A PROJECT REPORT

HelioTrack
A SUN TRACKING SOLAR PANEL

Submitted by :

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Submitted in partial fulfillment for the requirements of the degree of

BACHELOR OF SCIENCE
IN
COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
BANGLADESH UNIVERSITY OF BUSINESS AND TECHNOLOGY (BUBT)
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ABSTRACT

The phrase the sun is the source of all energy implies that solar energy is an essential element for the Earth. Sun-powered vitality is fast becoming a substantial approach for renewable energy source assets. The sun is a plentiful source of vitality, and this sun powered vitality may be effectively dealt with by employing sunlight-based photovoltaic cells and photovoltaic impact to convert sun powered energy into electrical vitality. The solar tracking system maximizes the power generation of the solar system by following the sun through panels throughout the day, optimizing the angle at which panels receive solar radiation. Compared to stable solar panels, a solar tracking system using solar panel linear actuators or gear motors can increase the efficiency of solar panels. The transformation efficiency of any sun-based application increases when the modules are consistently adjusted to the optimal edge as the sun crosses the sky. A dual-axis tracker allows panels to move on two axes, both north-south and east-west parallel. This paper presents the design and implementation of a single-axis solar panel based on the Arduino UNO microcontroller.

DECLARATION

I hereby declare that the project entitled "HelioTrack a Sun Tracking Solar Panel" submitted for the degree of Bachelor of Science Engineering in Computer Science and Engineering in the faculty of Computer Science and Engineering of Bangladesh University of Business and Technology (BUBT), is our original work and that it contains no material which has been accepted for the award to the candidates of any other degree or diploma, except where due reference is made in the next of the project to the best of our knowledge, it contains no materials previously published or written by any other person except where due reference is made in this project.

_____

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CERTIFICATION

This project "HelioTrack a Sun Tracking Solar Panel" report submitted by Md. Nawrose is a student of the Department of Computer Science and Engineering, Bangladesh University of Business and Technology (BUBT), under the supervision of Ms. Fahima Khanam, Assistant Professor, Department of Computer Science and Engineering has been accepted as satisfactory for the partial requirements for the degree of Bachelor of Science Engineering in Computer Science and Engineering.

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Ms. Fahima Khanam
Assistant Professor & Project Supervisor
Department of CSE (BUBT)

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Md. Saifur Rahman
Assistant Professor & Chairman
Department of CSE (BUBT)

DEDICATION

Dedicated to our parents and our honorable teacher for all their love and inspiration**.**

APPROVAL

This Report "HelioTrack a Sun Tracking Solar Panel" Submitted by Md. Nawrose. ID NO: 21221503248, Department of Computer Science and Engineering (CSE), Bangladesh University of Business and Technology (BUBT) under the supervision of Ms. Fahima Khanam, Assistant Professor, Department of Computer Science and Engineering has been accepted as satisfactory for the partial fulfillment of the requirement for the degree of Bachelor of Science (B.Sc. Eng.) in Computer Science and Engineering and approved as to its style and contents.

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CHAPTER 01

INTRODUCTION

Energy is the primary and most universal measure of all kinds of work by human beings and nature. Primarily, it is the gift of nature to mankind in various forms. The consumption of energy is directly proportional to the progress of mankind. With an ever-growing population, improvement in the living standard of humanity and industrialization of developing countries, the global demand for energy increases day by day. The primary source of energy is a fossil fuel, however, the finiteness of fossil fuel resources and large-scale environmental degradation caused by their widespread use, particularly global warming, urban air pollution, and acid rain, strongly suggests that harnessing of non-conventional, renewal and environmental friendly As the sources of conventional energy deplete day by day, resorting to alternative sources of energy like solar and wind energy has become the need of the hour. The purpose of this report is to demonstrate our design for a sun-tracking solar panel and show the tests performed on the solar panel device with their results. The motivation behind our project is to create a sun-tracking solar panel system for residential use, as well as to prove that the sun-tracking solar panel can be a more effective solution than the traditional stationary panel. This can be proved by measuring the power generated by a traditional stationary panel and our sun tracking system, where the sun tracking system follows the angle of the sun, and comparing the results. So, the problem is to design a system that allows a standard solar panel to track the sun, thereby increasing its efficiency.

In sun-tracking solar panel systems, the solar charge controller plays an important role as the system’s overall success depends mainly on it. It is considered an indispensable link between the solar panel, battery and load.

