Autonomous Cobweb Cleaner

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Abstract. Cleaning is an advancement of inhale dust on the surface of any object or wall. Nowadays dust cleaning is a tedious task in many of the industry especially for the food processing Industries which are the milk, oil, soft drinks, chocolate etc., while cleaning the ceiling there may be a possibility of dust falling into the products which may cause the serious issue in the quality control. If it is not observed during quality test and reached to the consumer it also affects the marketing of that product. Hence the cleaning process in food processing industry is important. When the workers are employed for the cleaning process, it leads to difficulties such as health issues to the workers and time consuming job. During manual cleaning process the food processing have to be stopped to avoid the dust falling on the product. Being a repetitive process it affects the production. To overcome all the drawbacks an automated cobweb cleaner is designed. In this paper, design and implementation of automated cobweb cleaner is presented.

Keywords: Cobweb Cleaner, Dust Collector, Quad copter, Sensor, Vacuum Pump

1. Introduction

Industrial ceiling cleaning is a tedious task. Nowadays, this is one of the problems in every industry and is being done by manually so far. Usually number of workers employed in this job based on the size of the industry. The workers in this job for the industries are not sufficient. The insufficient workers in the industry are due to the risk factors such as health issues and also cause life risk. Some industrial cleaning processes have to be done at the time of shutting the factory. It affects the industry working hours and there will be a delay in completing the work on time. In the residence floor cleaning is done by vacuum cleaners for ceiling cleaning no automatic device is used. The cleaning is done by vacuum cleaner with extension rods. But all these kind of process is a manual process which consuming more time based on the area also requires more man power. To overcome the problem, the work to be simple, and also reduce the reduce the manpower an automatic cobweb cleaner is designed. Above all this interior and exterior wall cleaning has common slight in research actions. The dust particles can cause hazard to human such as eye, skin and lungs diseases. Also, the nature of cleaning technique is tedious and time consuming. This project aims to develop the wall cleaning vehicle with remote control. The robot is designed by using vacuum module, an electric motor, Remotely Piloted Vehicle (RPV) and a regulator unit to handle the complete operation of the dust cleaning. Due to sophisticated and meek control systems it can govern vibration and does the noiseless & decent operation. The noise developed at the time operation is tolerable and does not damage the human ears. Durability, efficiency and time reduction in execution is better than the existing modules.
The operation and maintenance are easy, automatically obtain paths from the Unidentified flying object (UFO) android application.

2. Literature Review

Mr. Adeel Saleem and Mr. Atif Iqbal [1], described the room cleaning robot which has map stockpiling and divider following usefulness and this executed utilizing Arduino Uno and it has significantly more advantages over traditional family vacuum cleaners, for example, there is no need of individual to tidy up the room, office and so forth and satisfying the primary reason for tidying up the room consequently.

Mr. N. Seemuang [2], portrayed the Sunlight, a significant factor to develop crops with high efficiency, is obstructed by the plastic sheeting of the nursery rooftop and their neatness. the proposed cleaning robot enables the specialist to clean the rooftop efficiently with no harm to the plastic sheeting and it can clean the rooftop twice as quick as manual cleaning.

Mr. Seung Woo Jeon and Mr. Wootae Jeong [3], described dust contaminants within tram HVAC conduit including different channel cleaning innovations. The proposed plan of computerized gadget is relied upon to spare the time, give a decent nature of cleaning the pipe for each administrator and support clean air condition of metro spaces.

Mr. Sungsoo Rhim and Mr. Jae-Chang Ryu [4], the advancement of the exhibition file of the self-governing versatile cleaning robot. The one of a kind trademark highlights of the cleaning robot have been recognized as self-ruling versatility, dust assortment, and activity clamor.

Mr. Chao-Chung Liu and Mr. Yu-Ping Kang [5], described the robot is intended to coordinate the dynamic component, dust evacuation gear, electric circuit and single-chip microchip for cleaning indoor steps.

Mr. K. Yoshihara and Mr. T. Hoh [6], depicted The strategies for clean robots have been concentrated during the improvement of a rectangular clean robot for use in a PC circle sequential construction system.

Mr. Wancheol Myeong and Mr. Hyun Myung [7], portrayed the Wall-climbing drones have numerous applications, including auxiliary wellbeing checking of common structures, for example, extensions and tall structures. The automaton stage depends on a X-setup quad copter, and a tilt-rotor component is joined into the two tomahawks, with the end goal that the front engines and the back engines are combined.

Mr. S. M. Miraj Uddin and Md. Reyad Hossain [8], depicted the plan of an ardui pilot mega (APM) based remote-controlled unmanned elevated vehicle framework for cleaning the tall structures windows and Moreover, the engineer of UAV for cleaning the tall structures glass is moderately straightforward and less expensive in contrast with other existing strategies.

3. Existing System

The current advancements address little separation wall climbing robot just robot, where the current line devotee robot is a sort of robot that recognizes and finishes a way RFID that are drawn on the divider. So as to identify the line which is to be follow the sensors ought to be utilized. The line adherent robot in every case needs a way to run in 90 degree tendency surface it moves in a level surface with assistance of RFID, so we can't utilize the robot in typical spots and also it can't operates in flat surface. Because of various line thickness or hard points, the robot speed is restricted. These confinements are defeated in the proposed framework.

