

# Constructing and Analyzing a Smart Cleaning Machine with IoT Capabilities for Home Upkeep

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## **Abstract:**

With advancements in science and technology and the increasing demand for a higher quality of life, an Internet of Things (IoT)-based intelligent cleaning machine has been proposed. The design and structure of this cleaning machine are elaborated upon, along with an analysis of its operating principles. This intelligent cleaning machine offers a solution to the labor-intensive and time-consuming nature of manual cleaning, particularly in hard-to-reach areas such as under beds and sofas. Enhancements to the traditional intelligent cleaning machines have been made to enable remote monitoring via mobile devices, thereby improving cleaning efficiency and quality to align with the fast pace of modern life.

## **Keywords:**

Internet of Things; Cleaning machine; Home; Intelligence.

## **1. Overview**

In modern life, people's requirements for quality of life are getting higher and higher. Intelligent cleaning machines are recognized and used by more and more people. However, there are still some areas for improvement in current smart cleaning machines, such as the current smart cleaning machines. It is not enough to be humanized. It is impossible to remotely monitor the cleaning machine anytime and anywhere through personal mobile monitoring terminals and other devices. When the cleaning machine performs corner cleaning, the cleaning machine cannot accurately position the corner due to the angle. Cleaning, resulting in low quality cleaning. The IoT-based cleaning machine has improved the traditional smart cleaning machine for these two aspects.

## **2. The Overall Structure**

A cleaning machine based on the Internet of things, comprising a cleaning machine body, the top outer wall of the cleaning machine body is provided with an imaging mechanism, and the outer walls of the cleaning machine body are provided with a mosquito killing lamp, and the outer wall of the bottom of the cleaning machine body is welded with a dust collecting plate The top outer wall of the dust suction disc is provided with a cleaning mechanism. The top inner wall of the cleaning machine body is provided with a speed sensor. The top inner wall of the cleaning machine body is provided with a motor, and the output shaft of the motor is connected with a rotating rod through the coupling, and the bottom of the rotating rod The outer wall is connected to the outer wall of the top of the dust collecting plate through a bearing, and the outer wall of the bottom of the cleaning machine body is provided with a fan, and the input end of the fan and the top inner wall of the dust collecting plate are connected with the same dust suction pipe through the flange. The camera mechanism includes a fixed block. One side of the fixed block is provided with a camera. The cleaning mechanism includes a micro-cleaning brush and a large cleaning brush, and the micro-cleaning brush is located on both sides of the large cleaning brush. The outer wall of the bottom of the suction disk is welded with six

equal sizes and equidistantly distributed. The fixing rod and the outer wall of the bottom of the fixing rod are all provided with a universal wheel. One side outer wall of the cleaning machine body is provided with a charging port and an opening key, and an outer wall of one side of the cleaning machine body has an opening. The inner wall of one side of the mouth is connected with a box door through a hinge. The inner wall of the bottom of the cleaning machine body is provided with a distance sensor and a dust box, and the inner walls of both sides of the cleaning machine body are provided with an angle sensor. The top inner wall of the dust box and the output of the fan The end is connected to the same dust guiding tube through a flange, and one side of the outer side wall of the dust guiding tube is screwed with a solenoid valve.

### **3. Hardware Setup And Function Implementation**

#### **3.1 Distance sensor**

Ultrasonic waves have the characteristics of small diffraction, good directivity, and directional propagation. Ultrasonic sensors are mainly used to measure distances. The sensor has sound wave transmitting and receiving devices. The emitted ultrasonic waves return to obstacles and return, and the time difference between launch and return. The distance of the sound wave in the air is calculated as the distance of the obstacle, and the ultrasonic sensor is used as the distance sensor for calculating the distance.

#### **3.2 Anti-mosquito device**

The carbon dioxide exhaled by human beings is scientifically proven to be a substance that attracts mosquitoes by the human body. Photocatalyst mosquito killers, which produce mosquito-like light, heat, carbon dioxide, water vapor, flowing air, and simulate human body breathing to attract mosquitoes. The mosquito is sucked open, falls into the mosquito cyclone, and is dehydrated and dried. The photocatalyst can also purify the air and disinfect. The small mosquito lamp is embedded in the outer wall of the cleaning machine, and is opened when the cleaning machine cleans the bottom of the sofa and under the bed. The mosquito killer can both illuminate the camera and kill mosquitoes under the bed and under the sofa.