CHAPTER 02

PRINCIPLE BEHIND OF HelioTrack

The HelioTrack a Sun tracking solar panel consists of two LDRs, a solar panel, a servo motor and an ATmega328 Microcontroller. Two light-dependent resistors are arranged on the edges of the solar panel. Light-dependent resistors produce low resistance when light falls on them. The servo motor connected to the panel rotates the panel in the direction of the Sun. The panel is arranged in such a way that light on two LDRs is compared and the panel is rotated towards LDR which have high intensity. low resistance compared to the other. The Servo motor rotates the panel at a certain angle.

When the intensity of the light falling on the right LDR is higher, the panel slowly moves towards the right and if the intensity on the left LDR is higher, the panel slowly moves towards the left. In the noon time, the Sun is ahead and intensity of light on both the panels is same. In such cases, the panel is constant and there is no rotation.

CHAPTER 03

OBJECTIVE OF HELIOTRACK A SUN-TRACKING SOLAR PANEL

The objective of the Sun Tracking Device project is to develop an intelligent solar energy system that maximizes energy generation efficiency through precise sun tracking. The project aims to:

- **Optimise Solar Energy Capture:** Design a system that dynamically adjusts solar panel angles to align with the sun, ensuring maximum exposure to sunlight throughout the day.
- **Increase Energy Yield:** Enhance energy output by enabling the solar panels to actively follow the sun's movement, capturing sunlight at optimal angles.
- **Utilise Arduino Technology:** Implement Arduino microcontrollers, sensors, and actuators to create an automated and responsive sun-tracking mechanism.
- **Improve Sustainability:** Contribute to sustainable energy solutions by utilizing renewable solar power effectively, reducing reliance on non-renewable energy sources.
- **Promote Eco-Friendly Practices:** Encourage the adoption of clean energy technologies, reduce carbon footprint, and promote environmental conservation.
- **Facilitate Research and Education:** Serve as an educational tool and a basis for further research, fostering an understanding of solar energy tracking systems and their real-world applications.

CHAPTER 04

LIST OF EQUIPMENT

The proposed system consists of a Solar panel, light-dependent resistors, and a Servo Motor.

Solar Tracker Circuit Components List :

1-Arduino UNO
2- Servo Motor
3- Solar Panel
4- 10k Resistance
5- Header Pins
6- Some Jumper Wires
7- Battery Holder
8- 3.7 volt Two Cell
9- LEDs
10- 1N4007 Diode
11- 0.1 Microfarad Capacitor
12- Voltage Regulator IC LM317
13- 1k Preset
14- 220 OHM Resistance
15- 1k Resistance
16- Power Jeck
17- Switch

Smart Street Light Circuit Components List-

1- Transistor BC547
2- LDR
3- 1k Resistance
4- Battery Cap
5- White LEDs
6- Ten Core Wire - 1 Meter

Solar Panel

A solar panel is placed on a piece of cardboard (just for demonstration) and the bottom of the cardboard is connected to the Servo motor. A solar panel consists of photovoltaic cells arranged in an order. The photovoltaic cell is nothing but a solar cell. A solar cell is made up of semiconductor material silicon. When a light ray from the Sun is incident on the solar cell, some amount of energy is absorbed by this material. The absorbed energy is enough for the electrons to jump from one orbit to another inside the atom. Cells have one or more electric fields that direct the electrons which create current. By placing metal contact energy can be obtained from these cells.

LDR

Light Dependent Resistors or LDRs are resistors whose resistance values depend on the intensity of the light. As the intensity of light falling on the LDR increases, the resistance value decreases. In the dark, LDR will have maximum resistance. LDR will output an analog value which should be converted to digital. This can be done using analog to digital converter.

The two LDRs are connected to ADC pins 27 and 28 in a voltage divider fashion with the help of individual 10KΩ Resistors. ADC conversion is done using successive approximation methods.

Servo Motor

A Servo motor is used to rotate the panel. To drive the servo motor, a PWM Signal must be provided to its control pin and hence Pin 17 (which has PWM) is connected to the control pin of the servo motor.

By connecting a battery to the solar panel, you can store the energy generated by the solar cells and this energy can be used when required. There are separate charge controller circuits dedicated to efficiently controlling the charge acquired from solar panels and charging the batteries.

CHAPTER 05

PROJECT APPLICATION

We hope this letter finds you well. We are writing to request permission for a project involving the installation and operation of a Sun Tracking Device system. The purpose of this project is to harness solar energy efficiently by utilizing sun-tracking technology. Here are some details regarding the project :

- **What We Want to Do:** We want to set up solar panels that move to follow the sun. This helps them catch more sunlight and make more energy.

