

THE AUTOMATED FLYING VEHICLE FOR SECURED MAINTENANCE OF LARGE PV INSTALLATION USING IOT AND HIGHLY POLISHED WIPER

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ABSTRACT

The efficiency of the solar panel is greatly affected by environmental factors like dust, due to this effect of panel output drops down drastically. Current solar panel suffers a major power loss when unwanted obstruction covers the surface of the panel, this obstruction turns the shaded cell into a resistor, causing it to heat up and consume more power. In this project, we are using a solar panel on which a cleaner mechanism is placed this cleans the solar panel with the help of IOT and wiper mechanism. The proposed cleaning mechanism operates by spraying an amount of water on the panel. The Motor is used for the movement of the wiper where power is taken from the panel. Raspberry Pi is once programmed which makes the cleaning process easy. For Security and maintenance purpose we are using a drone. In which drone will recognize the human or animal presence and also detect crack on the panel using an IR sensor. The dust present on the solar panel can also be recognized. The distance from the solar panel to the drone is recognized by the IR sensor, where an IR sensor captures the image and compare with the initial image.

computer science. The principal goal of intelligent systems for objects recognition and tracking is the use of these systems in various sectors of computer engineering, e.g. image processing, security, and robotics. People can focus on a specific object, and the aim of the research is to implement this ability in intelligent systems.

Due to the increased cost of conventional energy and its harmful effects on the environment, the use of renewable energy systems has attracted much attention in recent years. Among them are systems for generating energy from sunlight highlight the potential of this type of energy, since in human species longevity terms, the Sun's life is effectively infinite. There are many ways to use solar energy. What is worse, if the solar cells with large cracks are exposed to space full of low-energy protons, the electrical performance will be badly impaired, even the lifetime will be shorten. In order to avoid the unqualified solar cells to be put into use, it is vital to detect cracks after bonding. Adopting image processing to detect the flaws of solar cells will be concerned with several technologies.

The most critical of the tropical countries is the soiling loss, which is due to the accumulation of the dust, dirt or other particles on the glass of the PV modules. So, in these areas there is no option other than cleaning the PV modules to maintain the high power output, but as the PV modules are mounted at greater height on the roof for avoiding the shading in the off grid system, their access is difficult and risky. Also, the

1 .INTRODUCTION

Motion detection and objects recognition in the image is an active research being done as a part of

panel cleaning is required to be done once or twice a day in the dusty areas, which would be cumbersome if done manually. So, there is a necessity of developing a system to clean the solar panel automatically, to reduce the loss of power due to soiling.

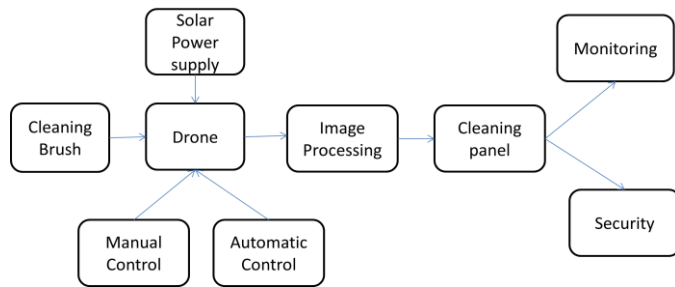


Fig.1. Architecture of crack detection and human detection

The major advantage of the image based analysis of the crack detection is that by using the image processing technique it provides accurate result compared to the conventional manual methods. The processing difficulty of the crack detection completely depends on the size of the image. Recent digital cameras have the image resolution beyond 10 megapixels. This increase in resolution enables the acquisition of detailed images of concrete surfaces.

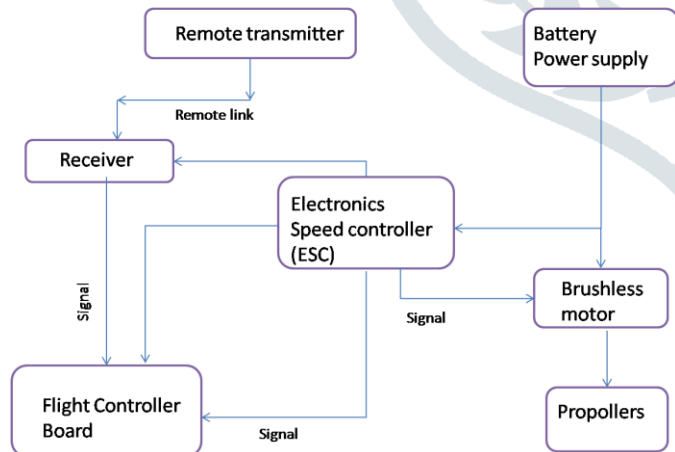


Fig.2. Construction of UAV

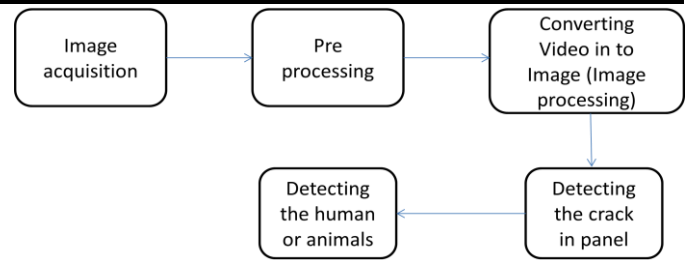


Fig.3. Working of Image Process

Fig. 1 shows general architecture for crack detection based on the image processing. The steps in the image processing technique are as follows:

