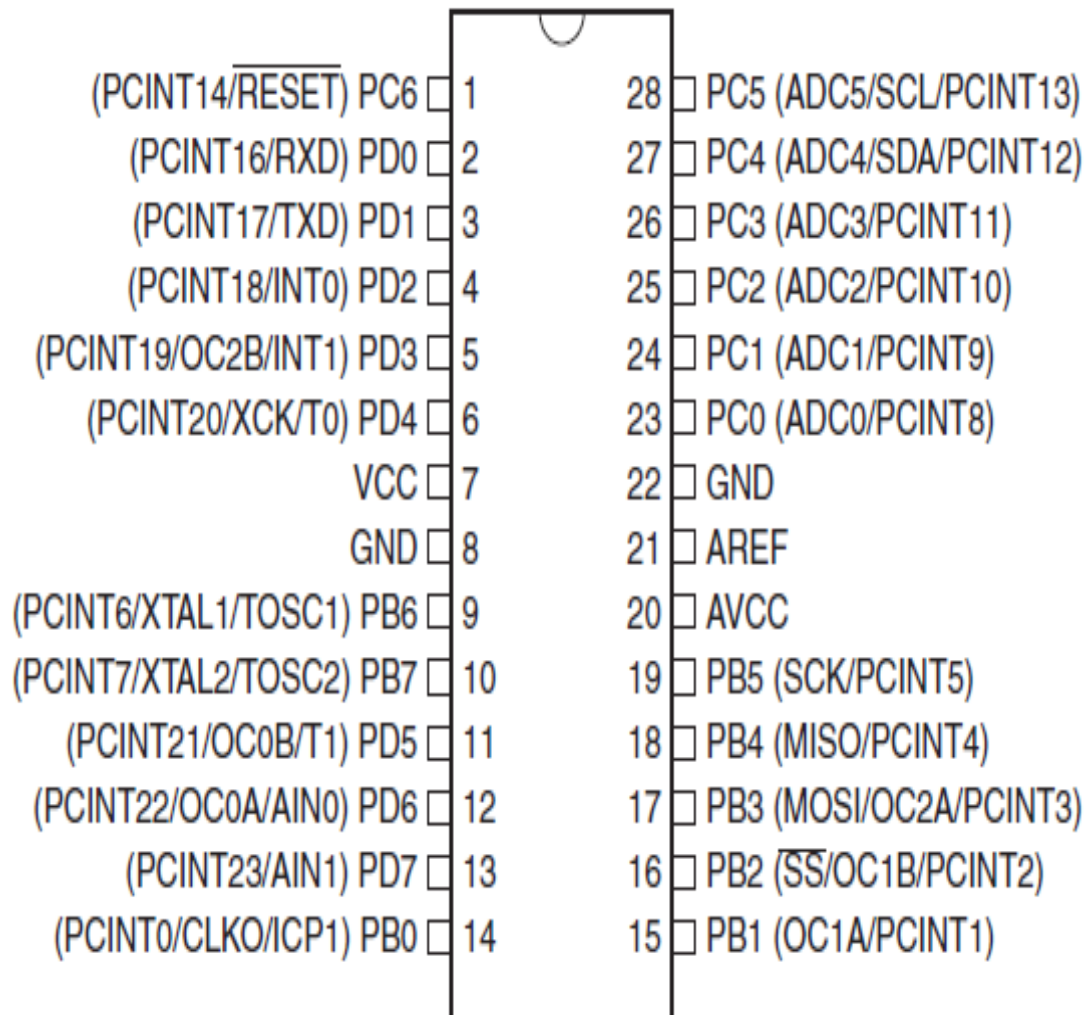


Fig : 4.3 : Pin Diagram atmega328

4.4 ARCHITECTURE DIAGRAM

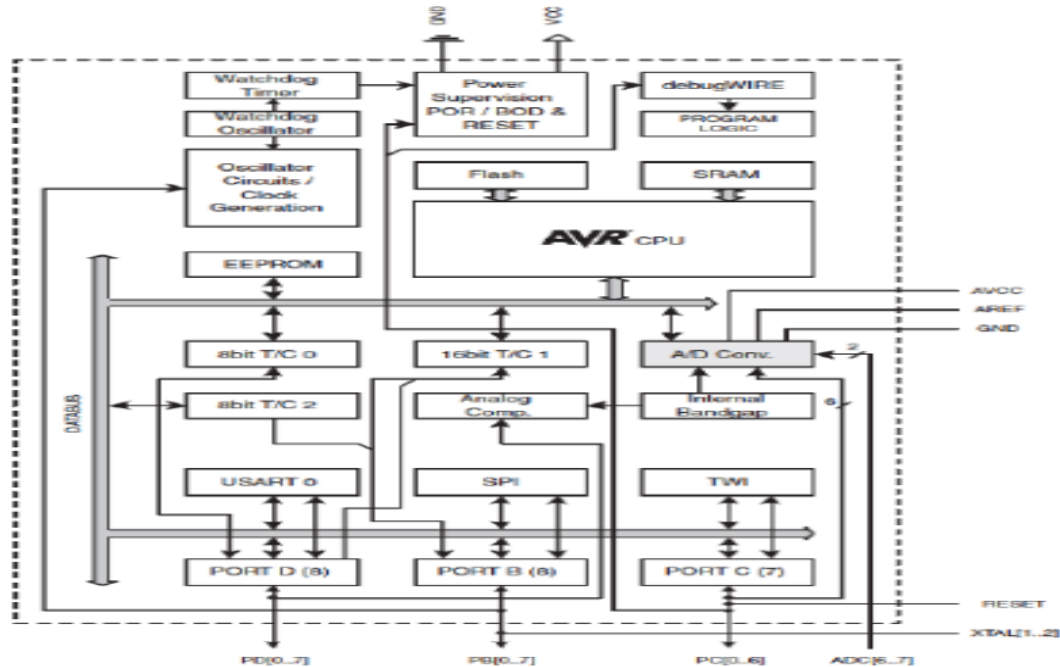


Fig : 4.4 : Architecture Diagram of AVR

AVR employs Harvard engineering, which includes discrete recollections and transports for programme and data. Single-level pipelining is used to execute guidelines in the programme memory. The next guidance is pre-gotten from the programme memory when the previous one is being executed. This concept allows for instructions is carried out each clk cycle. In-Framework Reprogramming is used to rewrite the application memory. Single clk cycle time to gain access, digit widely useful working registers can be accessed. This allows for single-cycle. The 16-cycle X-, Y-, and Z-registers are the extra limit registers shown later in this section. Between registers or between a clear and a register, the ALU keeps track of math and reasoning assignments. In addition, single register exercises can be performed in the ALU. The Status Register is updated after a number-crunching exercise to reflect data about the activity's aftereffect.

The majority of AVR directions use a single 16-cycle word pattern. A 16- or 32-digit guidance is included in each programme memory address. The Boot Program segment and the Application Program segment are separated in the Program Space memory space. Compose and read/compose assurance are provided by dedicated Lock bits in both parts. The Stack stores the return address Program Counter. during hinders and subroutine calls. In the Reset routine, all client programmes should provide the SP prior to the execution of subroutines or hinders. Stack Pointer has the value p. via the five distinct tending to modes incorporated into the AVR specification In AVR engineering, memory space is all straight and conventional memory maps. The control registers of an adaptable intrude on module are with an extra Worldwide Hinder Empower bit in the Status Register in the I/O space. In the Intrude on Vector table, each hinder has a different Interfere with Vector value. The impediment Their location interferes with that of the vector. The higher the need, the lower the Interfere with Vector address. For computer chip fringe capacities, the I/O memory has 64 locations. The I/O Memory can be accessed directly through 0x20 - 0x5F Information Areas Document. Furthermore, device have a larger input space in SRAM, ranging from 0x60 to 0xFF.

4.5 ARITHMETIC LOGICAL UNIT

