A

PROJECT REPORT

ON

“Solar Power Laptop & Mobile Charging Station”

Submitted by

Sonia Hatkar (B05)

Nachiket Shilwant (B27)

Swati Wankhade (B57)

Indrapal Singh Shiledar(B66)

Vaishnavi Mani (B71)

F.Y. B Tech

UNDER THE GUIDANCE OF

Mr. K Murli Mohan

Mrs. Vinaya Khiste

Ms. Madhuri Baswade

(Engineering Exploration Lab)

Shri Guru Gobind Singhji Institute of Engineering & Technology

Nanded - 431606, India.

(An Autonomous Institute of Govt. of Maharashtra)

Year 2020-2021

Semester-1

CERTIFICATE

This is to certify that, the Project report entitled

"Solar Power Laptop & Mobile Charging Station"

Submitted by

Sonia Hatkar (B05)

Nachiket Shilwant (B27)

Swati Wankhade (B57)

Indrapal Singh Shiledar (B66)

Vaishnavi Mani (B71)

As the partial fulfillment of Engineering Exploration Lab

For the academic year 2020-2021

This project is a record of student's own work, carried out by them under our supervision and guidance.

Mr. K Murli Mohan **Mrs. Vinaya Kishte** **Ms. Madhuri Baswade**

ACKNOWLEDGEMENT

For all the efforts behind the project work, we first & foremost would like to express our sincere appreciation to the staff of Department of Engineering Exploration Lab, for their extended help & suggestions at every stage of this project.

It is with a great sense of gratitude that we acknowledge the support, time to time suggestions and highly indebted to our guide.

Finally, we pay our sincere thanks to all those who indirectly and directly helped us towards the successful completion of this project report.

Sonia Hatkar (B05)

Nachiket Shilwant (B27)

Swati Wankhade (B57)

Indrapal Singh Shiledar (B66)

Vaishnavi Mani (B71)

Abstract

A solar powered mobile phone and laptop charging station is proposed in this paper. The proposed system can be installed in any public places like market, bus stops and other shopping places.

The charging station is a portable charging station so that it can be easily moved with an anti-theft feature to prevent any theft or mischief with the charging station. The green energy charging station offers a wide variety of features including:

- Power generation Solar Energy
- 5V DC USB charging ports for Mobile phones
- 230V AC socket for all Laptop charging
- Inbuilt Inverter and charge controlling circuitry
- Select the type of device and charging duration to activate port for charging
- Automatic Charge Cutoff on Charging Completion
- Anti-Theft Feature – Alert Buzzer Alarm in case of Station Robbery/Damage Attempt
- Automatic Sun tracker solar panel

The system makes use of a battery to store the energy generated by the power generators. This battery supply is now connected through the inverter for usage. The system provides 2 types of outputs. 4 USB outputs for 4 x 5V DC mobile charging ports and 1 x 230V AC port with current limitation for charging laptops only.

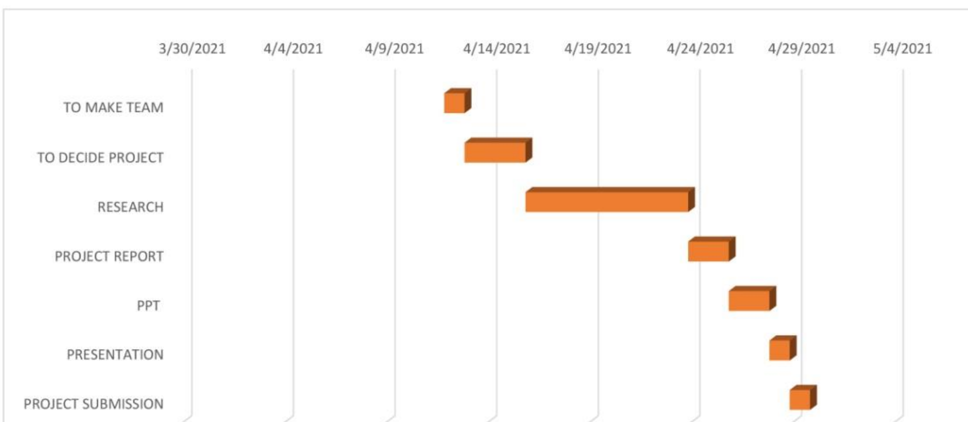
The system is fitted with 4 wheels for ease of movement making it very portable. It can easily be used near bus stops, garden, historical monuments, zoo, college campus, corporate parks, footpaths, open parking and more. The system is further fitted with anti theft feature to prevent robbers from robbing or miscreants from damaging it and also fitted with automatic sun tracker solar panel to generate the maximum energy it could provide by automatically rotating toward sun's directions . It instantly senses if it is being moved by unauthorized person or is trying to be damaged using impact sensors.

In such cases the system instantly sounds a loud alarm sound to alert nearby people authorities without stopping. Thus the system provides efficient mobile and laptop charging outdoors with a whole lot of features.

Gantt chart

GANTT CHART FOR SOLAR POWER MOBILE AND LAPTOP CHARGER

SR. NO.	TASK	START DATE	END DATE	DURATION
1	TO MAKE TEAM	4/12/2021	4/13/2021	1
2	TO DECIDE PROJECT	4/13/2021	4/16/2021	3
3	RESEARCH	4/16/2021	4/24/2021	8
4	PROJECT REPORT	4/24/2021	4/26/2021	2
5	PPT	4/26/2021	4/28/2021	2
6	PRESENTATION	4/28/2021	4/29/2021	1
7	PROJECT SUBMISSION	4/29/2021	4/30/2021	1



INDEX

CONTENTS **PAGE NO.**

INTRODUCTION

In the past couple of years, advancements in technology put devices in our pockets that we could not have even dreamed of years ago. However, these devices often have drawbacks. One of the most pressing issues with phones, tablets, and laptop, PCs is power. We have not yet been able to develop efficient energy sources to match the efficiency of our devices. In fact, many laptops can drain a standard battery from a full charge in a matter of a couple hours. We are proposing a solution that will provide power to charge devices using power generated from solar energy when you are not at home and enjoying time with your family at parks, museums and shopping malls etc. And in case suddenly the official work strikes and there is lack of power in our devices then this is the most useful station at this type of situations and this type of situation are very usual.

NEED STATEMENT:

People usually run out of phone and laptop charging when they are travelling and at public places like parks, museum, malls, restaurants etc. At such times there is literally no way of charging your phone & laptop in such environment.

PROBLEM STATEMENT:

We hereby solve this problem with a green energy system using a power generator solar energy charging system for mobile phones and laptop.

2) LITERATURE REVIEW

2.1) PURPOSE:

Solar energy is a technology that has been increasing in popularity as it is further developed. Improvements in the panels and coatings as well as solar tracking have made solar energy more efficient. In this project, we will be utilizing solar energy to provide the supply for an outdoor charging station for devices. This project will further efforts to reduce our dependence on fossil fuels as a means to generate electricity. If our system can charge several devices without having external power from the national grid, it will be able to reduce some of the demand for energy resulting in less fuel used to generate the electricity over time. Solar energy continues to be researched and improved as an alternative source of energy. This project will aid global research efforts in helping protect our environment. Many are becoming aware of the effects of using oil and natural gas as a form of energy. These methods do create plenty of energy, however they are non-renewable and can cause harm to the Earth's atmosphere and ecosystems.