4. System Design

The block diagram of the proposed Autonomous cobweb cleaner is shown in Fig 1. It consists of the controller circuit with vacuum pump, a tank and vacuum nozzle.

Cleaning Process
RPV inbuilt residue cleaner is essentially a vacuum module with ultrasonic sensor coordinated into a quad copter to clean dust through the roof towards structures. The remote steered vacuum cleaner contains a vacuum pump which is accustomed to sucking the dust particles through vacuum pump and afterward the dusts are put away in the dust collector. The eminent target of this project is to decrease the threatening impacts to people.

5. Proposed System

In this project, an innovative vacuum cleaner dependent on Drone for cleaning purposes is designed. The Drone can follow the divider by utilizing RF correspondence and Ultrasonic sensor innovation, where the ultrasonic sensor is utilized to provide guidance to the Drone. Ultrasonic sensor is utilized to discover the separation among Drone and divider and signs during any mediation of outer forces. If the sensor distinguishes the divider the Drone moves alongside vacuum cleaner, it can move in x-bearing until the divider closes and reflects back to unique position then it moves in y-heading until the divider closes and reflects back to unique position. This is the procedure runs ceaselessly to clean the roof. Microcontroller is utilized to give the tasks of hand-off. Transfer is associated with dc drive and it works the dc brushless arrangement engine. The different angles of drone shown in Fig 2.

Fig. 1 Block diagram of Autonomous Cobweb Cleaner

Fig. 2 Different Angles Of Drone
6. Quadcopter Working Principle

The quadcopter is the executable design with four BLDC rotor controlled by electronic speed control. The arduino pilot regulates all the components when the quad copter portable from one place to another. The flight controller is the main part of this vehicle. The vacuum module operation is fully programmed by ardui pilot. The data is transmitted by transmitter, the transmitted signal is received by antenna. The quad copter floating condition and various thrusts are depends upon the four BLDC rotor and it can be moved by particular speed of the rotors. The battery and ardui pilot is interconnected through power distribution, it can supply the power for electronic speed control and vacuum module. Based on the construction, it can classified into two types such as plus and cross formation. In this X (Cross) formation are used. Because the total weight is approximately 6kg, the rotor can be produced the thrust should be 12kg. A Remote direction framework is utilized here to explore the RPV. Pre-stacked direction gives the ongoing synchronizes to Electronic speed controller (ESC). In light of these synchronizes, the microcontroller explores the RPV. The various blocks are connected in Quad copter shown in Fig.3.

![Fig.3 Block diagram of Quad copter.](image)

7. Sensor

Ultrasonic sensor comprises of a receiver, controller, and the transmitter unit. The gadget utilize electrical mechanical vitality change to gauge good ways from the sensor to the objective object. It takes a shot at the rule of sound waves. A heartbeat is coordinated about 10us to trigger the unit. After which the segment consequently sends 8 patterns of 40 kHz ultrasound sign and checks its reverberation. The receiver signal returns back to the sensor in the wake of hitting with a snag. The Sensor is utilized in the fluid distributor to check whether the surface is available or not. At whatever point the surface is before a sensor, at that point the waves radiated by the transmitter will fall on a superficial level and the reflected waves will be distinguished by the beneficiary unit A signal is sent to the controller when the surface is sensed which consequently drives the cleaner.

8. Vacuum Module

It has Vacuum Pump, Vacuum nozzle, Dust collector. These are main components of the vacuum module. In the transmitter unit, it transmits the data through the antenna and signal is received by the receiver. The sensor detects the surface, it sends signal to controller, it makes the relay as NC position vacuum pump operates when the signal receives by the relay it starts create a space through devoid of
air from high pressure to low pressure and the electric motor rotates the fan to produce the suction to suck the dust particles. Cleaning component contains the cleaning content i.e., vacuum pump and the controller unit used to trigger the nozzle of vacuum pump. The Nozzle of the cleaner segment will be activated by relay has shown in the Fig. 4 and the interior design of RPV has shown in Fig.5.

9. Results & Discussions

This method can be utilized in all conditions, explicitly in the spots where laborers are hard to track down. In the existing cleaning method, it can clean ceilinga building of the wall, and it cannot identify the wall while operated. These limitations are overcome in the proposed technologies. In our prototype, itsenses the wall through a sensor and then moves in horizontal and vertical directions depends upon the instructions given to us. It has numerous preferences that contain fast to move the vehicle for the cleaning procedure of dust, there by inundate the oil dust because of dust exposures and consequently prevents the chipping away at platforms. It is additionally a decent strategy for vector control into the regions where there is needs getting to by people or hardware. The up-degree later depends on the application and parts used as a piece of the arrangement. The multispectral camera execution may give the screening of the surface, and in addition is to choose the exact rise confirmation. GPS module can be completed and distinctive related works in agribusiness.

10. Conclusion

This project demonstrated for an autonomous cobweb cleaner. To overcome the vacuum cleaners drawbacks while cleaning the wall ceiling the proposed method is efficient and reduces the man power, consumes less time reduces the accident during cleaning process. Machine cleaning is proper compared to the manual cleaning. In the proposed cleaner Collecting the dust is simple. Hence it is concluded that the proposed system is efficient in cleaning.
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