

# Solar Panel Cleaning Robot with Water Tank

Deore Pranjali. D, Nikam Rituja. S, Borse Vaishnavi. D, Deshmukh Neha. M,  
Students of Electronics and Tele-Communication Engineering Department

Miss. P.V. Narale

Guide Lecturer at Electronics and Tele- Communication Engineering Department of Shri Hiralal Hastimal  
(Jain Brothers, Jalgaon) Polytechnic,  
Chandwad, Dist. - Nashik, Maharashtra

Mr.N.R.Thakre

HoD of Electronics and Tele-Communication Engineering Department at Shri Hiralal Hastimal  
(Jain Brothers, Jalgaon) Polytechnic,  
Chandwad, Dist. - Nashik, Maharashtra

**Abstract:** A solar panel cleaning robot with a water tank is a device designed to automatically clean solar panels. Over time, dust and dirt can reduce the efficiency of solar panels. This robot uses water from its built-in tank to help remove dirt, making the panels work better. The robot moves across the panels, cleaning them without needing chemicals. It's designed to be energy-efficient, eco-friendly, and easy to use, helping solar panel owners save time and money while ensuring their panels perform at their best.

**Keywords:** -Solar Panel Cleaning Robot1, Water Tank2, Efficiency3, Time and Money Saving4, Dirt and Dust5.

## INTRODUCTION:

A Solar Panel cleaning robot with a water tank is an innovative Solution designed to help maintain solar panels by cleaning them efficiently. This robot is equipped with a water tank to spray water onto the panels clean dirt and dust. And then uses brush. The robot operate autonomously, reducing the need for manual cleaning, saving time, and ensuring Solar Panels continue to perform optimally. It's Particularly useful for large solar panel installations where manual cleaning would be labour intensive and difficult.

## Existing System

A solar panel cleaning robot with a water tank is a device designed to clean solar panels automatically. It has a built-in water tank to supply water for cleaning the panels. The robot moves across the surface of the solar panels, spraying water and using brushes or other cleaning methods to remove dust, dirt, or debris that might block sunlight. This helps maintain the solar panels' efficiency without needing humans to clean them manually. The robot is powered by batteries and is designed to be easy to use and maintain.

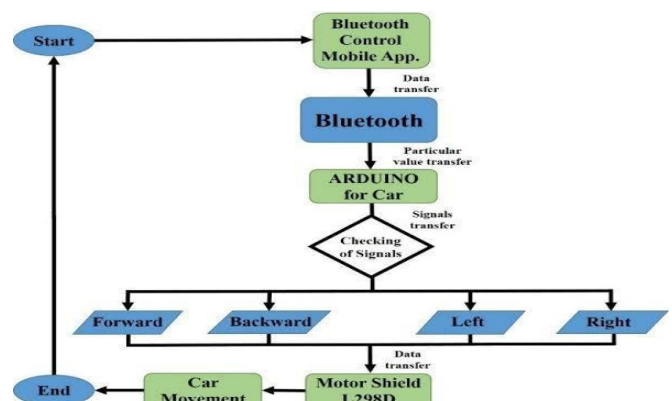
## LITERATURE SURVEY

Performance Analysis of a Solar Panel Cleaning Autonomous Robot (SPCR) with comparative study. Photovoltaic systems are the largest source of renewable energy, and to make the most of this energy, solar panels need to work at their highest efficiency. Dust on solar panels is one of the major obstacles to producing solar energy efficiently. Cleaning the dust is difficult because traditional methods are time-consuming,

uneven, costly, and can even cause damage to the panels or lead to minor injuries. This paper suggests using an autonomous robot to clean the dust and debris from solar panels, which can help improve the system's efficiency. The proposed robot uses sensors, motors, cameras, and other tools to clean based on the type of dust present. It also has a water tank and fan for cleaning. The robot's performance is analyzed in different scenarios and compared to other existing solutions.[1]

Automated Solar Panel Cleaning and Monitoring Robot Solar photovoltaic (PV) technology is becoming increasingly important for generating clean, efficient energy. The Sun's natural radiation holds great potential, making solar energy one of the largest and most reliable energy sources. In today's world, solar energy is considered one of the most promising clean technologies since it produces no carbon emissions. However, to make the most of solar power, it's crucial to maintain the solar panels properly. As solar panels are often installed in open spaces, they can accumulate sand, dust, and bird droppings, which can reduce their energy output. Without regular cleaning, the lifespan of the panels is shortened due to energy loss over time and the formation of hot spots. To tackle this issue, automated solar panel cleaning and monitoring robots, powered by Internet of Things (IoT) technology, are emerging as a viable solution. Therefore, it is necessary to design and develop a system for cleaning and monitoring solar panels that can collect and analyze solar energy data, forecast performance, and ensure efficient power production.