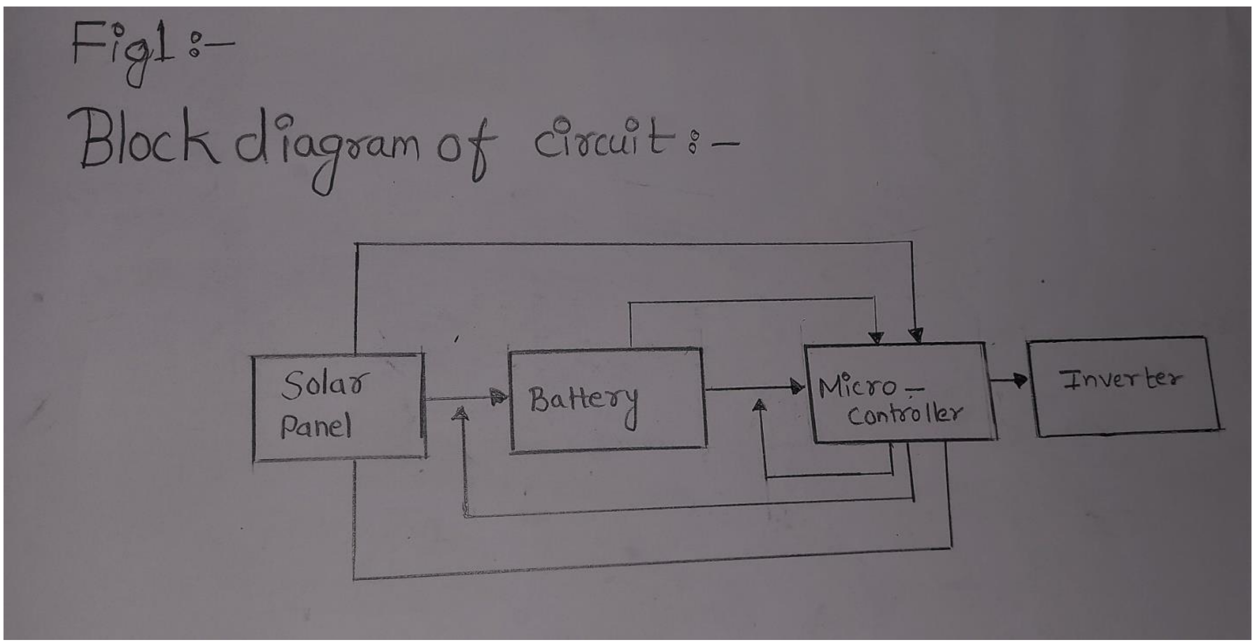
The objective of this project is to investigate the problem of providing an outdoor power source for charging devices in an environmentally friendly way to help reduce the demand of power from other methods. Our objective for this project will not only be to generate power from solar energy, but to also conduct research to improve the efficiency of solar panels. We will have to not only create this device but to optimize the project for sale as to create a cost-effective, economically friendly outdoor charging station for most electrical devices. Research on other existing solar stations and patents was conducted by the team. From research of the existing designs, we found several points that can be improved. Three key areas that we saw were cost, efficiency, and complexity. Many will say the goal of electrical engineering is to design a cost-effective, efficient, and easy to use device or product. The only downfall is the panels are stationary and smaller, which may result in less energy produced. So we attached automated sun tracker device. These charging stations were very ingenious as we claim to be able to charge multiple handheld devices at a time and are portable. Many People use their cell phones or tablets a lot. However, cost of production of these charging stations was also costly as well as aimed solely for use with hand-held and portable device.

2.2) <u>**Design Constraints:**</u>

This project will be required to take energy from the sun generated by solar panels and convert the energy to AC voltage, which will be able to power most electronic devices. The project must have a system to keep track of voltage levels and be able to protect the system from being overused or overcharged. It must also be able to keep track of its solar efficiency and be able to maintain the maximum amount of solar energy possible with the given environmental and weather conditions. The biggest constraint to this project will be to maximize the solar efficiency to provide the most power to the system that can be generated by the solar panels. Weather and solar patterns must be accounted for when making all of the calculations for the efficiency and output of the solar panels. Climate factors, such as clouds, moisture, haze, dust, and smog will have a degrading effect on the output power of the station's panel array. Obtaining the greatest amount of sunlight throughout the day needs to be for optimum output. Different enhancements to the solar panels such as adding solar concentrators or a solar tracking device may be necessary adding to the cost. Research on these devices is currently being done so that we may incorporate them into the final product while we test the smaller components of the charging station. Another constraint is to ensure the efficiency of the battery system which will be used to store the energy from the solar panels. Measures must be taken to prevent damaging the batteries by over charging them. Deep cycle batteries will be used since they are able to handle charging and discharging very well. Ensuring proper safety regulations are met is another constraint dependent upon the electrical design, but more importantly is the overall structure of the station. Building and safety codes must be researched and implemented. A stand -alone structure poses significantly less risk regarding fire safety when proper precautions are taken during site preparation. We have not yet conducted research into the structure of the system, but upon the successful testing of the electronics, this will be a major focus of the final product. Not only do we want a successful product, but we want to make sure it is ethical and is safe for all.

