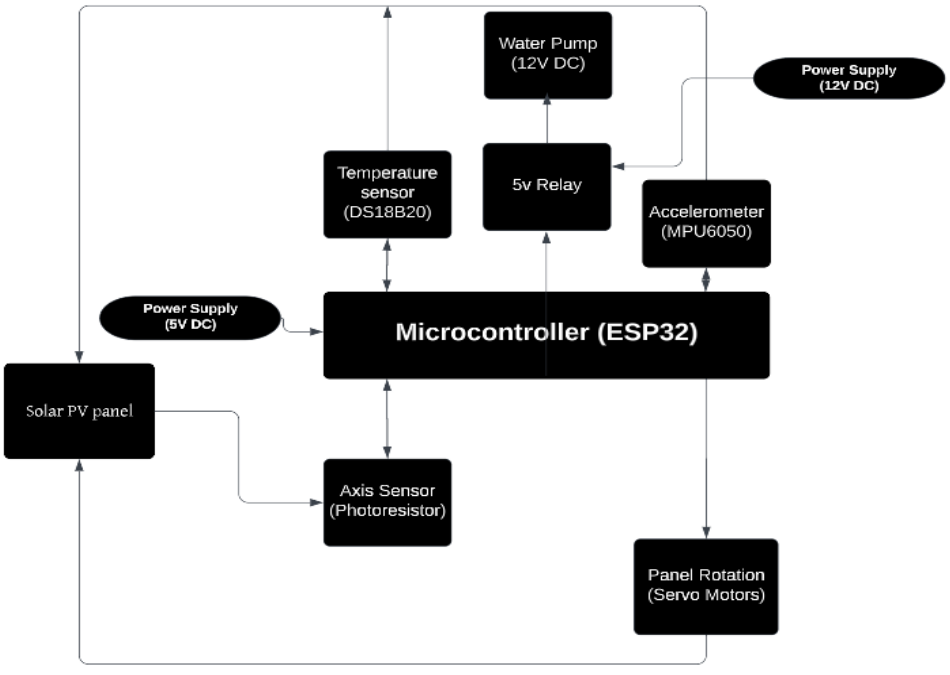
SYNOPSIS

1.	**Title of the Project**	IMPROVING THE EFFICIENCY OF A SOLAR PV PANEL'S POWER GENERATION BY USING A DUAL-AXIS TRACKER WITH A COOLING SYSTEM Project Reference No.: 46S_BE_0515
2.	**College and Department**	Sahyadri College of Engineering & Management, Mangalore-575007 (Electronics and Communication Engineering)
3.	**Name of the Students and Guide**	Akash N V akashnv10@gmail.com Deeksha B N deekshabn26@gmail.com Devang Pradeep devangpradeep01@gmail.com Mrigank Jay mrigank2j@gmail.com Mr. Sachin C N Shetty (Guide) sachinshetty.ec@sahyadri.edu.in
4.	**Keywords**	Dual Axis Solar Tracker, Cooling System, Solar Energy, Efficiency, Energy Output, Renewable Energy.
5.	**Introduction**	As is commonly known, photovoltaic cells are one of the best renewable energy sources currently available. Solar panels capture sunlight, a source of clean, renewable energy, and convert it into electricity, which is then often utilized to power electrical loads. This is pretty significant. Generally speaking, solar panels are made up of several very distinct solar cells, each of which is essentially made up of layers of silicon, phosphorus, which supplies the specific negative charge, and boron, which subtly imparts the positively charged electrons. The photons are absorbed by solar panels, and as a result, a significant amount of electric current is essentially started. The energy produced as a result of photons striking the solar panel's surface enables electrons to be effectively knocked out of their atomic orbits and released into the solar cells' electric field, which then attracts these free electrons into a directional current that is unquestionably quite significant. Using a dual-axis tracker with a cooling system is one technique to increase the effectiveness of a solar PV panel's power generation. Moreover, a cooling system can aid in lowering the solar panel's temperature, which can increase its effectiveness. Cooling down solar panels can increase their power production since too-hot solar panels lose efficiency. This strategy has the potential to dramatically improve solar PV panel efficiency, which might lead to a more dependable and economical source of power.

6.	**Objectives**	• The objective of this project is to get the best possible efficiency at the lowest cost possible. • Efficiency is improved by using a dual-axis system rather than a static system. • It is further improved by using a cooling system to cool down the solar panel when it heats up.
7	**Methodology**	• The microcontroller used in this project is from the ESP32 family of low-cost, system-on-a-chip microcontrollers. • Four LDRs are used to sense the intensity level of the sun's rays. • The movement of the panel is made possible using two servo motors, one of which is used for horizontal movement and another for vertical movement of the solar panel's structure. • To enable the use of DC servo motors, a 12V dc relay is employed. • The DS18B20 Digital Thermometer provides 9 to 12-bit (variable) temperature readings which indicate the temperature on the solar panel. • A water pump is an electromechanical device that raises water pressure so that it can be moved from one location to another i.e., from the water tank to the solar panel.  Fig1: Block Diagram • Dual Axis method is implemented on a solar panel to ensure that the sun's rays are always perpendicular to the solar panel.

- LDRs (Photoresistors) are utilized to compare their intensity levels throughout the initial procedure.

