

E.C.L.I.P.S.E

Efficient Controlled Locus for Intelligent Photovoltaic Sun-Tracking Equipment

Giorgi Koberidze

Demetre Sazonov

Mariam Razmadze

e-mail: giorgi.koberidze417@ens.tsu.edu.ge

Electrical and Electronics Engineering Department Faculty of Exact and Natural Sciences

Ivane Javakhishvili Tbilisi State University

3 Ilia Tchavtchavadze Avenue, 0179 Tbilisi Georgia

The pre-bachelor's project aims to design and develop a two-axis solar tracker system. Its main goal is to improve the efficiency of solar energy use. A system will be designed to automatically adjust the solar panel along two axes horizontal and vertical ensuring it stays in the optimal position relative to the sun throughout the day. This approach is intended to reduce the energy losses that are typical for fixed solar panels.

The sun tracking mechanism will be built by integrating sensors, an ESP32-based control system, and mechanical components. The system determines the sun's position and, based on the data received, sends commands to the motors to move the panel, ensuring that it maintains the optimal angle for maximum energy capture. In addition, the MPPT algorithm will make sure the solar panel delivers maximum power under different environmental conditions. The project covers both the solar tracking and MPPT algorithms, as well as the circuit, mechanical design, and other essential aspects of the system.

The goal of this work is to demonstrate the technology of a dual-axis solar tracker and highlight its potential benefits.