Both 32 working register is straight connects to superior AVR . Number juggling tasks between widely useful registers or between a register and a prompt are performed within one clk cycle. The operation of the ALU are subdivided into three types: number juggling, coherent, and bit-capacities. A few variations of the style also have an amazing impact. partial configuration and marked/unsigned augmentation For a more detailed illustration, see the Guidance Set Outline segment.

4.6 GLOBAL INTERRUPT ENABLE

Worldwide Hinder Empower should be fix to hinders to empowered. The each hinder empower responsible and acted isolated register control. On the Worldwide Hinder Empower Register is finished, not even single hinders is empowered individual hinder empower .cycle is finished by equipment and a hinder had happened, and set a guidance for empower ensuing interferes depicted to guidance for setting the reference. The Cycle Duplicate guidelines BLD and BST use the objective to work bit. Piece from a register to Register Record are also to be duplicated in T by BST guidance, somewhat T is replicated to somewhat in register to the Document by BLD guidance. Half Convey Banner H demonstrates Half Convey math tasks. The Half Convey Banner is helpful in BCD numbering juggling. Guidance Portrayal for definite data. Sign Banner, The S-digit is consistently a select or inbetween Negative Banner N and Two's Supplement Flood Banner 5. Guidance Set Portrayal for itemized data. The 2's Supplement Flood Banner V backings two's supplement number-crunching. See the Guidance Set Depiction for nitty gritty data. The Negative Banner N shows a negative outcome in a math or rationale activity. See the Guidance Set Depiction for itemized data. The Zero Banner Z shows a zero outcome in a number-crunching or rationale activity. See the Guidance Set Portrayal for nitty gritty data.

4.7 POINTER STACK

The pointer stacks are primarily used to keep track of temporary information, storing neighbourhood variable. Stacks are carried out by developing from top to bring down those areas. Stack pointer consistently focuses for highest point of the Stack. The Stack Pointer directs attention to the information stored in the SRAM to Stack territories in which a Subroutine with Interfere with Stacks found. Stack PUSH order is to diminish Stack Pointer. Stack information must be characterized to program before the subroutine call are executed or hinders also empowered. Introductory and esteem approaches last location inside SRAM .