- **Why It's Good:** These special solar panels can make more energy than regular ones because they always face the sun. This means we can use more clean energy and help the environment by not making as much pollution.

- **How It Works:** We'll use solar panels with a small monitor inside that tells them where the sun is. This monitor moves the panels so they're always facing the sun.

- **Where We Want to Put It:** We've found a good spot in Roadside. Where there's lots of sunlight all day long. This will make sure our solar panels work their best.

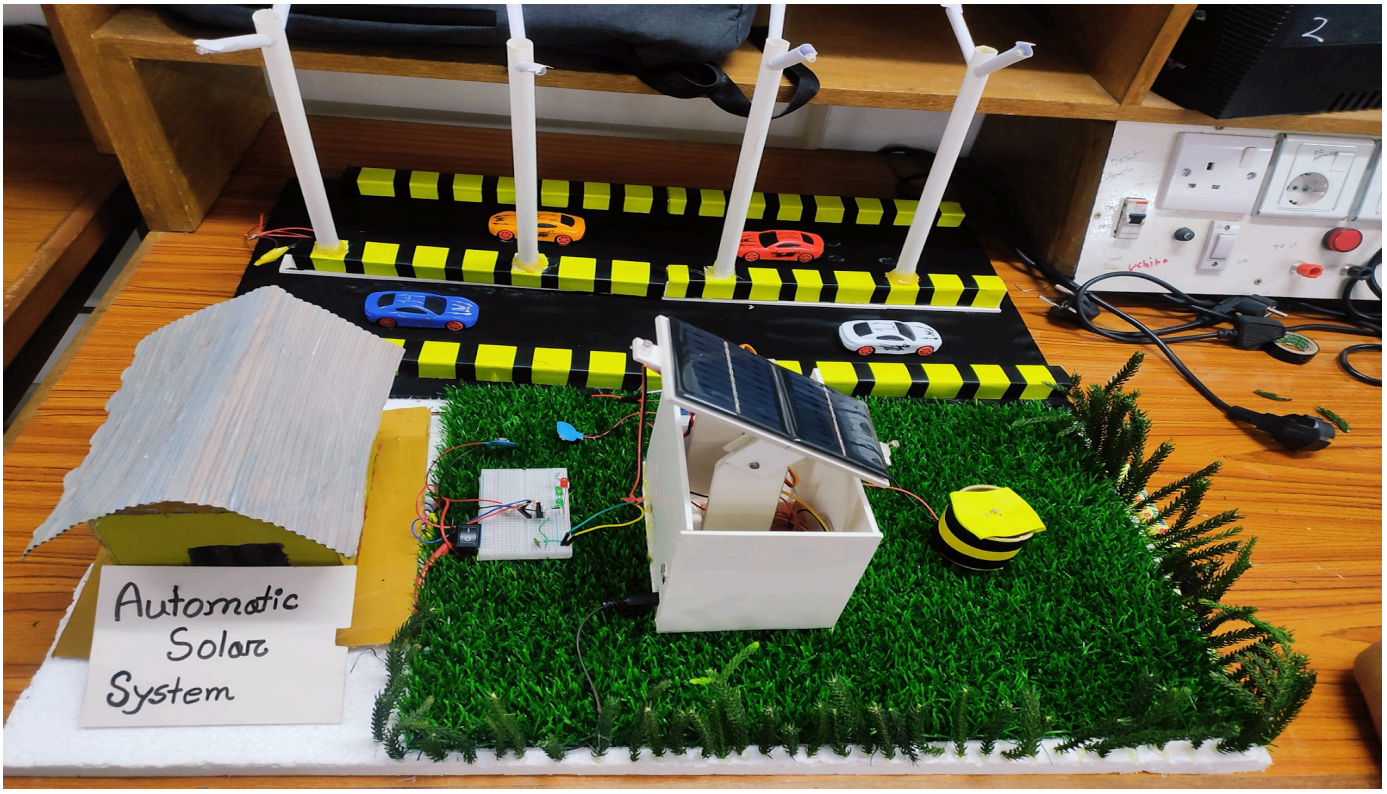
- **Staying Safe:** We'll be careful when we're setting everything up and when the panels are running to make sure nobody gets hurt.

