SUN TRACKING SOLAR PANEL

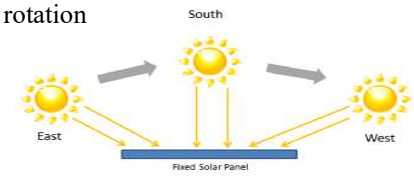
Taha Athar Shafique
BEng (Hons) Electronic Engineering
Q14470721

SOLENT UNIVERSITY SOUTHAMPTON

Tutor: Dr. Janet Bonar

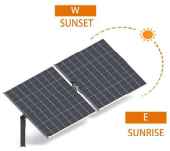
Project Introduction

Our era challenge is not only generating greener sustainable solar energy to electrical energy but it is also a challenge of converting maximum solar energy to electrical energy via photovoltaic solar cells and achieve best possible yields of solar energy and reducing £/watt of delivered solar electricity. In order to be successful in this challenge the sun trackers solar panel system is required, the devices or system designed itself also need to be energy efficient. Solar cells are normally fixed on rooftop or fixed on ground. As a result, solar cells unable to receive maximum light as position of sun changing varying with time due to earth's rotation



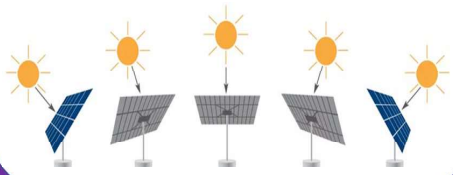
Project Aim

The aim of this project is to design a system that maximises amount of sun energy absorption of Photovoltaic (PV) cell through a electro mechanical process controlled by electronic circuit to increase efficiency of Solar panel and to enhance performance of PV cell by building capacity of sun tracking and following of sun, thus achieving high yields of solar energy by low maintenance, low cost sustainable system.



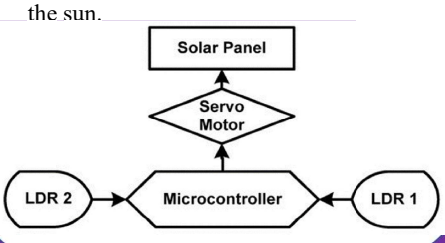
Project Objectives

- Study of existing solar technologies and systems.
- Research on pros and cons existing solar panels and tracking technologies
- Research on suitable axial selection for single axis tracking
- Research and develop circuits using components which are capable of finding / measuring / calculating best direction for a solar panel using sun beam.
- Research, designing and development of circuit which suits the purpose by tracking sun autonomously.



How it works?

The solar tracker is a device used to increase the solar energy harnessed by solar photovoltaic cells by reducing the angle of incidence between the incoming light beam from the sun. This is achieved by adjusting the position of the PV panels in accordance to the direction of the sun's movements from east to west. A successful solar tracker ensures that the PV panels face the sun directly at most times by being able to follow the movement of the sun. This technique is identified as "single axis" due to only one level of freedom and flexibility of rotation of the PV panel, from one side to another whilst facing the sun.



Hypothesis

Does Solar panels in current form with whatever material or technology they are using are working on maximum efficiency in fixed position? How it could be improved and what is required to get the best yield of solar energy from conversion of static panel to sun tracking solar panel? Zhenya Lieu believes that with solar tracking technology, the annual solar irradiation intensity of regions with average solar resources can be improved from 1200 kWh/m2 to 1500 kWh/m2

Recommendations / Future work

A modelling and optimization method from a new point of view is proposed. More factors like further modelling and optimization can be taken into consideration in future, this may include sensitivity ranges of controlling system which can determine when the solar tracker / system may operate to generate more power or stay still for energy conservation. The project provides references for solar tracking system ranging from designing, modelling and optimization method, which can be modified and applied in other mechanical and electronic systems.

In order to get the best yields from solar energy particularly in high latitudes we need a solar tracking system. The solar tracking system needs to be energy efficient so that the energy gain may not be lost in energy consumption by the solar tracking system. Servo motor is found more efficient for the purpose of single axis sun tracker system, Arduino with right coding is found to be most suitable for single axis sun tracker. This study concludes that it is highly important to track the sun at a high degree of accuracy to improve solar irradiation absorption and also improve yields of energy generated from the solar panels. It also provides references for solar tracking system designing, modelling and optimization methods, which can be further modified and applied in other mechanical and electronic systems.