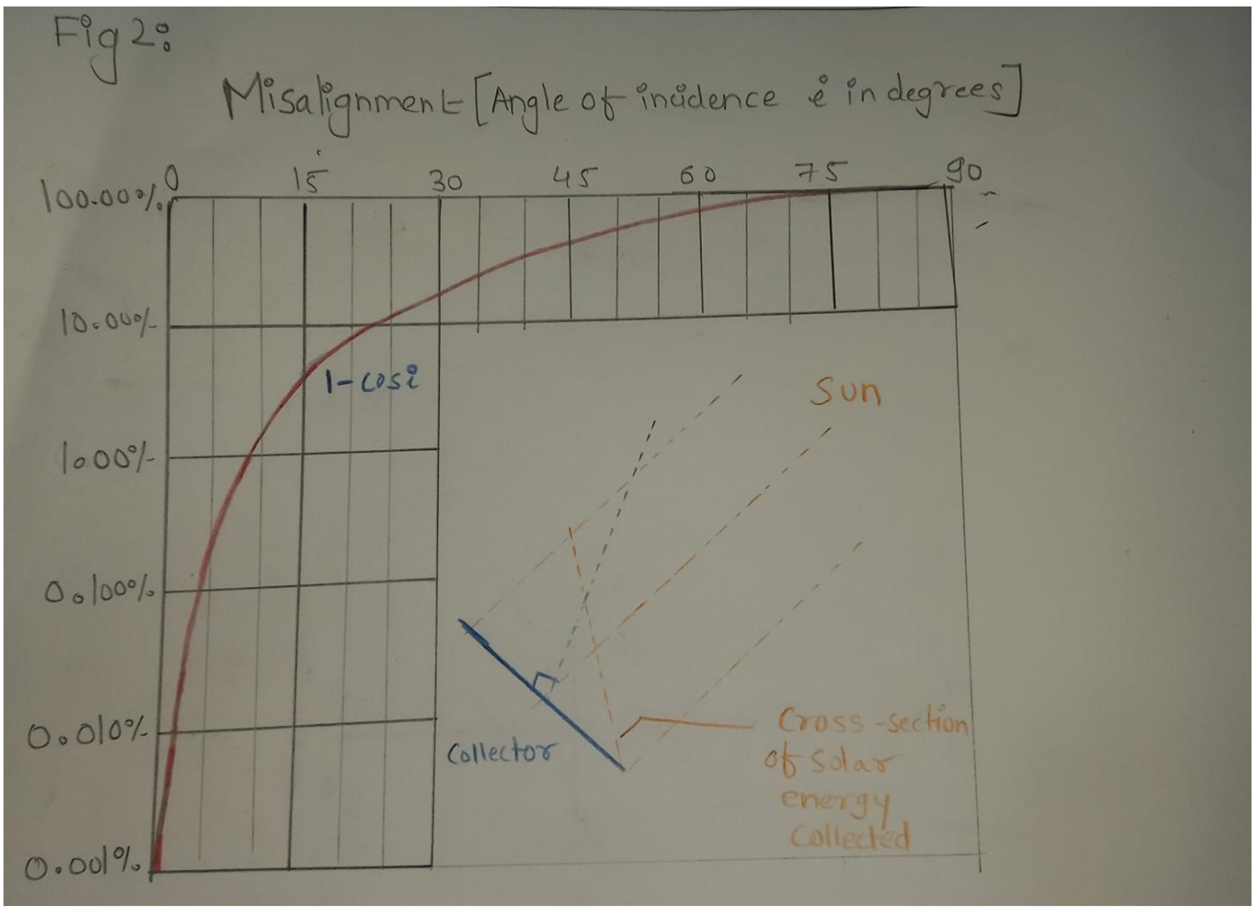
2.3) <u>**System Design:**</u>

From research on similar models and our knowledge from previous courses, we determined that this project would need to follow the example of any electrical system. It must have a source, a function, and an output. For our source, we will be using solar panels optimized with solar tracking. The system will contain the microcontroller to act as a charge controller and an inverter to convert from 12 Volt DC stored in the batteries to 110 Volt AC as the output. Figure 1 below shows a block diagram of the system. The solar tracker would be affixed to the solar panel and would relay information to the microcontroller. The microcontroller would then send a signal to the servo motor to adjust the angle of the solar panels. The microcontroller would also read the battery level and determine if the battery needs to be stopped from charging or stopped from being utilized, if it has been fully used.



(A) <u>Solar Panel Technology:</u>

A solar panel is a group of electrically connected photovoltaic cells made of semiconductor materials, such as silicon, which is currently most common. When sunlight hits the cells, its energy is absorbed into the semiconductor material. This energy pushes other electrons loose that are then forced to flow in a certain direction by an electric field created in within the cells. This is the current for which is then drawn off of the panels by metal contacts on the top and bottom of the panels. The amount of current a PV panel produces has a direct correlation with the intensity of light the panel is absorbing[5].Figure 2 below shows a chart demonstrating the percentage lost based on the angle of incidence with the sun. Optimal conditions for a solar panel are at 0º, or directly perpendicular to the sun's rays. Whereas the least optimal at 90º, which is parallel with the sun's rays.



Multiple panels are electricallyconnectedin either series to achieve a desired output voltage and/or in parallelto provide a desired current capability. A single solar cell produces only about 1/2 (.5) of a volt. Atypical 12 volt panel about 25 inches by 54 inches will contain 36 cells wired in series to produce about 17 volts peak output. If the solar panel can be configured for 24 volt output, there will be 72 cells,so the two 12 volt groups of 36 each can be wired in series, usually with a jumper, allowing the solar panel to output 24volts. When under load, charging batteries for example, this voltage drops to 12 to 14 volts for a 12 volt configuration, resulting in 75 to 100 watts for a panel of this size.

The advantage of using a higher voltage output at the solar panel is that smaller wire sizes can be used to transfer the electric power from the solar panel array to the charge controller & batteries. This project was initially calculated utilizing two 12 volt, 100 Watts solar panels. Our decision to utilize two solar panels is being used based on the size of the panels and on the overall cost of the project. The size of each panel is 47 x 1.4 x 21.3 inches. The panels will be connected in parallel to acquire a maximum current. Equations 1, 2, & 3 provide our input current.

Solar panel 1: $I_1 = 100W/12V = 8.33A$ (1)

Solar panel 2: $I_2 = 100W/12V = 8.33A$ (2)

Total current for solar panels in parallel:

$$I = I_1 + I_2 = 8.33 + 8.33 = 16.66A \quad (3)$$

(B) <u>Solar Tracker :</u>

One solution to the aforementioned constraints is to integrate a solar tracker circuit into the design, which will allow constant alignment towards the Sun and can potentially increase the production of electricity by the solar panels by up to 30%. An increase in output allows for a reduction in panel array size, which helps with overall cost and size of the team’s design.

Solar trackers provide a precise tracking of the sun by tilting the solar panels towards the sunlight as it moves throughout the day and as well, the year. When sunlight strikes a solar panel, it comes in at an angle, called the angle of incidence. The normal angle to the cell is perpendicular to a PV cell’s face and this normal is necessary to achieve the panel’s proper alignment towards the sun. A tracking system can keep the angle of incidence within a certain margin and would be able to maximize the power generated.

A tracker produces more power over a longer time than a stationary array with the same number of modules. This additional output or “gain” can be quantified as a percentage of the output of the stationary array. These percentages will be tabulated after output measurements are taken once the tracker system is built and tested.

Trackers are categorized as either a single axis or dual axis system. Single axis accounts for horizontal east to west daily movement while dual axis integrates a vertical north and south seasonal tilt into the system. Single axis can provide a 15% to 30% increase of efficiency and solar power generated over a stationary panel while dual axis provides an additional 6%. The cost comparison for implementing a dual axis tilt tracker vs. single axis shows that dual axis will not be cost effective for this project because of the complexity and maintenance of the mechanics. Less components, in this case, will mean greater reliability and less down-time for maintenance issues.

The tracking system will consist of 2 front panel LDRs (light dependent resistors), separated by a fixed plate, for tracking throughout the day and one fixed to the back of the solar panel for daily adjustment to its initial position, which is done through a control circuit and bi –directional DC stepper motor attached to a rotating shaft which will orient the panel towards the sun.

The comparison of the intensity of light upon each LDR and the difference between their output voltages will be what determines the orientation of the panel. The LDR’s are made of a high resistance semiconductor material. This material absorbs photons from the light and some of their energy is transferred to the electrons. As the electrons break free, they gain sufficient energy to break free from the semiconductor lattice of the LDR and the overall resistance is lowered. This sensing from higher to lower density of sunlight is the driving force in the circuit design. The LDR’s will be connected to a voltage divider circuit since any change in light density is proportional to the change in voltage across the LDR’s.

One voltage will be higher depending on the higher intensity of light, while the other voltage will be weaker creating a weaker signal. The panel will rotate towards the stronger signal. Power for this design will be taken from the batteries charged by the solar panels, making this a closed loop system.

A microcontroller will convert the analog photocell voltage into digital values and provide output channels for motor rotation. A relay controls the rotation of the motor either to rotate clockwise or counterclockwise.

(C) **Motor :**

A bi –directional stepper motor has been chosen for this application because of their speed and torque yet low power and current consumption [9]. In order to determine the amount of torque needed, we need to take two details into consideration. First, we must calculate the center of gravity point of the panel, then measure the distance from the pivot point, using the mass of the panels at the center of gravity, to give the torque required for normal operation. The second detail is wind loading. There is also a frictional load situation, because many panel manufacturers prefer to design their equipment so the center of gravity is over the axis, such that the only torque needed is frictional and counters wind loading. So we will need to figure out how much force is needed to break frictional forces as well as wind forces when selecting our motor. The microcontroller will be programmed to run the motor to align the panels when there is a specified degree of misalignment towards the normal, which will save in power consumption.

