IOT Based Automatic Solar Panel Cleaner

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Abstract— **In these days, the world is heading to use endless power sources like solar power, wind power etc. In order to gain energy from these resources we need some devices that convert this natural power to electricity or fuel. However, these devices like solar panels or generators need maintenance and sometimes special conditions to work and these conditions are not neutrally available all the time. Our project comes to break the challenges which are faced by one of these devices which is solar panels. The main challenge for this device is dirt and dust or any climate condition so our role is to make it efficient whatever the weather is.**

Keywords: solar panels, power source

Introduction

The proposed work is used to solve the problem of dirtiness of solar panels through sensing the air dust, humidity / fog and based on that the cleaning operation done automatically when needed. The aim of the work is to clean the solar panels automatically so that we do not need employees. It also maintains the life of the solar panels when it cleans constantly. So it gives us full energy**.** The aim of our work is to clean the solar panels automatically without the need for an employee to clean them. Reduce the cost of cleaning process. Expand the life time of the panel. Monitor the panel status. It is automatically cleaning so no need to higher employees for cleaning service. It will expand the life time of the panels. In addition, when the panel is dirty it will not give the expected power so it has to be clean.

Related Work

This project considered as IOT project which is used for smart home and they are planning to use it to control the home things using IOT technology. Moreover, they used Raspberry bi as their board which has Wi-Fi so they also will use Wi-Fi technology as connection protocol also they will control the house using smart phones [1]. IOT project used for home automation and they are planning to use it to control the home things using IOT technology. Moreover, they used Arduino as their board which has Wi-Fi so they also will use Wi-Fi technology as connection protocol using Wi-Fi adapter also they will control the house using smart phones [2].

This IoT project has used iot in environmental way so it monitors the soil condition using different sensors like soil sensor so the data will be sent it the user's smart phone [3]. This is another IOT project but this one is in the energy field. This is an energy or electricity meter used to measure the electricity and it is using Arduino and LCD to display the data which has been read by the meter [4]. This project considered as IOT project which is used for smart home and they are planning to use it to control the home things using IOT and also they involved AI technology. Moreover, they used LSTM to recognize human activity and then do some actions [5].

This project is a greenhouse and it is using iot technology to control several things so it uses some sensors like temperature sensor, soil sensor and intensity sensor. Moreover, it

measures the temperature and the amount of water in the soil and show it to the user wherever he was [7]. This project is to measure water level using IOT technology to avoid wasting water and monitor the water level also it is used to control the tank that it has this device and send the data to the user [6]. This project is to measure the garbage in the garbage bin using iot and Arduino it also uses ultrasonic sensor to do this measuring. And it will inform the company [7].

Problem Definition

Sometimes, solar panels get dirty or have some fog on it and this may reduce the productivity of the panel. Moreover, the manual cleaning sometimes is dangerous for the workers because the panels sometimes are mounted on a high place so it is very dangerous to go up there every three weeks. In addition, it is costly especially when the company has many panels which means it will need more workers and that means it will spend more money as a salary for them.

Design and Implementation

Our design is based on dirty types that may affect the solar panel productivity and we design it like a frame with wiper moves forward and backward and we have divided it into three cases:

Fog: as we know sometimes the weather becomes foggy and when the fog covers the panel it may not get the entire amount of solar energy. In this case we have put a squeegee part which is going to wipe the panel from fog in figure [1]
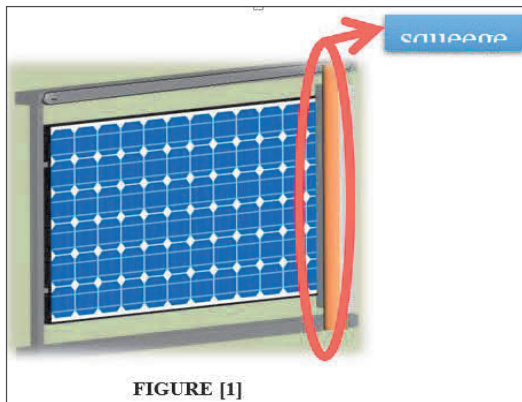
FIGURE [1]

