

RESEARCH OF SOLAR PANEL CLEANING MECHANISM

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Abstract:

As the use of renewable energy is increasing day by day. Solar panels are used as the source of electricity in many places like residential area, office and many other places. Solar panel cleaning has become wider problem and if it is not cleaned regularly dust get accumulated over the panel which block sunlight and reduce the efficiency of solar panel. To overcome this problem we have design a cleaning mechanism which is cost efficient and increase the efficiency of solar panel to 15 to 20%. This mechanism is automatically controlled by ESP328 Controller which is comparatively cheaper than PLC. It clean the panel with 95% accuracy and it is Wi-Fi based mechanism.

Introduction:

The solar photovoltaic industry has grown noticeably over the last decade as a result of growing interest in renewable energy. The European Union produced 3.03 million gigawatt hours (GWh) of electricity in 2014, approximately 3 percent of the total demand. Because Photovoltaic energy is an accessible technology, it has become a popular investment for companies as well as for residential users. Due to this demand, scientists from all over the world have been working hard to improve the overall efficiency of PV systems while reducing their cost.

Solar photovoltaic cell (PV) industry is booming worldwide, owing to technological and economic advantages. At the commercial level, PV conversion efficiency ranges between 10 to 13%. However, for outdoor installations, PV efficiency may decline by 10 to 25%. Any substance that spreads in the air includes soil particles (suspended dust), smoke, fog, and particulate matter known as dust. Losses in the inverter, wiring and dust pollution decrease the overall effectiveness. Dust consists of substances like sand storms, bacteria, factories' smoke, pollen, forest fires and volcanoes vapors. These particles also include the solids that remain in the air for extended periods of time.

They can travel long distances in the air with the movement of the wind. Significant losses are caused by dust pollution in areas with high dust concentration levels. Several valuable studies have shown that the airborne dust deposition on outdoor photovoltaic modules reduces the transparency of the cells. Results indicated that PVs exposed to outdoor conditions about eight months ago had a 32% reduction in energy output. In the study, the monthly percentage decline in glass transmissivity was between 10% in summer and 6% in winter. Solar panels, however, are not always so easy to clean. To begin with, it is difficult to reach them. PV panels are often positioned in hazardous and hard to access places, so cleaning them manually might be difficult and take a while.

In addition, cleaning a panel only once a year is unlikely to make a significant difference to its yearly energy yield since dirt accumulates again over time, negating any difference. Cleaning the panel might not be an economical option, particularly if you have to hire someone to do it for you. However, leaving the panel uncleaned may not be a wise idea either since soiling may damage the glass permanently, cutting the lifespan of the installation in half



The content of research

In our project we have used automated Wi-Fi based controller name as ESP328. This project can be operated using mobile phone with the help of its hotspot. After Connecting it will show UI interface through which you can set time for cleaning of solar panel. We have design the structure of mechanism according to the size of solar panel.