(D) Charge Controller:

The Charge Controller is a switching device that can connect and disconnect the charger to the battery and it will take control over charging and to stop charging at the correct voltage. This will protect the batteries from damage from over-charging and regulate the power going from the solar panels to the batteries. A microcontroller in the circuit will read the level of the batteries and then cut off the source of the solar panels to the batteries, once it sees the battery is at the fully charged state. If this was not in place, the solar panels would keep feeding the batteries energy and the batteries would become overheated and damage the internal components.

The advantage to have a microcontroller in the system is that it will open a variety of features to add to the system. For example the microcontroller will be programmed to control and display the battery level of the system. It will ensure that there is enough power to charge devices by displaying the gauge on a 7 segment LCD. If there is insufficient power, it will prevent the system from being used until sufficient power has been reached. The microcontroller will also be used in aiding solar efficiency by controlling the solar tracker, as mentioned previously.

(E) Battery:

The team has selected two deep cycle batteries to power the system. Each battery is a 12V and has a 35 Amp-hour capacity.

Batteries for PV systembatteries generally have to discharge a smaller current for a longer period of time, such as at night or during a power outage, while being charged during the day. Deep cycle batteries aredesigned for the purpose of discharging to a lower capacity, between 50% and 80%, than a conventional battery.The most commonly used deep-cycle batteries are lead-acid batteries and nickel-cadmium batteries, both of which have pros and cons. The deep-cycle batteries are able to be easily charged and discharged many times and can last for several yearsdue to the thicker plate materials utilized.

Batteries in PV systems can also be very dangerous because of the energy they store and the acidic electrolytes they contain, so you'll need a well-ventilated, nonmetallic enclosure for them.

The total power for the batteries can be calculated as follows:

Battery 1: $P_1 = 12V \times 35A = 420Wh$ (4)

Battery 2: $P_2 = 12V \times 35A = 420Wh$ (5)

Total Power for Batteries:

$P = P_1 + P_2 = 420 + 420 = 840Wh$ (6)

Total Amp-hour for Batteries:

$35 + 35 = 70Ah$ (7)

Charge time in full sun, zero load:

Total Batteries Ah / Total Solar Panel A $= \mathbf{70/25} = 2.8 hours$ (8)

Discharge time in full sun, full load:

Total Batteries Wh / (Inverter W – Solar Panel W) $= \mathbf{840/(600-300)} = 4.2 hours$ (9)

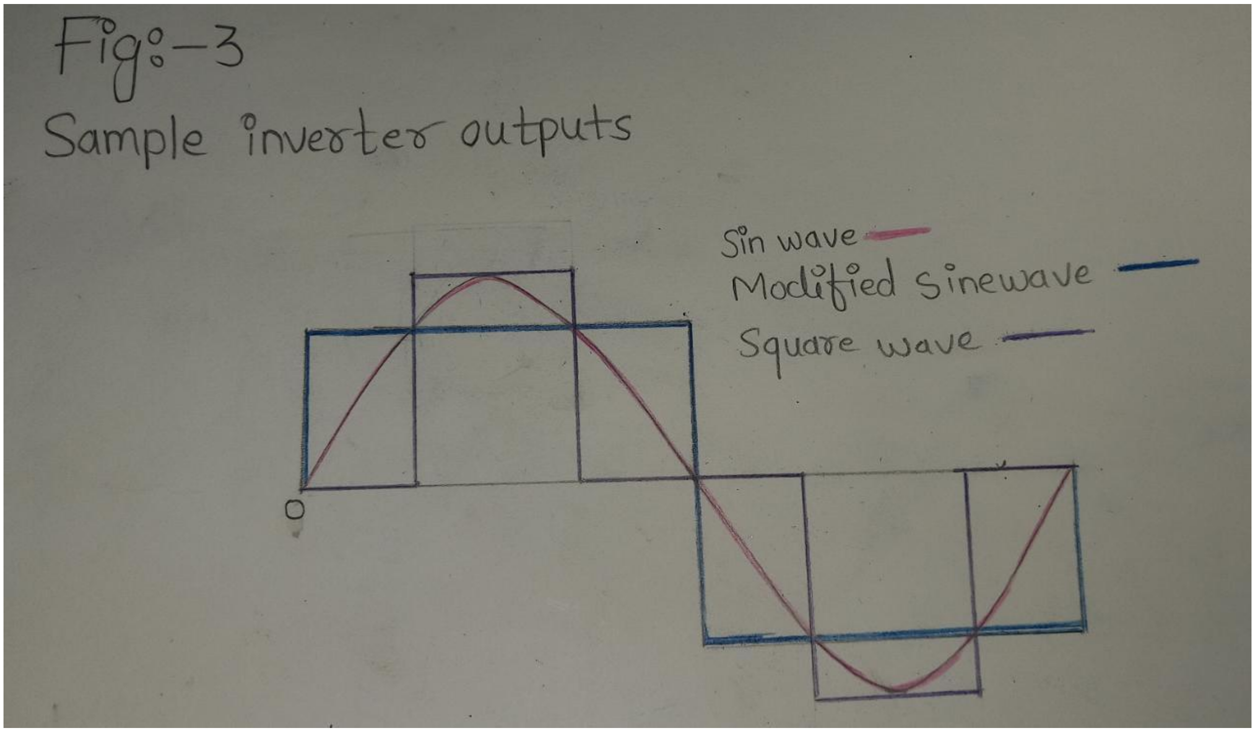
Discharge time in no sun, full load:

Total Batteries Wh / Inverter W $= \mathbf{840/600} = 1.4 hours$ (10)

(F) <u>Inverter:</u>

An inverter is an integral component in the solar station' design. It will convert the DC voltage generated from the solar panels to an AC voltage. The team will be testing two designs by using special ICs or several pairs of transistors and diodes.

An inverter can produce square wave, modified sine wave, pulsed sine wave, or sine wave depending on circuit design, demonstrated in Figure 2. The two dominant commercialized waveform types of inverters as of 2007 are modified sine wave and sine wave. There are two basic designs for producing household plug-in voltage from a lower-voltage DC source, the first of which uses a switching boost converter to produce a higher-voltage DC and then converts to AC. The second method converts DC to AC at battery level and uses a line-frequency transformer to create the output voltage.



Inverter circuits can have a power loss of 10%or even up to 20%. The team anticipates for a larger power inverted based on our maximum expected output and that the largest output will be required when two laptops are plugged into the system. Generally, laptops can draw anywhere between 65-90 Watts. For two laptops rated at 90 Watts, the inverter will be required to generate 180 Watts. From our calculation, we determined a 200 Watt inverter will suffice. At a 90% efficiency (10% power loss), the inverter will generate the 180 Watts we need.