Dust and bird's dirt: in this case the panel needs brush, some water and finally the squeegee so the brush is going to wipe the panel to remove the dirt then water will be spilt on the panel and finally the squeegee. FIGURE [2]
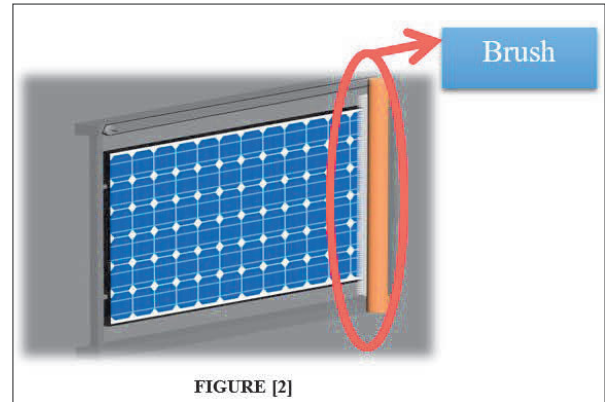
FIGURE [2]

This case it is not for cleaning dirty but it is for avoiding dirty when the panel is not used like after sun set. In this case the panel will be covered until sun rises in the next day. Figure [3]
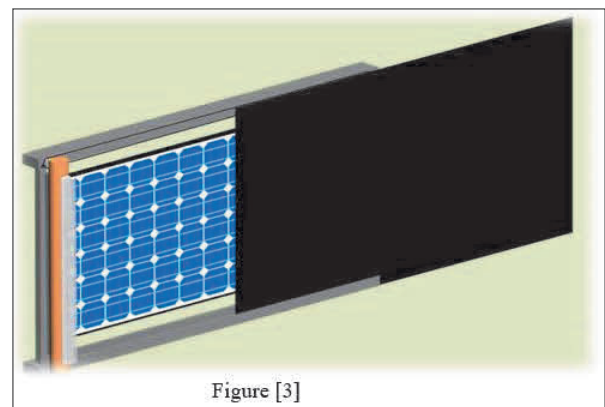
Figure [3]

Block Diagram - This diagram shows the system and how the components are connected also it declares that if the component is an output or input components and in the figure 1 below the exact components will be showed. Figure [4]
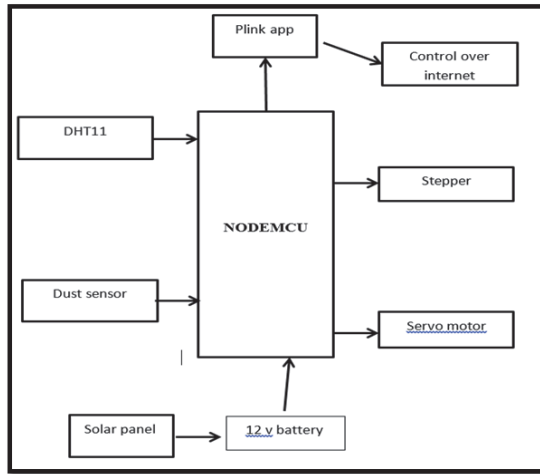
Figure [4]

Figure [6]

Results

In this work have analyzed the two different approaches about the effect of dust and dirt on solar panels productivity and the results were unbelievable after cleaning the panels the productivity has increased more than 10% which means more power and cleaning solar panels deserves your time to clean but we think what if you have many panels how many workers you are going to need? Also how much salary you will pay for each one of them so based on this many or energy that we may waste we came with our project which is going to solve both of these problems. The experiments are shown in the graphs below the first one shows that the productivity of the solar panel increased 26% from 145W to 182W as the highest amount that can be produced and on the other experiment with 4 panels it shows that the energy productivity has increased by 17 and that from 421 to 495.
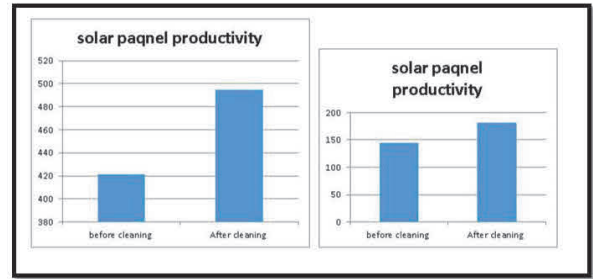
Conclusion

In this work we have created a porotype for IOT based automatic solar panel cleaner. Which is used to clean the solar panel on various circumstance occurs, like fog and dust. In this prototype we also included a shutter to close the panel during night. We also compared the power generation before and after the implementing the work which clearly show there is significant improvement.

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