## 3. TECHNOLOGY USED



## 1. Microcontroller Arduino Uno (ATmega328P)

- Role: The brain of the Solar Panel cleaning robot with water tank.
- The Arduino Uno is a microcontroller board that controls and coordinates the actions of all the connected components, based on programmed logic.
- Trigger motors and relays

## 2. Power Supply

- Role: Provides the required electrical power for the Arduino and all connected components.
- The power supply for an Arduino-based project typically provides 5V DC (for the Arduino) and 12V DC or higher (for motors, relays, and other devices).

## 3. Bluetooth Module (HC-05)

- Role: Enables wireless communication between the Arduino to communicate with a mobile app.
- The Bluetooth module allows the user to control and monitor the Solar Panel cleaning Robot with Water Tank remotely. For example, you could use a mobile app to:

## 4. Channel Motor Driver IC (L298N)

- Role: Controls the direction and speed of the DC motors.
- It is also known as Movement controller.
- This Part controls the wheels or tracks that make the robot move Forward, Backward, or turn. It gets instructions from the Arduino.

## Cleaning Mechanism

- Role: The robot typically uses soft or medium-hard brushes (e.g., microfiber, polyamide, or rubber) that rotate or oscillate to scrub the solar panels. These brushes help in removing dirt, dust, and other debris from the surface without damaging the solar cells.
- Automated Movement: The cleaning mechanism is automated, and the robot moves across the panel surface using wheels or tracks. The brushes maintain contact with the surface while the robot moves to ensure consistent cleaning.
- Water Tank: The capacity varies depending on the robot's size and the solar panel area it is designed to clean..

## 5. Relay Module

- Role: Controls multiple high-power devices like motors .
- It can control multiple motors or (e.g. ,motors for motorized wheels).
- The Arduino sends signals to the relays, which then switch high-power components on or off based on the programmed logic.

## 6 . Motor [100 rpm DC Motors]

- Role: Powers the mechanical movement for Solar Panel cleaning Robot.
- Motors in an automatic Solar Panel cleaning robot could be used for:
- Driving the wheels or tracks of the robot .

## WORKING

- Powering Up: The battery pack gives energy to all the parts-The brain Arduino, The motors, and the pump. Following Commands: The Arduino brain decides what the robot should do; If it needs to move , the Arduino tells the motor driver to turn the tracks. If it needs to spray , the Arduino turns the water pump on.
- Moving the tracks roll, powered by motors. The robot can go forward, backward, or turn based on how the Arduino controls the motors.
- Spraying; When its time to spray the pump pulls liquid like water from a container and pushes it through the nozzle which sprays it out
- The brush on the robot can scrub surfaces as it moves helping clean while spraying.

## RESULT:



## FUTURESCOPE

Motor efficient Robots can use advanced algorithms and sensors to navigate around obstacles and clean solar panels. More intelligent Robots can use thermal cameras to inspect panels and identify areas that need to be cleaned again. More scalable robots can be designed to adapt the different solar panel configurations and industrial environments. More sustainable robots can use water efficient systems to reduce their environmental impact. More automated robots can be used to automatically clean and inspect panels. The future of solar panel cleaning robot with water tank looks very bright. As solar energy use grows there will be a greater need for advanced, automated solutions to clean large solar farms and home panels. These robots will likely become smarter using AI to plan the best cleaning routes and detect problems like dirt or damage on the panels . They may also use less water, have longer battery life . when ongoing technological improvements this robots will become more affordable, efficient, eco-friendly making solar panel clean easier

#### REFERENCES

- M. N. Mohammed; Rubendren AL Selvarajan; Salah Al- Zubaidi; Study on Solar Panel Cleaning Robot Published in 2019
- Deepak Devasagayam; Jay Masal; Shreyash Patil ; Solar Panel Cleaning Robot Published in 2023
- Solar Powered PV Panel Cleaning Robot; Shiva Shankar; Keshav Murthy; Published in 2024
- Automatic Solar Panel cleaning system Design; Ali Al Dahoud; Published in 2021. Design and Implementation of Cleaning Robot for Solar Panel; Tang Minh nhat Published in 2023