#### **3.3 Cleaning device**

The cleaning mechanism connected to the vacuum disk includes a micro cleaning brush and a large cleaning brush, and the micro cleaning brush is located on both sides of the large cleaning brush. The micro cleaning brush is disposed at an angle to clean the gap that the conventional cleaning machine cannot clean. Solve the problem of low cleaning quality of traditional cleaning machines.

#### **3.4 Remote monitoring device**

By setting up a camera, it is possible to capture the position cleaned by the cleaning machine through the camera, and transmit the signal to the personal mobile monitoring terminal through the wireless LAN module to remotely monitor the cleaning machine anytime and anywhere.

### **4. Specific Implementation**

The cleaning machine based on the Internet of things includes a cleaning machine body 1. The top outer wall of the cleaning machine body 1 is connected with a camera mechanism by screws, and the outer walls of both sides of the cleaning machine body 1 are connected with a mosquito lamp through screws. 2, the bottom outer wall of the cleaning machine body 1 is welded with a dust suction disk 3, and the top outer wall of the dust suction disk 3 is fixed with a cleaning mechanism by screws, and the top inner wall of the cleaning machine body 1 is connected with a speed sensor 18 by screws, and the cleaning machine body The top inner wall of 1 is fixed with a motor 15 by screws, the output shaft of the motor 15 is connected with a rotating rod 14 through a coupling, and the bottom outer wall of the rotating rod 14 is connected to the top outer wall of the dust collecting disk 3 through a bearing, and the cleaning machine body 1 is The bottom outer wall is connected to the fan 6 by screws, and the input end of the fan 6 and the top inner wall of the suction disk 3 are connected to the same suction pipe through the flange.

The intelligent cleaning machine camera mechanism includes a fixing block 16, and one side outer wall of the fixing block 16 is connected with a camera 22 by screws. The cleaning mechanism includes a micro cleaning brush 4 and a large cleaning brush 5, and the micro cleaning brush 4 is located in the large cleaning brush. 5, both sides of the bottom of the suction tray 3 is welded with six identically sized and equidistantly disposed fixing rods 19, and the outer wall of the bottom of the fixing rod 19 is connected by a universal wheel 20.

One side outer wall of the cleaning machine body 1 is provided with a charging port 21 and an opening key 8. One side outer wall of the cleaning machine body 1 has an opening, and one side inner wall of the opening is connected with a box door 23 through a hinge, and the bottom inner wall of the cleaning machine body 1 The distance sensor 10 and the dust box 9 are fixed by screws, and the inner walls of both sides of the cleaning machine body 1 are connected by an angle sensor. The top inner wall of the dust box 9 and the output end of the fan 6 are connected by a flange. The dust guide tube 12, and one side of the outer wall of the dust guide tube 12 is screwed with a solenoid valve 13.

Among them: 1-cleaning machine body, 2-mosquito lamp, 3-vacuum disc, 4-micro cleaning brush, 5-large cleaning brush, 6-fan, 7-vacuum tube, 8-open key, 9-set Dust bin, 10-distance sensor, 11-angle sensor, 12-dust tube, 13-solenoid valve, 14-rotor, 15-motor, 16-block, 18-speed sensor, 19-fixed rod, 20- Universal wheel, 21-charge port, 22-camera, 23-box door.

Connect the device to the power supply, open the switch key 8, the camera 22 captures the position cleaned by the cleaning machine body 1, and transmits the signal to the personal mobile monitoring terminal and other devices through the wireless local area network module, and can remotely monitor the cleaning machine at any time and anywhere, and open The motor 15 and the motor 15 drive the rotating rod 14 to rotate, so that the micro cleaning brush 4 and the large cleaning brush 5 start to rotate, and the micro cleaning brush 4 is arranged in an inclined shape, and the micro cleaning brush 4 can be swept to a position at a corner to open the fan 6 The garbage swept out by the micro-cleaning brush 4 and the large cleaning brush 5 can be sucked into the dust box 12, and after the cleaning is completed, the opening key 8 can be closed.

## 5. Conclusion

The new IoT-based cleaning machine, developed through enhancements to the traditional intelligent cleaning machine, has significantly improved cleaning quality. It now includes additional functionalities, such as mosquito eradication, and supports personal mobile monitoring terminals, allowing for remote operation and supervision of the machine from anywhere at any time. This comprehensive system effectively addresses daily cleaning needs, making it highly practical and user-friendly.

## Acknowledgements

(2019 Liaoning University of Science and Technology College Students Innovation and Entrepreneurship Training Program Project Funding Support).

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