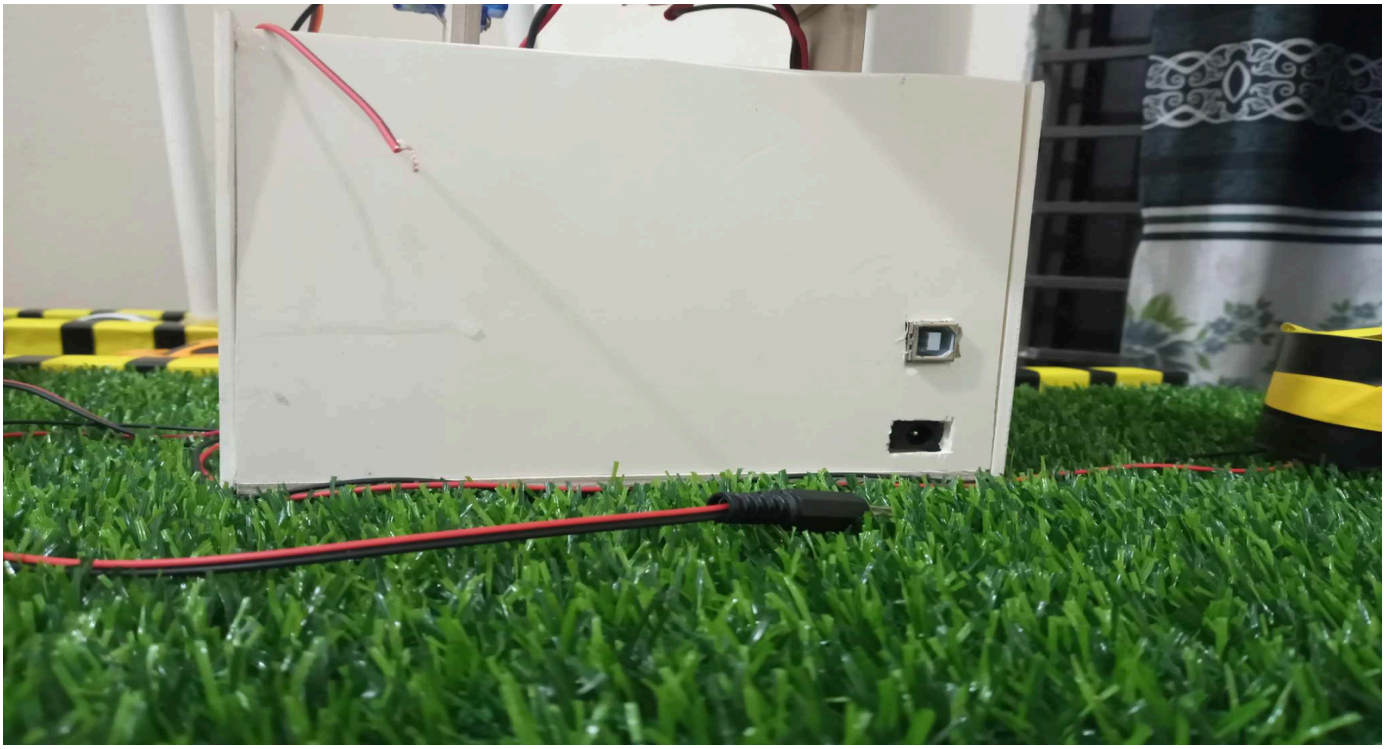
- **How Long It Will Take:** We think the project will take about 36 months. During this time, we'll keep an eye on the panels to make sure they're working well.

We understand the importance of obtaining the necessary permissions and approvals for undertaking such projects. Therefore, we kindly request your support and approval for the Sun Tracking Device project. We assure you that we will adhere to all relevant regulations and guidelines throughout the duration of the project.

CHAPTER 06

DESIGN OF THE PROJECT





CHAPTER 07

ARDUINO CODE

```
#include <Servo.h>
Servo myservo;

#define LDR_1 A0
#define LDR_2 A1

int pos = 90;
int Resistance = 20;

void setup(){
myservo.attach(4);
pinMode(LDR_1, INPUT);
pinMode(LDR_2, INPUT);

myservo.write(pos);

delay(1000);
}

void loop(){
int value_1 = analogRead(LDR_1);
int value_2 = analogRead(LDR_2);

if((abs(value_1 - value_2) <= Resistance) || (abs(value_2 - value_1) <= Resistance)) {

}else {
if(value_1 > value_2)
{
pos = pos+1;
}
if(value_1 < value_2)
{
pos = pos-1;
}
}

if(pos > 180) {pos = 180;}
if(pos < 0) {pos = 0;}
myservo.write(pos);
delay(50);

}
```