3) PCC AND PUGH CHART

PUGH CHART

FOR SOLAR POWER MOBILE AND LAPTOP CHARGING SYSTEM

CRITERIA	DESIGNS			
	1	2	3	4
	REGULAR CHARGER	OUR MODEL	MODEL- 3	MODEL-4
ANTI-THEFT	D	+++	0	0
COST	A	-	--	-
SUN TRACKER	T	+++	0	0
PERFORMANCE	U	++	+	+
PORTABILITY	M	+++	---	+++
WEIGHT FOR SHIFTING		0	--	-
DURABILITY		+++	++	++
AUTOMATIC CHARGING COTOFF AFTER CHARGING		+++	0	0
EASE OF USE		+	+	+
SPACE OCCUPIED		+	--	+
+		19	4	7
-		1	9	2
0		1	3	3
TOTAL		18	-5	5
RANK		1	3	2

PAIRWISE COMPARISON CHART (PCC)

FOR SOLAR POWER MOBILE AND LAPTOP CHARGING SYSTEM

	EASE OF USE	COST	DURABLE	PORTABLE	ANTI-THEFT	SUN TRACKER	AUTOMATIC CHARGING CUTOFF	AESTHETIC	TOTAL
EASE OF USE	#	1	0	0	0	0	0	1	2
COST	0	#	0	0	0	0	0	1	1
DURABLE	1	1	#	1	0	0	1	1	5
PORTABLE	1	1	0	#	0	0	0	0	2
ANTI-THEFT	1	1	1	1	#	0	1	1	6
SUN TRACKER	1	1	1	1	1	#	1	1	7
AUTOMATIC CHARGING CUTOFF	1	1	0	1	0	0	#	1	4
AESTHETIC	0	0	0	1	0	0	0	#	1

RANK OF OBJECTIVES

1. SUN TRACKER
2. ANTI-THEFT
3. DURABLE
4. ATOMATIC CHARGING CUTOFF AFTER CHARGING
5. PORTABLE
6. EASE OF USE
7. AESTHETIC
8. COST

4) **WORKING PRINCIPLE**

(4.1) Solar power to Electrical power:

How do solar panels work? Step by step overview

Solar panels work by absorbing sunlight with photovoltaic cells, generating direct current (DC) energy and then converting it to usable alternating current (AC) energy with the help of inverter technology. AC energy then flows through the home's electrical panel and is distributed accordingly. Here are the main steps for how solar panels work for your home:

1. Photovoltaic cells absorb the sun's energy and convert it to DC electricity
2. The solar inverter converts DC electricity from your solar modules to AC electricity, which is used by most home appliances
3. Electricity flows through your home, powering electronic devices
4. Excess electricity produced by solar panels is fed to the electric grid

How do solar panels generate electricity?

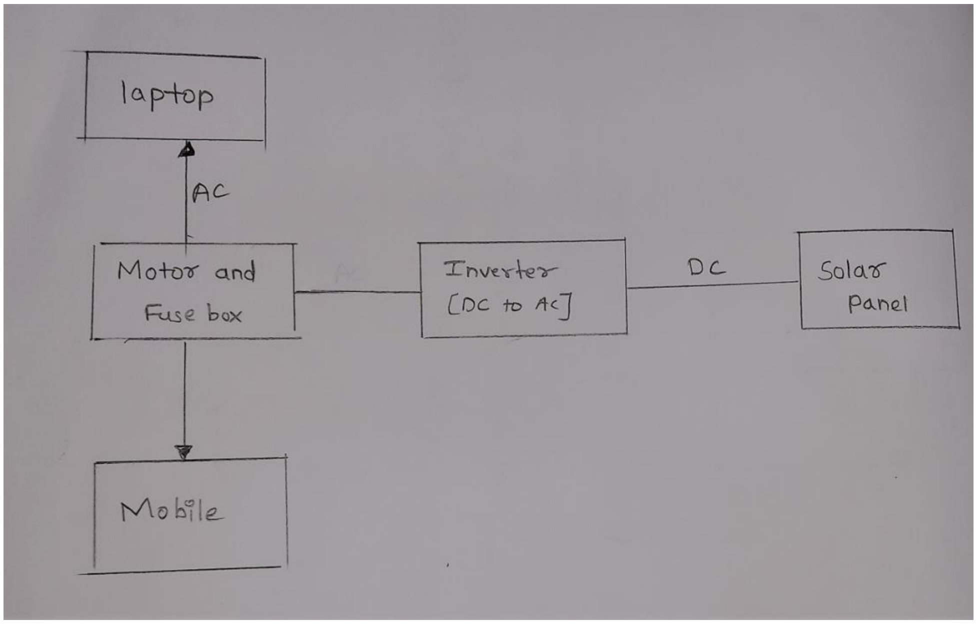
A standard solar panel (also known as a solar module) consists of a layer of silicon cells, a metal frame, a glass casing, and various wiring to allow current to flow from the silicon cells. Silicon is a nonmetal with conductive properties that allow it to absorb and convert sunlight into electricity. When light interacts with a silicon cell, it causes electrons to be set into motion, which initiates a flow of electric current. This is known as the "photovoltaic effect," and it describes the general functionality of solar panel technology.

The photovoltaic effect

The science of generating electricity with solar panels all comes down to the **photovoltaic effect**. First discovered in 1839 by Edmond Becquerel, the photovoltaic effect can be generally thought of as a characteristic of certain materials (known as **semiconductors**) that allows them to generate an electric current when exposed to sunlight.

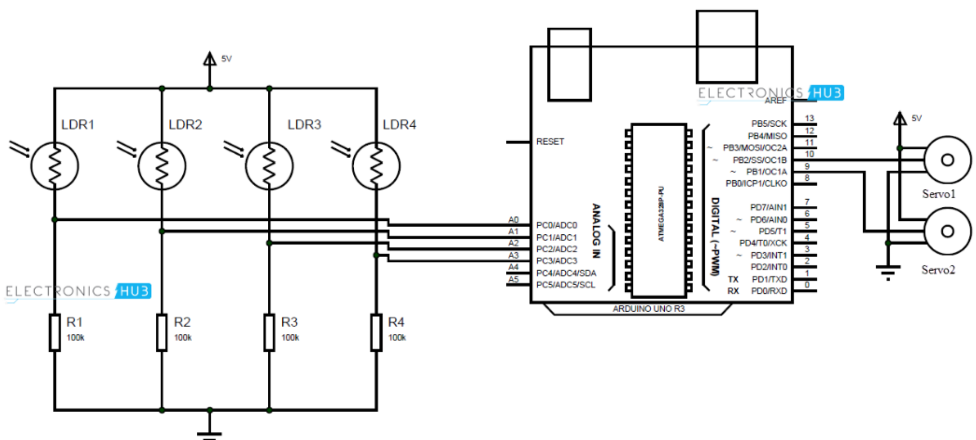
The photovoltaic process works through the following simplified steps:

1. The silicon photovoltaic solar cell absorbs solar radiation
2. When the sun's rays interact with the silicon cell, electrons begin to move, creating a flow of electric current
3. Wires capture and feed this direct current (DC) electricity to a solar inverter to be converted to alternating current (AC) electricity



(4.2) Automatic Solar Tracker :

Circuit Diagram



Working

LDRs are used as the main light sensors. Two servo motors are fixed to the structure that holds the solar panel. The program for Arduino is uploaded to the microcontroller. The working of the project is as follows.