4.8 MEMORY DESCRIPTION

It has a space of 15 pieces. Programmable Inspected Just Memory. It is nonvolatile memory. Burst program collecting. Hence AVR headings is sixteen and thirty two pieces. For programming guard, Gleam Program memory space are disconnected into two parts - Boot Loader Region, Application Program Area to contraption. Sparkle memory have a diligence in any event make/demolish cycle. Development of program boot an area are related Boot Lock bits for programming security are portrayed in detail in loader boot Sponsorship – Read-While-Stay in contact with Self-Programming. Recommend Memory Programming for the depiction on Streak information back to back downloading utilizing the SPI pins.

4.9 REGISTER

ATmega-three twenty eight has thirty two General Purpose register, all of which are source of Static Random Access Memory

7	0	Addr.
R0		0x00
R1		0x01
R2		0x02
...		
R13		0x0D
R14		0x0E
R15		0x0F
R16		0x10
R17		0x11
...		
R26		0x1A
R27		0x1B
R28		0x1C
R29		0x1D
R30		0x1E
R31		0x1F

Fig : 4.5 : Register

4.10 ATMEGA AND ARDUNIO

- The ATmega-328 is the most commonly used microcontroller in design.
- The ATmega-328 is the most crucial component of Arduino.
- The programme is uploaded to the Arduino-connected AVR microcontroller.



Fig : 4.6 : UART Diagram

4.11 UART

The Universal Asynchronous Receiver/Transmitter correspondence convention will be our primary focus (UART). Because information is communicated in sequential pieces (which we'll get to later), UART is a type of sequential correspondence. The wiring for establishing a UART correspondence consists of a single line for sending data and one line for receiving data . As one might expect, the sending line is used to send data and

the receiving line is used to receive data. A serial port is formed when the sending and receiving lines of a device that uses in communication are connected together.

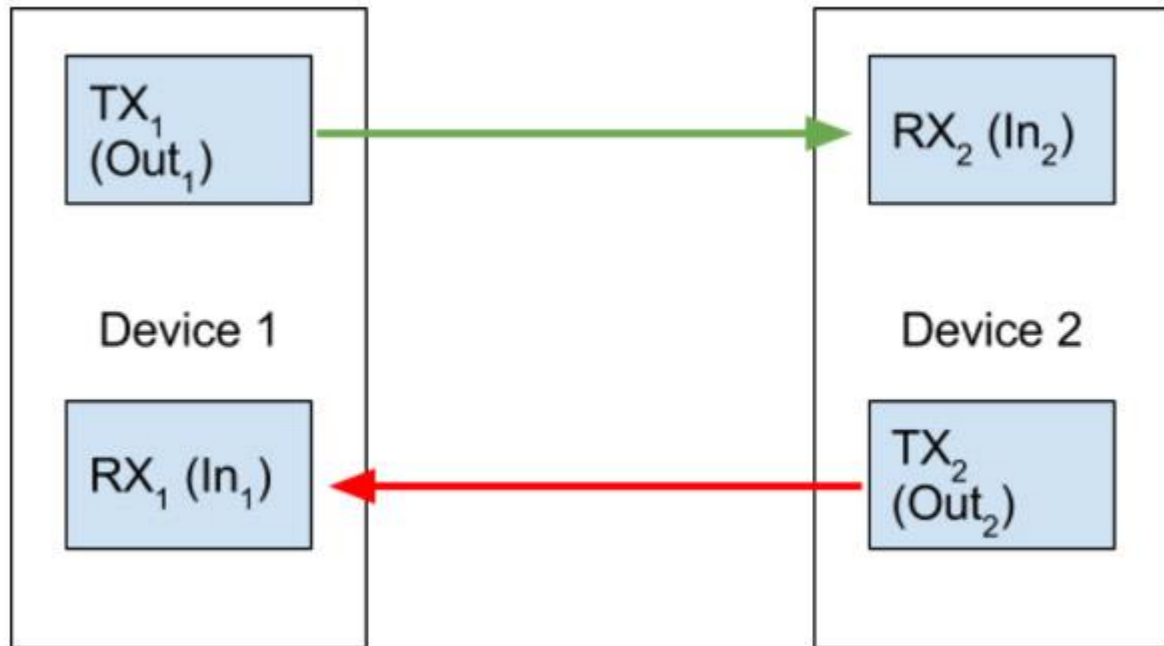


Fig : 4.7 : Hardware Connection Diagram

UART defines the installed hardware which handles the bundling also the interpretation of sequential details. The serial port is used to communicate with the PC that the Arduino is connected to. Believe it or not, this is true! USB stands for All-Inclusive Sequential Transport, is a port that works in a sequential order. USB connection is broken out into 2 advanced pin, gpio0 and gpio1, which can be used in a variety of projects require sequential correspondence devices except for the PC, using locally available equipment.