- Initially collect the image of the structure which will be subjected to the crack detection process using the camera or any sources.
- After the image acquisition, the collected images are pre-processed within which the methodologies like segmentation are done there by making it an efficient one for the image processing procedure.
- In the image processing, some of the techniques are employed to process the deducted image sample.
- The crack detection will be noticed here on the structure using the result of the processed image.
- Crack feature extraction is the step in which the detected cracks are separated based on the width, depth and the direction of propagation of the crack.

2. Effect of Dust on Performance of solar PV Modules

Although the efficiency of the PV system has augmented through many improvements, there are several environmental and natural factors such as the deposition of soil, snow, bird droppings etc., on the PV module surfaces that can result in inefficiency in the performance of such systems. The amount and type of dust in the air vary at different places, and it depends on presence various factors like industries, automobiles, forest fires, volcanic eruptions etc.

Accumulation of different types of dust particles has different effect on the transmittance of the glass cover. There are 15 different types of dust that are commonly found in the air and some of them are red soil, cement sand and soil have greater effect on the PV panel

- The transmittance of solar radiation through the dust ranges from about 2% to 40% depending on the factors like duration of dust accumulation.
- [The effect of the dust accumulation on the solar panel inclined at different angles is different.
- [Measurements of similar type were made in Kuwait by Sayigh et al.
- The dust deposition density varies with the tilt angle of the PV panel
- The tests of the effect of the dust on the solar panels were carried by many researchers at several places over the world.

3. CLEANING METHODS FOR PV PANEL'S

3.1. Natural Removal Of Dust

The natural powers are employed to remove the dusts, such as wind power, gravitation and the scour of the rainwater. The effect of this method is not very well. It is seen that the solar cell array can be turned to vertical or oblique position to remove the dusts easily when early morning, late evening, night and a rainy day. However, the rotation of the large solar cell array is very difficult.

3.2. Mechanical removal of dust

The mechanical methods remove the dusts by brushing, blowing, Vibrating and ultrasonic driving. The brushing methods clean the solar cell with something like the broom or brush that were driven by the machine was designed just like windscreen wiper. However, firstly, because of the small size and the strong adhesively of the dusts, the cleaning method is inefficient. Secondly, the abominable working environment of the solar cell makes the maintenance of the machine difficult. Then,

due to the large area of the solar cell array, the cleaning machine is powerful. Lastly, the surfaces of the solar cell maybe were damaged by the brush when wiping. The blowing method cleaning the solar cell with wind power is an effective cleaning one except the low efficiency, high energy-consumption and the unsatisfactory maintainability of the blower.

3.3. Electrostatic removal of dust

If there are a high potential on the surface of the solar panels, the charged and uncharged dusts will be attract to the panels because of the electrostatic forces. Then, the dust particles will be charged by the solar panels finally, so they have the same electric charge and the electrostatic forces between them are repulsion. At last, the dust particles will float away the solar panels. However, this strategy cannot be used in PV system, because of the effecting of the rain on earth.

METHODOLOGICAL

1. Wiper cleaning

As its name states that it is a mechanism which is used to clean the PV panel. It consists of wiper or brush mounted on PV panel. It will start moving from one end of PV panel to clean it and it will move towards the other end of a PV panel. This mechanism is controlled by motor and spray valve control block. The wiper cleaning is have the motor and spray valve control This is used to control the motor assembly and spray valve. It will pump the water from water tank to wiper and spray mechanism. Motor assembly will move the wiper and spray mechanism across the PV panel.