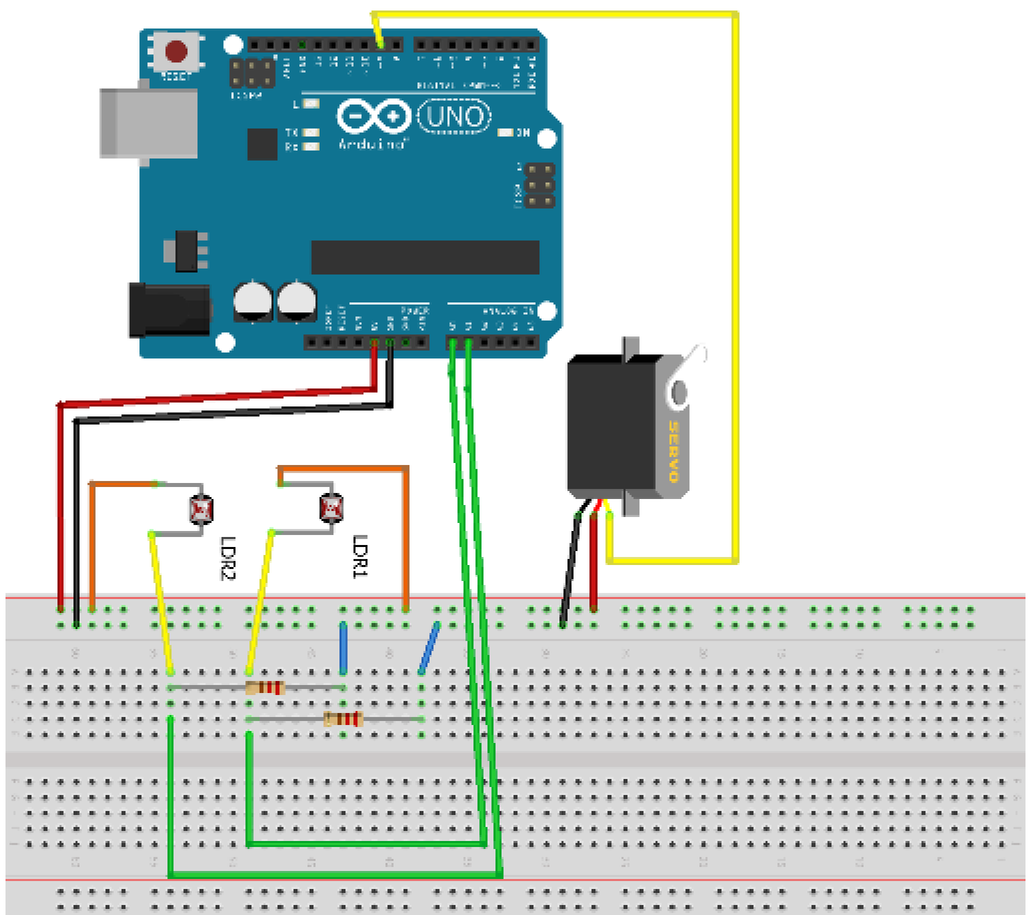
LDRs sense the amount of sunlight falling on them. Four LDRs are divided into top, bottom, left and right.

For east – west tracking, the analog values from two top LDRs and two bottom LDRs are compared and if the top set of LDRs receive more light, the vertical servo will move in that direction.

If the bottom LDRs receive more light, the servo moves in that direction.

For angular deflection of the solar panel, the analog values from two left LDRs and two right LDRs are compared. If the left set of LDRs receive more light than the right set, the horizontal servo will move in that direction.

If the right set of LDRs receive more light, the servo moves in that direction.

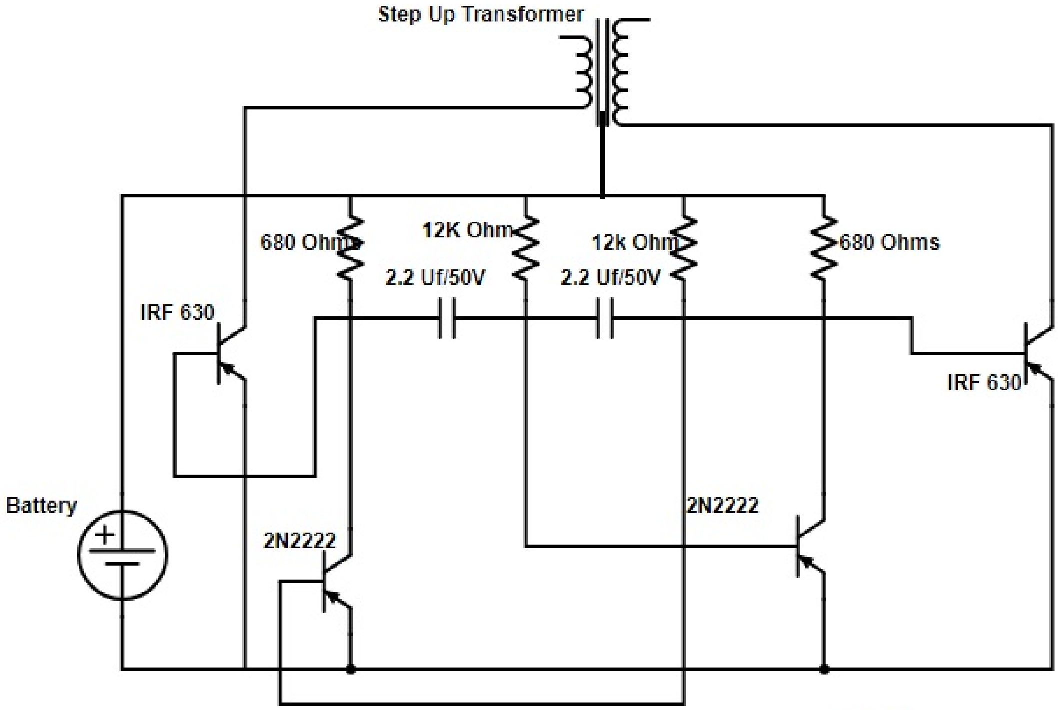


<u>CODE FOR TINKERCAD:</u>

```
#include <Servo.h>
Servo servo;   // Create a servo object to control the servo
```

```
int eLDRPin = A0; // Assign pins to the LDR's
int wLDRPin = A1;
int eastLDR = 0; //Create variables to store to LDR readings
int westLDR = 0;
int difference = 0; //Create a variable to compare the two LDR's
int error = 10;  // Variable for is there is a noticable difference between
the tow LDR's
int servoSet = 130; //Variable for position of servo - will be different for
each device
void setup() {
 servo.attach(9);   //attaches the servo object to PWM pin 9
 Serial.begin(9600);
}
void loop() {
 eastLDR = analogRead(eLDRPin); //Read the LDR values
 westLDR = analogRead(wLDRPin);
 if (eastLDR < 400 && westLDR < 400) {  //Check to see if there is low light
on both LDR's
   while (servoSet <=140 && >=15) {     // if so, send panels back to east
for the sunrise
     servoSet ++;
     servo.write(servoSet);
     delay(100);
   }
 }
 difference = eastLDR - westLDR ; //Check the difference
 if (difference > 10) {          //Send the panel towards the LDR with a
higher reading
   if (servoSet <= 140) {
     servoSet ++;
     servo.write(servoSet);
   }
 } else if (difference < -10) {
   if (servoSet >= 15) {
     servoSet --;
     servo.write(servoSet);
   }
 }
 Serial.print(eastLDR);      //Serial monitor can be useful for
debugging/setting up
 Serial.print("   -   ");    //Use it to see if your LDR's are noticeably
different when
 Serial.print(westLDR);      //They have equal light shining on them, if so,
correct with the error value
 Serial.print("   -   ");
 Serial.print(difference);
 Serial.print("   -   ");
 Serial.print(servoSet);     //Fine tune the servo settings, to maximise
swing available
 Serial.print("   -   ");
 Serial.println(".");
 delay(100);}
```

(4.3) DC to AC inverter:



The DC to AC Converter Circuit using Transistors is shown above. The basic function of an inverter circuit is to generate oscillations with the specified DC & apply these to the transformer's primary winding by increasing the current. This main voltage is then step up to a high voltage based on the number of twists within main and minor coils.