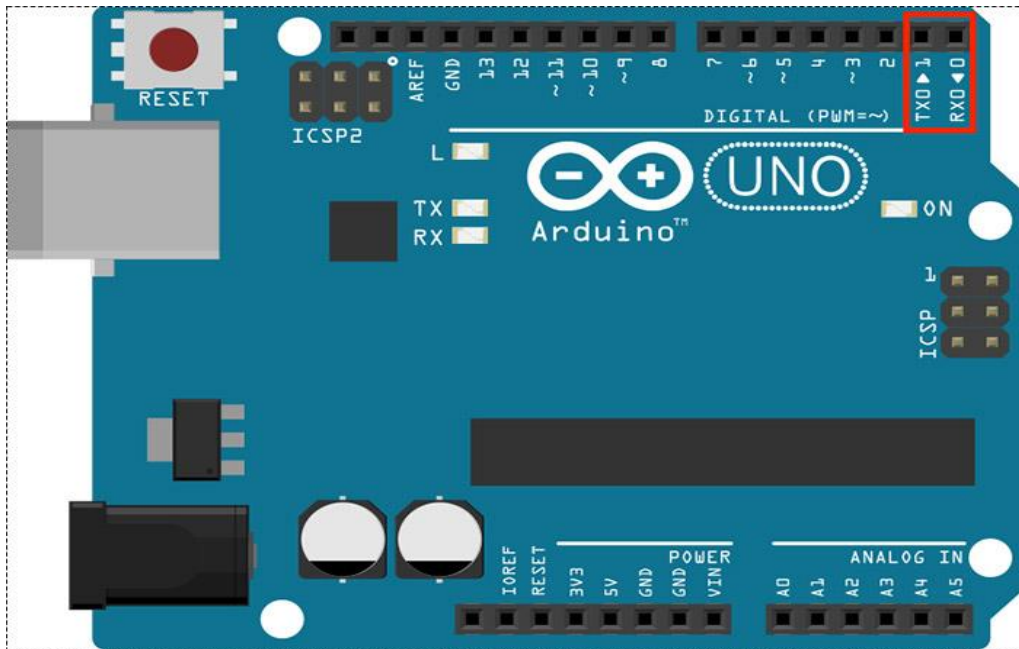


Fig : 4.8 : GPIO 0 and GPIO 1.

With the Product Sequential library, As a Sequential RX, any GPIO pin can be used or sending detail. Other GPIO pins can be used as Sequential RX and TX lines by using the Product Sequential Arduino library (Programming Sequential. h). The correspondence b/w the 2 device seek to communicate is called offbeat why because it does not rely on a synchronised clock s/g. The "sender" can't sure that the "recipient" receives the right information because of correspondence speed isn't characterised by this consistent sign

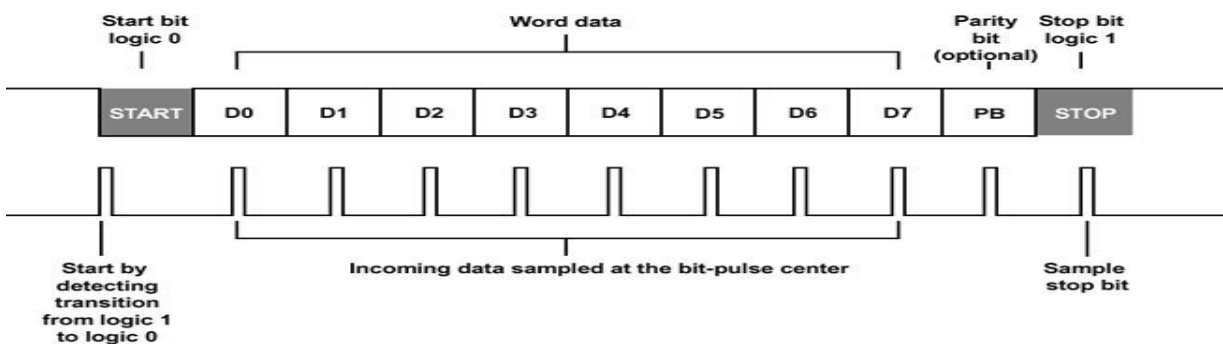


Fig : 4.9 : UART Data visualized

On most implanted stages, such as the Arduino, the client does not need to manage correspondence at the piece level while performing UART sequential correspondence. In any case, the stage frequently provides higher programming libraries. Clients can use the sequential and programming sequential libraries on the Arduino stage to execute UART correspondence for their tasks. In event that more than one gadget endeavors to communicate information on a similar line, transport dispute happens, and the accepting gadgets will doubtlessly get trash unusable information. Moreover, UART is half-duplex, which implies that despite the fact that correspondence can happen bi-directionally, the two gadgets can't send information to one another simultaneously.