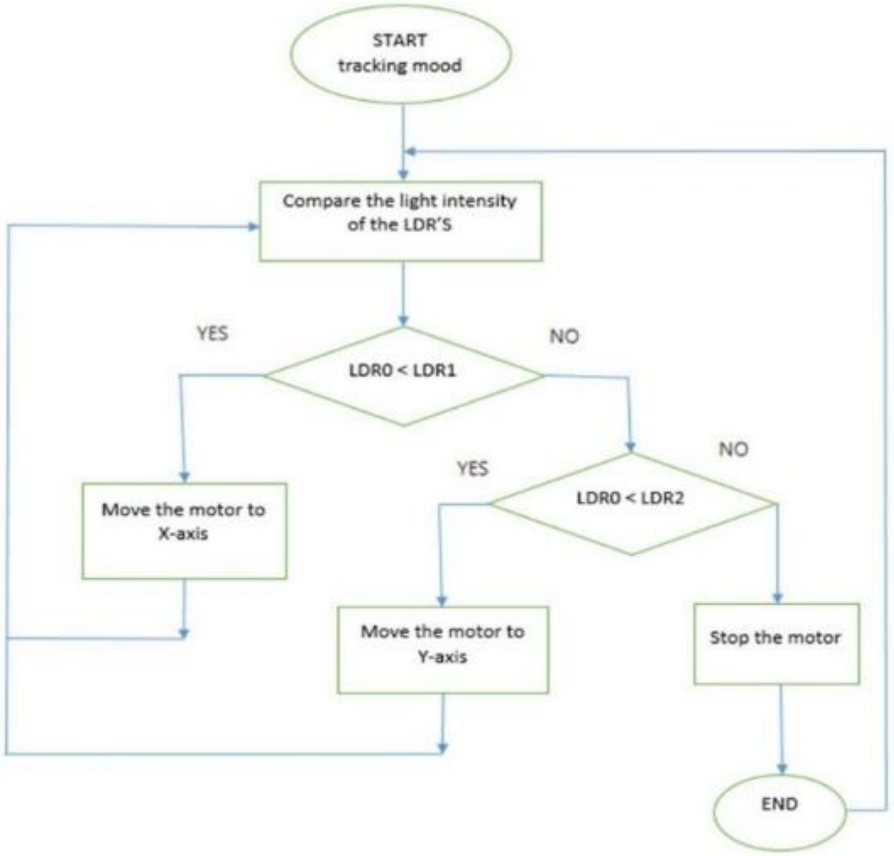


Fig 2: Flow Chart for Solar Tracking System

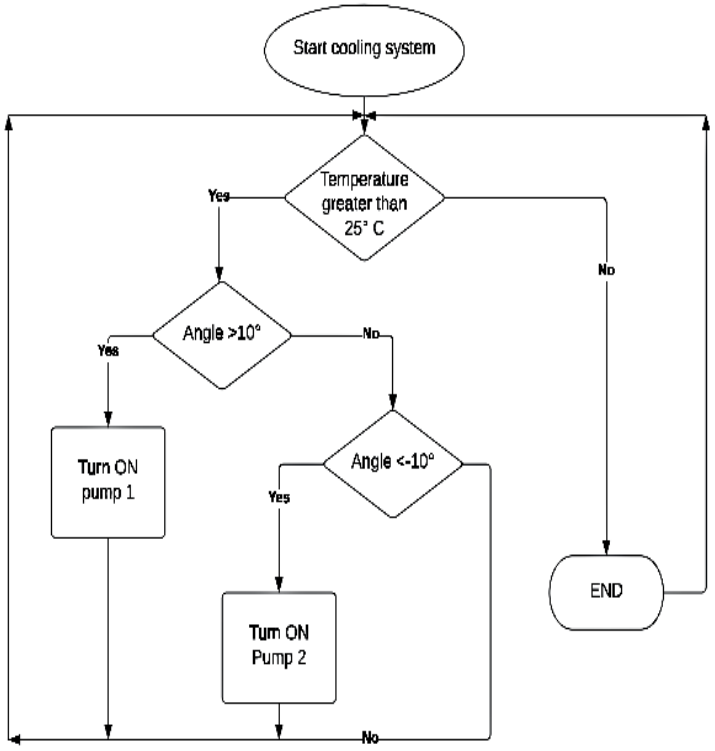


Fig 3: Flow Chart for Solar Cooling System

		• A mechanism that can move along the X and Y axes is designed to rotate the solar panel. • Servo motors are used for the movement, with one rotating along the X-axis and the other along the Y-axis. • The dual-axis PV panel's cooling system is utilized to lower the surface temperature of the panel. • The DS18B20 temperature sensor is used to measure the temperature on the solar panel. • The microcontroller controls the pump, which is connected from the water tank to the solar panel via flexible water pipes to a PVC panel with holes even water flow.
8	**Results and Conclusions**	When compared to a stationary panel without a cooling system, an output efficiency gain obtained around 8% when using a dual-axis tracking system and cooling system. In this study, the performance of various techniques is analyzed and integrated for the best outcome. A solar PV system's energy production may be greatly increased by using a dual-axis tracker to better match the panels with the sun's position throughout the day. By lowering the working temperature of solar panels, cooling systems can boost their effectiveness and lengthen the panels' useful lives. By adjusting the position of the panels and\ lowering thermal losses, a dual-axis tracker and cooling system combination can further boost a solar PV system's efficiency.
9	**Scope for Future Work**	• Incorporating more large-scale solar panels for greater efficiency in solar panel power generation by using a dual-axis solar tracking system with the cooling system. • This scope for conserving energy from being wasted