The circuit diagram of 12V DC-to-220V AC converter can be built with using simple transistors, and this circuit can be employed for powering lamps up to 35Watts although they can be designed for driving more influential loads by utilizing more MOSFETs.

The inverter executed in this circuit can be a square wave, & it works with devices like which do not need pure AC sine wave.

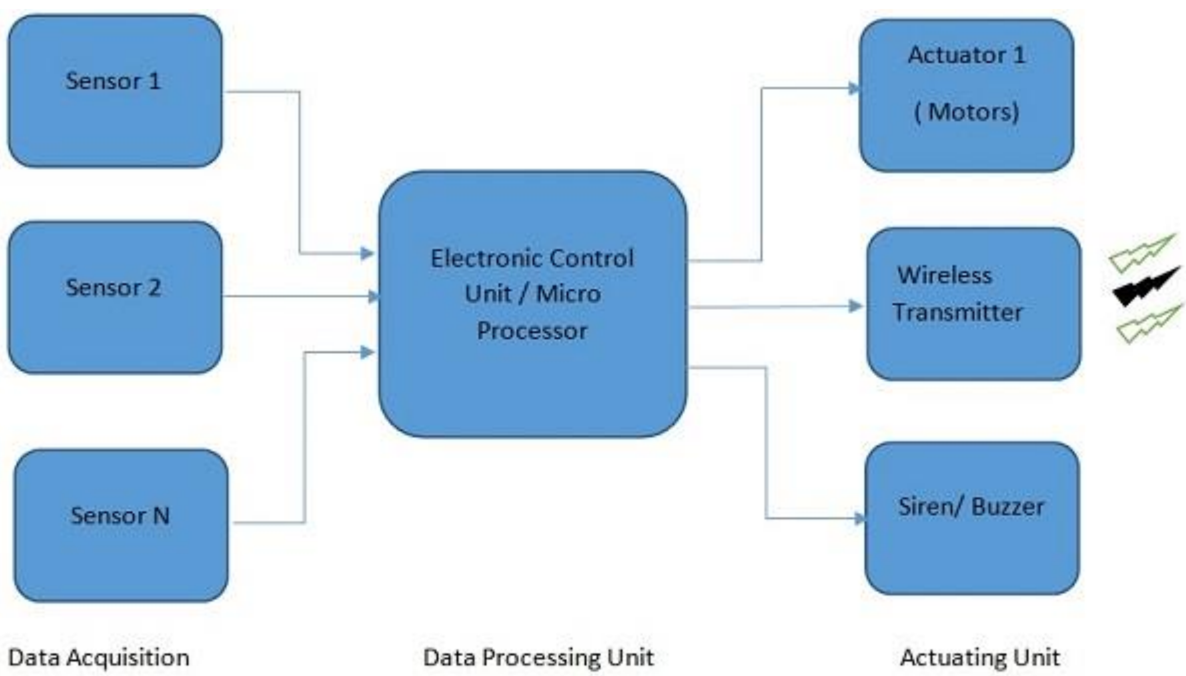
The required components to build DC to AC circuit mainly includes 12v Battery, 2N2222 Transistors, two MOSFET IRF 630, 2.2uf capacitors-2, two Resistors-12k, two 680 ohm resistors, and center tapped transformer (step up).

(4.4) Anti-theft system:

Anti-Theft Systems are devices which prevent unauthorized access to charging station or other mobile systems. The evolution of Anti-theft systems has ranged from simple key to RFID Tags, Bio metric Identification, and Palm Vein Recognition, etc.

The anti-theft systems are combination of smart sensors coupled with intelligent algorithms which can wisely distinguish between actual theft and fake ones. Upon detection of theft they immediately raise an alarm or notify the user with necessary details like geographical locations, time stamp , state of the device while theft occurred i.e.: If the anti-theft system is considered in automobiles , crucial data like whether the charging station was attempted to damage or there was an attempt to rob .

As the value of the goods such as, Cell Phones, Laptops, etc. are increasing day by day. So is the risk of insecurity associated with them. In this article we shall look into functioning of Anti-Theft Systems and various components of the system.



Consider any general anti-theft system, it consists of above mentioned blocks at the minimum level.

Data Acquisition :

Here different environmental conditions surrounding the device to be protected is measured. Various data like identification, motion sensed, pressure, temperature are captured through smart sensors and are buffered into processing unit. The identification part plays a major role in data acquisition.

As the system permits full access to the device with proper authenticated users. Various types of authentication are possible. Finger Print identification which involves scanning of palm pattern and storing in form of binary image to latest one of palm recognition which is the most advanced secure technique though not in wide application yet, involves identification of each individual based on vein patterns in human hand.

Data Processing Unit :

Once the sensor data is received it is the task of the controller or the processor to validate the data and decide whether the theft is genuine and to raise an alert or not. The controller consists of signal processing unit which is required to filter out incoming noise from sensors and other ambient resources. Processors like **ARM7** or dedicated **ECUs** in case of vehicles can be used.

Actuating Unit :

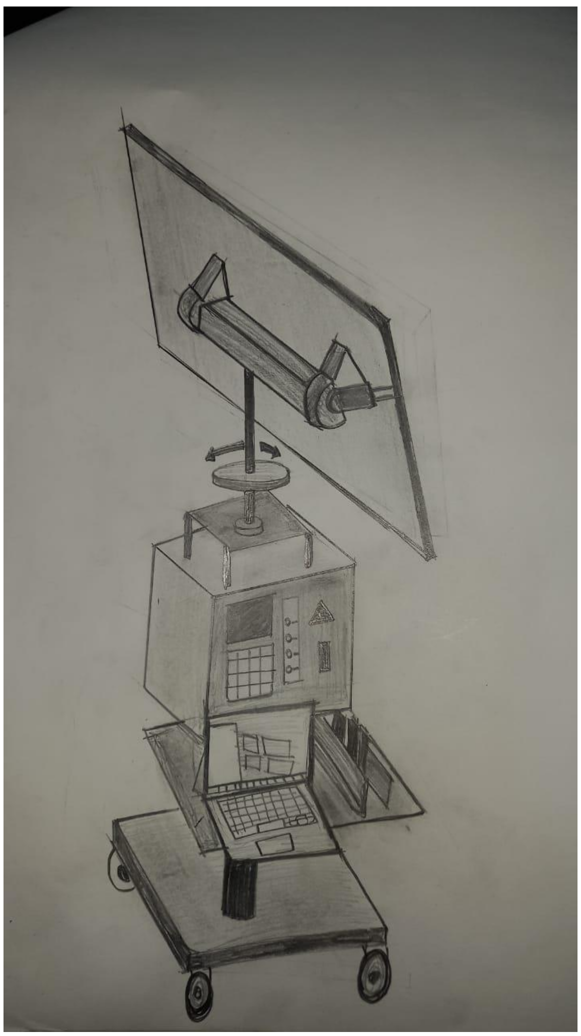
Once the embedded intelligence confirm the theft, it is now time to alert the owner or surrounding public .As a part of this step, based on the situation an alarm can be triggered off along with vibration/electric shock .In case of vehicles if the thief tries to drive away the vehicle, doors and power windows can be locked. A more sophisticated system would send the location details to nearest police station through an SMS and also notify the owner through form of a mobile application, etc.