4.12 LIQUID CRYSTAL DISPLAY (LCD)

The light-adjusting properties of fluid gems are used to create a flimsy, level electronic visual presentation known as a fluid precious stone showcase (LCD) (LCs). LCs do not emit light in a direct manner. They're used in a variety of jobs, including PC screens, TV, instrument loading, and plane cockpit shows, among others. In a variety of applications, LCDs have evacuated cathode shaft tube (CRT) displays. They are typically smaller, lighter, more adaptable, more reasonable, and stronger. Each pixel of a layer of particles in an LCD switched between two direct cathodes and two polarising channels, the hatchets of transmission of which are (in the vast majority of cases) inverse to each other in a specific way. Anodes are made of Indium Tin Oxide, which is a simple channel (ITO). The arrangement at the surfaces of terminals controls the movement of precious stone particles before an electric field is applied. The surface arrangement headings at the two terminals in a contorted nematic gadget are opposite one another, so the particles orchestrate themselves in a helical design, or wind. The applied voltage is sufficiently large, the fluid gem particles in the focal point of the layer are completely untwisted, and the occurrence light is not pivoted as it passes through the fluidlayer, reducing the turn of the polarisation of the occurrence light and making the device appear dark. This light will be primarily spellbound opposite at that point. on to the next channel.

4.13 PIN DESCRIPTION

LCDs with a single regulator and a character support of up to 80 characters, while LCDs with a character support of more than 80 characters use 2HD44780 regulators. LCDs with a single regulator have 14 pins, while LCDs with two regulators have 16 pins.

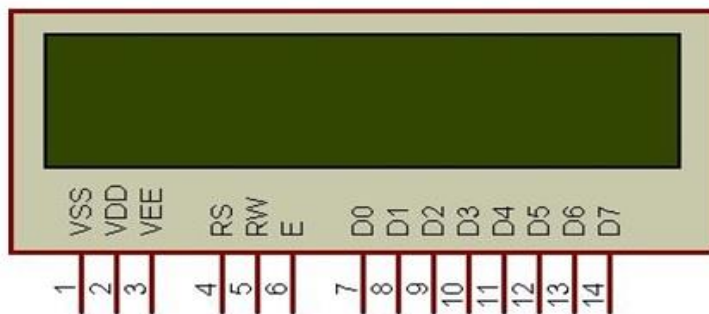


Fig : 4.10 : Pin diagram of 2x16 LCD

4.14 FEATURES

- Five cross eight dot with cursor
- Built-in controller
- Plus 5 volt power supply
- 1/16 duty cycle
- Optional for plus three volt power supply

4.15 BF- BUSY FLAG

The Occupied banner is an LCD view status indicator banner. This banner is set (BF=1) during the planning phase and cleared (BF=0) once the guidance has been successfully implemented. This is beneficial in terms of delivering and measuring the delay for LCD handling. To display an occupied banner, the conditions RS=0 and

R/W=1 must be met, and the MSB of the LCD information transport (D7) must be set to occupied banner. When BF=1, the LCD is occupied and will not consider the next order or information; when BF=0, the LCD is able to calculate the next order or information.

4.16 INSTRUCTION SET AND COMMAND

Only the instruction register (IR) and information register (DR) of the LCD can be constrained by the MCU. To allow interfacing with different MCUs that operate at different speeds or different fringe control gadgets, control data is briefly stored in these registers before the LCD begins its inward operation. The LCD's internal operation is regulated by signals from the MCU. There are three LCD directions: register determination signal (RS), read/compose signal (R/W), and data transport signal.

No.	Instruction	Hex	Decimal
1	Function Set: 8-bit, 1 Line, 5x7 Dots	0x30	48
2	Function Set: 8-bit, 2 Line, 5x7 Dots	0x38	56
3	Function Set: 4-bit, 1 Line, 5x7 Dots	0x20	32
4	Function Set: 4-bit, 2 Line, 5x7 Dots	0x28	40
5	Entry Mode	0x06	6
6	Display off Cursor off (clearing display without clearing DDRAM content)	0x08	8
7	Display on Cursor on	0x0E	14
8	Display on Cursor off	0x0C	12
9	Display on Cursor blinking	0x0F	15
10	Shift entire display left	0x18	24
12	Shift entire display right	0x1C	30
13	Move cursor left by one character	0x10	16
14	Move cursor right by one character	0x14	20
15	Clear Display (also clear DDRAM content)	0x01	1

Figure : 4.11 : commands

There are four different types of instructions:

- Use internal RAM to set addresses and perform data transfers.
- RAM to designate LCD functions such as display format, data length, and so on
- Carry out the miscellaneous tasks.

4.17 LDR:



Figure : 4.12 : LDR

The resistivity of a Light Dependent Resistor (LDR), also known as a photo resistor, is affected by electromagnetic radiation. From now on, they'll be light, touchy gadgets. Photograph conductors, photograph conductive cells, and simply photocells are all terms used to describe photocells. To demonstrate an LDR, a variety of images can be used; perhaps the most commonly used image is shown in the figure below.