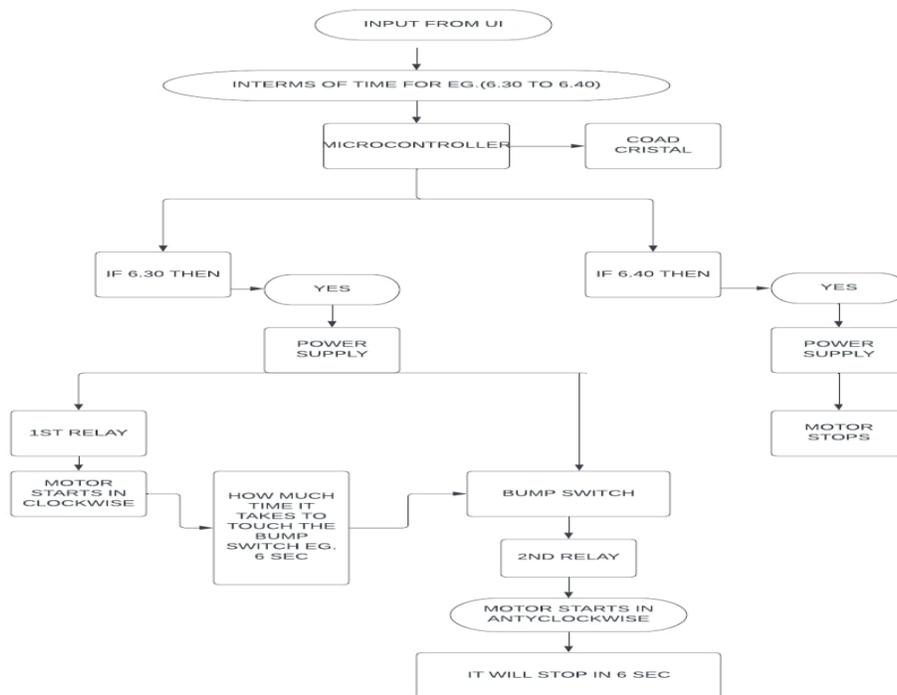


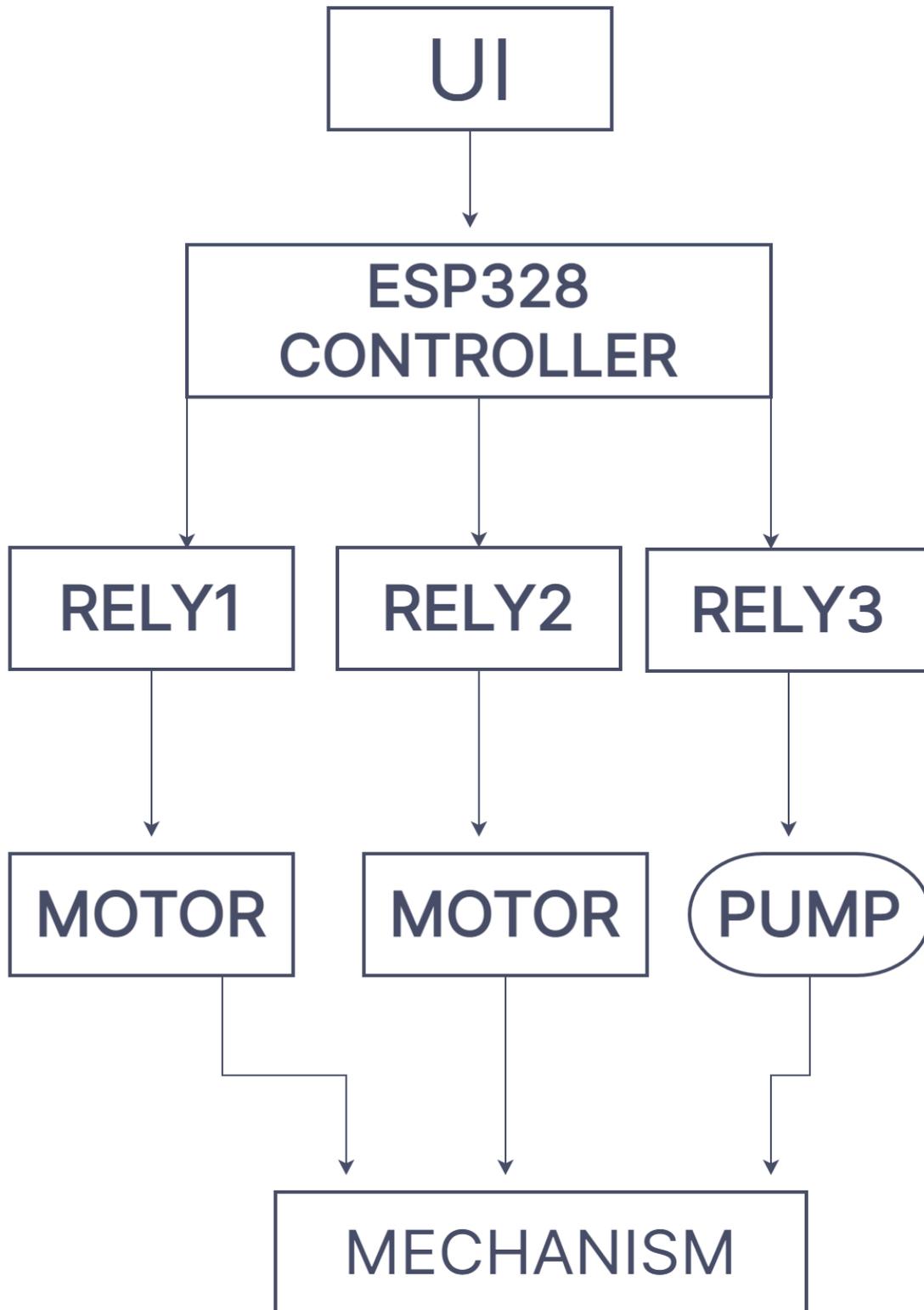
The working of project:

In this project we have used 12WT battery which give power to move entire mechanism. There are four motors used and four wheels of silicon rubber are attached with motor there are also two support wheel in the middle. We have used wiper and spunch for the cleaning of mechanism. There are two nozzle attached to the mechanism which spray water on the panel. This two nozzle are attached with water motor which pump water from the tank. The tank has storage capacity of 5litre. When it reaches to end point of solar panel we have attached limit switch which give controller input to move reverse. It will move in reverse direction and stop at the same time it started moving forward. Time is measured with the help of timer inside the circuit



Circuit diagram:





As per circuit diagram when you input data on your phone it is sent to the controller there are three relay attached to the controller. The work of each relay is different relay 1 moves mechanism forward and relay 2 moves it backward and relay 3 is for on and off of the pump. There is a timer in the circuit which counts operation time.

Future scope: In future we will make further update in this project like we will give home zero on both the side of the panel when is used in actual plant and we will give sump which will collect dirty water and with the help of filter we will filter the water and reuse it this way we will reduce the wastage of water

CONCLUSION:

The system can be applicable at any plant, it should guarantee a zero pressure on the PV cells and easy to control and maintain. Unfortunately, the disadvantage is that it need to be installed manually to the next array. Rainy region could create a problem for this design, because rain creates mud, and mud is hard to clean by using brushes only.

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