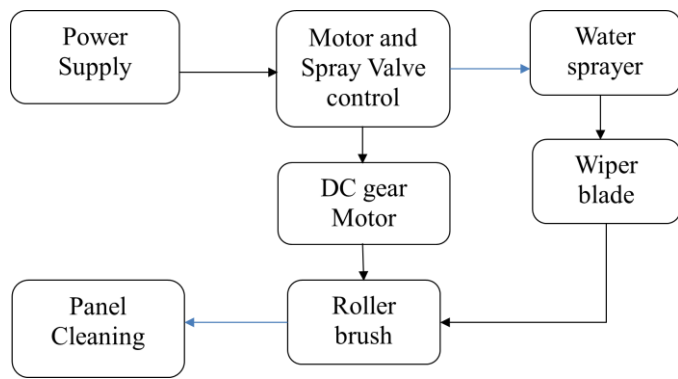


Fig.4. Wiper working process

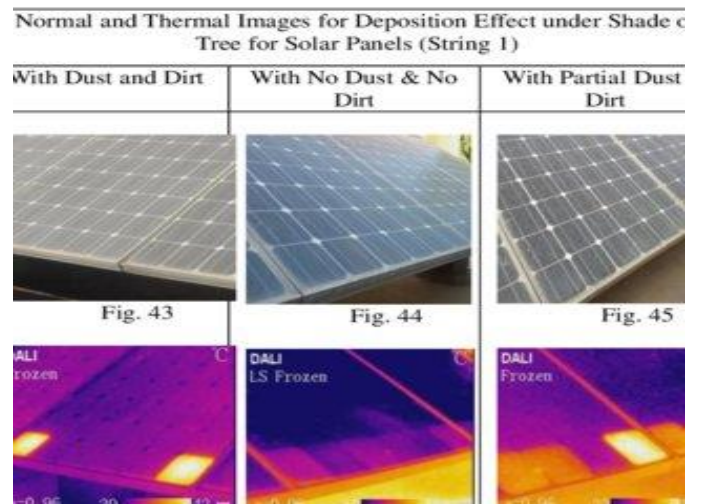


Fig. 6 . image processing of solar panel.

2. Image Processing :

The Drone will start initially at the centre and then take pictures from multiple directions, which will be streamed back to the processing unit stop detection.

Multiple direction frames will be streamed to the processing unit, and the unit will then conduct the image processing algorithms to decide to move in a specific direction.

Thus pollen and bird grapping can build up on solar panel and prevent them from absorbing solar maximum amount of sun light so recidensional solar panel. The amount forgive that belts up on solar panel. Isn't significant enough to make worth cladding on you are own higher some on to clean a solar panel.

OBJECTIVE

1. The main aim of this project is to develop much cleaner noise less cost effective Wiper for panel cleaning and UAV which detects crack detection in very efficient manner and also detects human and animal presence in night time.
2. Maintenance of panel in effective manner.
3. Reduce personnel expenses for cleaning and checking the panels.
4. Save time in cleaning panel.
- 5.

CONCLUSION

This paper provides the collective survey of the different image processing techniques used for the detection of the cracks in the engineering structures. The main intention of this study was about to study and review the crack detection system based on image processing. Here we have researched several papers for the review based on the crack detection. We have finalized our review based on the analysis of the five features. The first one is objective based analysis on to which the objectives like the length of the crack, width of the crack, direction of propagation of the crack are considered. Secondly, the datasets utilized for the methodologies were analyzed upon which we conclude

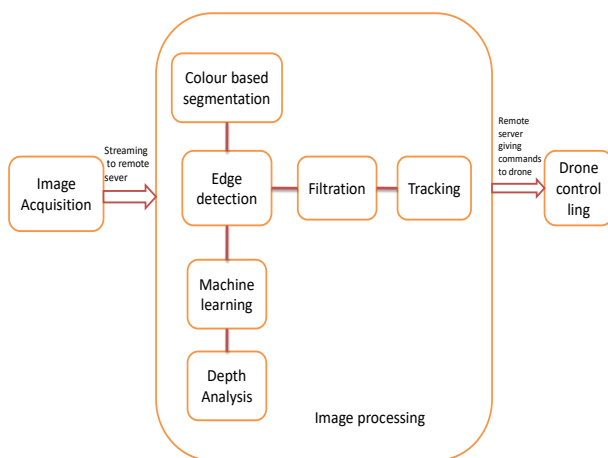


Fig.5. Block Diagram of Image acquisition

that most of the system uses real data sets for the convenience as well as efficiency. Next, the analyses based on the accuracy level as well as the error level in some cases are scrutinized. Finally, we have performed the analysis based on the image processing techniques used in each system. And also we present the research issues which can be useful for the further research on the image processing based crack detection system. Crack detection as this works presents an extensive study over the non-invasive methods of crack detection. Here we have researched several papers for the review based on the crack detection. The efficiency of photovoltaic panels is directly affected by dirt that is deposited on them. Therefore, the periodic cleaning of the panels is a necessary task in order to they operate at maximum efficiency. There are many cleaning solution for cleaning solar panels but this solution have high efficiency.

Crack detection as this works presents an extensive study over the non-invasive methods of crack detection. Here we have researched several papers for the review based on the crack detection. The efficiency of photovoltaic panels is directly affected by dirt that is deposited on them. Therefore, the periodic cleaning of the panels is a necessary task in order to they operate at maximum efficiency. There are many cleaning solution for cleaning solar panels but this solution have high efficiency.

The effects of presence of dust were studied using falling leaves, dust, bird dropping. The dust has a major impact on the efficiency and performance of the solar panel. The reduction in the peak power generates can be up to 10 to 30%. By the observation, it is observed that power reduction due to dust accumulated on the panel and it can be improved by using the cleaning method, there is increase in power and efficiency of solar panel.

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