4.18 FEATURES

- I/p voltage: five volt
- O/p: analog
- highly sensitivity to light
- O/p voltage: five volt

4.19 SOLAR PANEL



Figure : 4.13 : Solar Panel

Photons, or light particles, thump electrons emitted from atoms, resulting in a power progression on a photon-based surface. A solar-oriented board is made up of several smaller units called photovoltaic cells. (The term "photovoltaic" simply refers to the conversion of sunlight into electricity.)

4.20 ADVANTAGE

Because of their increased direct exposure to sunlight-based rays, trackers generate more power than their fixed counterparts. Solar trackers generate more power in roughly the same amount of space as fixed-slant systems, making them ideal for increasing area utilization frameworks. X have been drastically reduced thanks to advances in innovation and dependability in hardware and mechanics.

4.21 DISADVANTAGE

Because of the more perplexing innovation and moving parts required for their activity, sun-based trackers are slightly more expensive than their fixed counterparts. Fixed

racking is easier to understand than trackers. Single-pivot tracker projects also necessitate a greater focus on the organization's stability and dependability.

4.22 SOFTWARE REQUIREMENTS

Arduino is an open-source gadgets platform based on easy-to-use hardware and programming. Thousands of activities, ranging from simple objects to complex logical instruments, have relied on Arduino over the years. An entire community of producers has gathered around this open-source stage, including understudies, specialists, craftsmen, developers, and experts. Their efforts have resulted in an incredible amount of open information that can be extremely useful to both novices and experts. Arduino was created at the Ivrea Interaction Design Institute as a simple tool for rapid prototyping aimed at students with no prior experience with hardware or programming. When it arrived at a more extensive local area, the Arduino board began changing to adjust to new requirements and difficulties and installed conditions. All Arduino sheets are totally open-source, engaging clients to construct them freely and in the long run adjust them to their specific requirements. The product is also open-source, and it is evolving thanks to the contributions of clients all over the world. Arduino programming is simple enough for beginners to learn, but flexible enough for cutting-edge clients. It's compatible with Mac, Windows, and Linux. It is used by educators and understudies to demonstrate science and physical science standards, or to begin with programming and mechanical technology, make simple logical instruments. Intelligent models are built by creators and draughtsmen, and artists and specialists use them to establish new instruments and explore new avenues. Producers, for example, use it to put together a large number of the activities on display at the Maker Faire. Arduino is a crucial tool for learning new skills. Anyone - kids, experts, craftsmen, and developers - can start dabbling by following the unit's step-by-step instructions or sharing ideas online with other members of the Arduino community.

For actual figuring, there are numerous other microcontrollers and microcontroller stages available. Similar tools include Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and a slew of others. These devices take the muddled nuances of microcontroller programming and wrap them in a simple-to-use package. Nonetheless, it has some advantages over other frameworks for educators, students, and curious newcomers. In comparison to other microcontroller stages, Arduino sheets are usually more affordable. Hand-collecting the most affordable Arduino module is possible, and the pre-assembled Arduino modules are surprisingly inexpensive (under \$50). The Arduino Software (IDE) is compatible with Windows, Macintosh OSX, and Linux operating systems. The majority of microcontroller frameworks are only available for Windows. The Arduino Software (IDE) is simple to use for beginners, but it's also adaptable enough for cutting-edge clients to use. It's advantageous for instructors because it's based on the Processing programming environment.

4.23 EMBEDDED C

Installed C is a set of language enhancements created by the C Standards Board for the C Programming Language in order to address shared characteristic issues that exist between C expansions for various implanted frameworks. Verifiably implanted C programming necessitates nonstandard extensions to the C language to help fascinating features like fixed-point number crunching, various distinct memory banks, and fundamental I/O tasks. Primary() work, variable definition, information type presentation, contingent statements, loop, functions, clusters and strings, designs and association, bit activities, macros, and so on are all used in implanted C. Programs were created using constructing agents and melded into EPROM during the early stages of chip-based frameworks. There used to be no way to figure out what the programme was up to. To ensure that the programme was executed correctly, LEDs, switches, and other devices were used. They were, however, exorbitantly priced and not exactly dependable

CHAPTER 5

RESULTS AND DISCUSSION

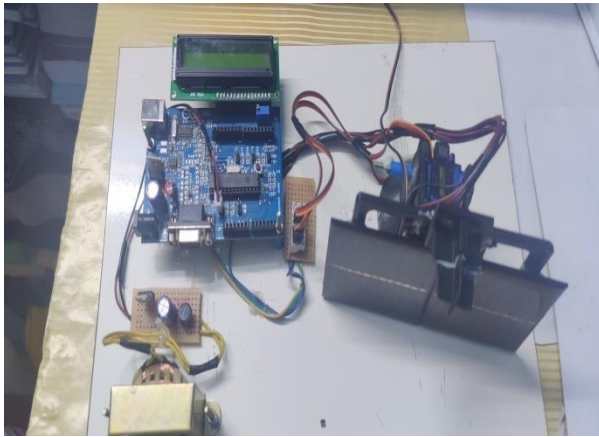


Fig : 5.1: solar tracker off condition

So the final output and the result that we found are explained below

- Initially the solar panel will be in the east, As we all know the sun rises from east to west
- When the power supply is given, the 4 LDR resistors will capture the sun light and turn the solar panel towards the direction of sunlight when the sunlight falls on the LDR
- Solar panel will rotate with the help of servo motor 1 (x, y axis) and servo motor 2 (perigon rotation)
- And finally the angle of the solar panel will be displayed on LCD
- And the voltage will be measured by using multimeter