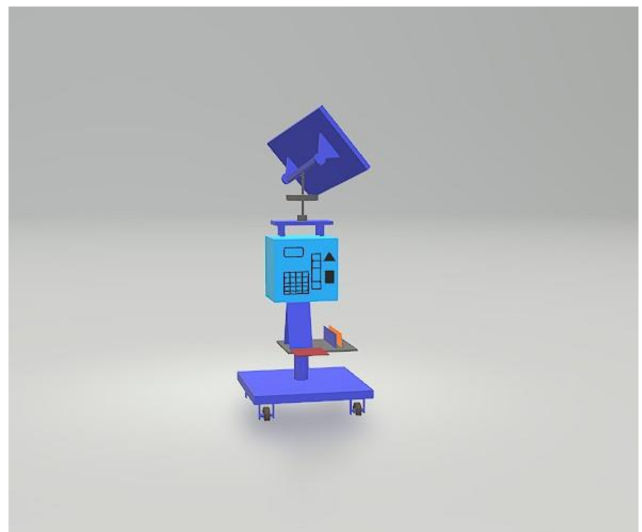
APPLICATIONS:

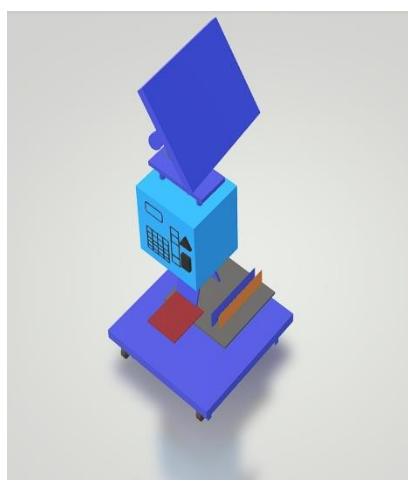
In everyday life we observe that whenever we visit parks ,malls ,museums etc we usually face the problem of charging our phones we hereby take initiative and solve this problem by designing a unique charging station with some unique features as mentioned above In our project report. so, we can use this charging station at public places such as public parks open parking lots, open rooftop of seating area in museum, exhibition, malls, pilgrimage etc. So basically, we can use this charging station at any public place where we can find sunlight

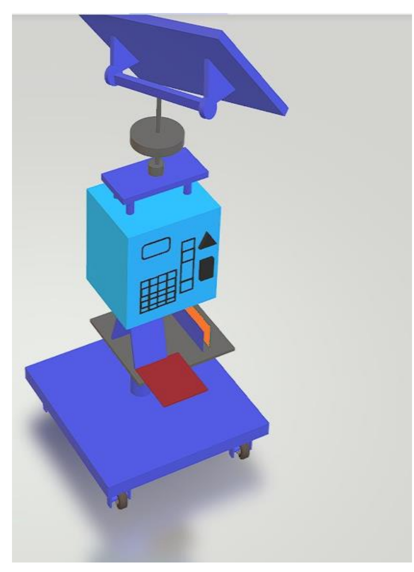
MODEL:

Initial Model:

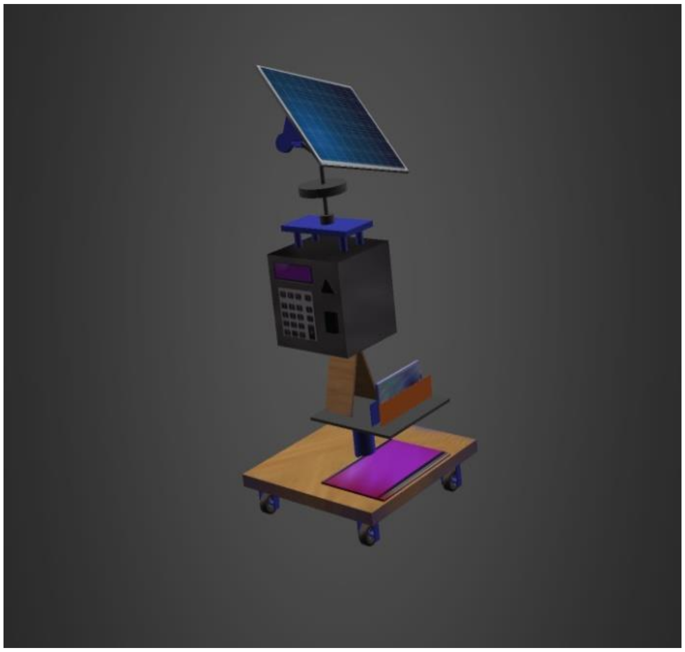








Final Model:



Conclusion:

Each and every project is never complete as new things are learned further modifications can be done.

Thus we have tried to make a solar power charging station for both laptop’s and mobile phone which will the efficiency of human being in everyday life. This is just the beginning, we can add different enhancements to make project more efficient.

We have done this project for eliminating dependence on fossil fuels and limited resources while designing an environmentally friendly, self-sustainable, outdoor energy source is the goal for the solar powered charging station

References:

[1]PORTIS JR.,M.(2013).UNITED STATES OF AMERICA PATENT NO.8,497,656.

[2]PULIAS,B.(2013,JULY 2).NEWS.RETRIEVED FROM GEORGE MASON UNIVERSITY:HTTP://NEWSDESK.GMU.EDU/2013/07/SOLAR-POWERED-STATION-LETS-YOU-RECHARGE-OUTDOORS

[3]CALAHAN,R.(2012).UTSTUDENTS PUMP UP AT CAMPUS SOLAR STATION.ALCADE.

[4]GOAL ZERO.(2013).RETRIEVED FROM STREET CHARGE:HTTP://STREET-CHARGE.COM/

[5]TOOTHMAN,J.,&ALDOUS,S.(2000,APRIL).HOW SOLAR CELLS WORK.RETRIEVED FROM HOW STUFF WORKS:HTTP://SCIENCE.HOWSTUFFWORKS.COM/ENVIRONMENTAL/ENERGY/SOLAR-CELL.HTML

[6]KIETH,J.(2008).MAXIMIZING SOLAR PANEL EFFICIENCY AND OUTPUT POWER.RETRIEVED FROM ELECTRO SCHEMATICS:HTTP://WWW.ELECTROSCHEMATICS.COM/8280/MAXIMIZING-SOLAR-PANEL-EFFICIENCY-AND-OUTPUT-POWER

[7]WIKIMEDIA FOUNDATION,INC.(2014,FEBRUARY 7).SOLAR TRACKER.RETRIEVED FROM HTTP://EN.WIKIPEDIA.ORG/WIKI/SOLAR_TRACKER#DUAL_AXISTRACKERS

[8]ZUBAIR,S.(2011,AUGUST 10).DESIGN AND CONSTRUCTION OF A MICROCONTROLLER-BASED SOLAR TRACKER.RETRIEVED FROM ACADEMIA:HTTP://WWW.ACADEMIA.EDU/970786/DESIGN_AND_CONSTRUC

TION_OF_A_MICROCONTROLLER_BASED_SINGLE_AXIS_SOLAR_TRACKER..

_INNOVATIONS_IN_SCIENCE_AND_ENGINEERING_.1_4_41-47

[9]MOTION DRIVETRONICS .(N.D.).GEARED MOTORS FOR SOLAR

TRACKING.RETRIEVED FROM MECH -

TEX:HTTP://WWW.MECHTEX.COM/PDF/NEW%20PRODUCTS/GEAREDMOTOR

SFORSOLARTRACKING.PD