As a result of this project, when light strikes the LDR, its obstruction changes, and a potential divider circuit is used to extract a comparing voltage value (5v) from the LDR's opposition. The Arduino microcontroller sends out a voltage signal. A corresponding PWM signal is sent from the servo engine based on the voltage signal, which causes it to turn and eventually achieves a position where the force of light drop on the sun.

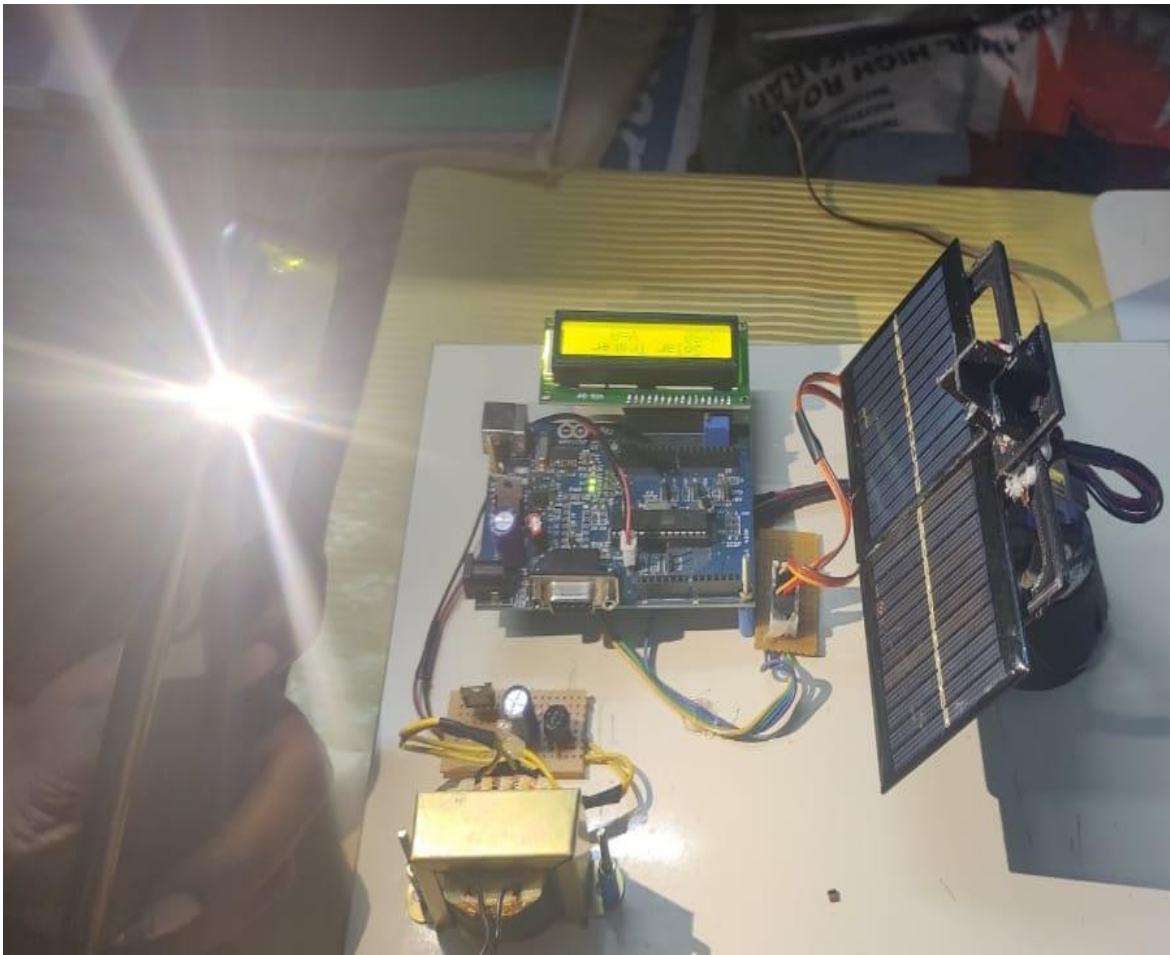


Fig : 5.2 : solar tracker on condition

Finally the voltage is measured with the help of multimeter and the degree of x and y axis will be displayed on the LCD and the readings are given in the table below

Table : 5.1 Day 1 Reading

TIME	OUTPUT(v)	X-AXIS(degree)	Y-AXIS(degree)
8.00am	4.9v	50	90
9.00am	6.2v	60	90
10.00am	6.2v	80	90
11.00am	6.2v	90	90
12.00am	6.2v	100	90
1.00pm	6.2v	110	90
2.00pm	6.2v	120	90
3.00pm	6.2v	130	90
4.00pm	6.2v	150	90
5.00pm	5.5v	160	90
6.00pm	1.2v	180	90
7.00pm	0.9v	180	90
8.00pm	0.4v	50	90

Table : 5.2 Day 2 Reading

TIME	OUTPUT(v)	X-AXIS(degree)	Y-AXIS(degree)
8.00am	5v	50	90
9.00am	6.2v	60	90
10.00am	6.2v	80	90
11.00am	6.2v	90	90
12.00am	6.2v	100	90
1.00pm	6.2v	110	90
2.00pm	6.2v	120	90
3.00pm	6.2v	130	90
4.00pm	6v	150	90
5.00pm	5.5v	160	90
6.00pm	1.1v	180	90
7.00pm	0.6v	180	90
8.00pm	0.3v	50	90

Table : 5.3 Day 3 Reading

TIME	OUTPUT(v)	X-AXIS(degree)	Y-AXIS(degree)
8.00am	4.5V	50	90
9.00am	5V	60	90
10.00am	6.2V	80	90
11.00am	6.2V	90	90
12.00am	6.2V	100	90
1.00pm	6.2V	110	90
2.00pm	6.2V	120	90
3.00pm	6.2V	130	90
4.00pm	6.2V	150	90
5.00pm	6V	160	90
6.00pm	1.3V	180	90
7.00pm	0.8V	180	90
8.00pm	0.3V	50	90

Table: 5.4 Day 4 Reading

TIME	OUTPUT(v)	X-AXIS(degree)	Y-AXIS(degree)
8.00am	4.2V	50	95
9.00am	5.1V	60	95
10.00am	6.2V	80	95
11.00am	6V	90	95
12.00am	6.2V	100	95
1.00pm	6.2V	110	95
2.00pm	6.2V	120	95
3.00pm	6.2V	130	95
4.00pm	6.2V	150	95
5.00pm	5.5V	160	95
6.00pm	1.2V	180	95
7.00pm	0.7V	180	95
8.00pm	0.3V	50	95

Table: 5.5 Day 5 Reading

TIME	OUTPUT(v)	X-AXIS(degree)	Y-AXIS(degree)
8.00am	4.5V	50	90
9.00am	6V	60	90
10.00am	6.2V	80	90
11.00am	6.2V	90	90
12.00am	6.2V	100	90
1.00pm	6.2V	110	90
2.00pm	6.2V	120	90
3.00pm	6V	130	90
4.00pm	6.2V	150	90
5.00pm	5.7V	160	90
6.00pm	1.1V	180	90
7.00pm	0.6V	180	90
8.00pm	0.3V	50	90

Table : 5.6 Day 6 reading

TIME	OUTPUT(v)	X-AXIS(degree)	Y-AXIS(degree)
8.00am	4.6V	50	92
9.00am	6V	60	92
10.00am	6.2V	80	92
11.00am	6.2V	90	92
12.00am	6V	100	92
1.00pm	6.2V	110	92
2.00pm	6.1V	120	92
3.00pm	6.2V	130	92
4.00pm	6.1V	150	92
5.00pm	5V	160	92
6.00pm	1.6V	180	92
7.00pm	0.6V	180	92
8.00pm	0.3V	50	92

Table : 5.7 Day 7 Readings

TIME	OUTPUT(v)	X-AXIS(degree)	Y-AXIS(degree)
8.00am	4.5V	50	95
9.00am	6.1V	60	95
10.00am	6.2V	80	95
11.00am	6.2V	90	95
12.00am	6.2V	100	95
1.00pm	6.2V	110	95
2.00pm	6V	120	95
3.00pm	6.2V	130	95
4.00pm	6.2V	150	95
5.00pm	6V	160	95
6.00pm	1.4V	180	95
7.00pm	0.8V	180	95
8.00pm	0.3V	50	95

Table : 5.8 Day 8 reading

TIME	OUTPUT(v)	X-AXIS(degree)	Y-AXIS(degree)
8.00am	4.3v	50	93
9.00am	5.8v	60	93
10.00am	6.2v	80	93
11.00am	6v	90	93
12.00am	6.2v	100	93
1.00pm	6.2v	110	93
2.00pm	6.2v	120	93
3.00pm	6.1v	130	93
4.00pm	6.2v	150	93
5.00pm	5.5v	160	93
6.00pm	1.3v	180	93
7.00pm	0.7v	180	93
8.00pm	0.3v	50	93

CHAPTER 6

CONCLUSION

An Arduino sun based tracker was planned and developed in the current work. LDR light sensors were utilized to detect the force of the sun light event on the photovoltaic cells board. Finishes of this task is summed up as ,the current global positioning framework effectively portrayed the light source even it is a little light, in a dull room, or it is the daylight beams. The expense and dependability of this sunlight based tracker makes it appropriate for the rustic utilization. The motivation behind environmentally friendly power from this paper presented new and progressed suggestion to help individuals.

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