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AIR DUCT CLEANING ROBOT

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Abstract - *In the globe of proliferation and contraption where air conditioning system acts as the pulse of every modern infrastructure in which air supply plays a crucial role in cooling. The duct system work as nerves of these air conditioning units. Also, its maintenance is required for greater efficiency to prevent damage, destruction and devastation of the system. Our research focuses on the non-destructive techniques to clean the dust, debris, air cell, fungi, and it also detects flaws, rift, detonation and corrosion inside the ducts. The technique if used on a daily basis, we can increase the efficiency, life of ducts and also the cooling units. This research involves a wirelessly controlled robot powered by NRF module .This robot is controlled by joystick for movement inside different cross-sectional ducts. It comprehend of several sensors like ultrasonic, humidity, gas, thermography and pressure sensors. The main objective is to clean the ducts by a probe attached to the robot, different probes like brush, scrubber blades, abrasive blades are attached further for removing the dust from ducts. The robot Equipped with infra-red cameras for the live view of inside the ducts. Dust, fungi, bacteria and corrosion affects the efficiency of the system, hence the removal of these impurities is done by the cleaning probe. To provide fresh and clean supply air through the ventilation system into the. closed space such as subway stations, eliminating source of pollutants and contaminants is the most cost effective than cleaning and replacement of air ducts.*

Key Words: Duct cleaning, NRF

1. INTRODUCTION

Nowadays, buildings are designed to accommodate centralized air conditioning and heating systems. In today's world of globalization and modernization, there is an increase in earth's temperature and has also demanded an increase in air conditioning and ventilation systems. A robot is a mechanical or virtual agent that has the capability to work in an autonomous, semi-autonomous or remotely controlled way .Air conditioners are machines that alter the characteristics of surrounding air to condition more comfortable for humans by lowering temperature, eliminating humidity. More than 75% of the ventilation systems are highly contaminated. Nowadays As its need is increasing exponentially, these system require inspection at regular basis to maintain its high efficiency and to lower the losses of effects produced by the air conditioners. A robot is a mechanical or some intelligent virtual agent that has the capability to work in an autonomous, semi-autonomous or remotely controlled way. Some scrutiny and exploration in unsympathetic situations are isolated to humans.

With the advancement in technology, Robots are increasing day by day and get involved in the task that are either unvaried or vicious for human life like in fields of applications not limited to office, military operations, hospitals, industrial automation, security systems, and agriculture.

2. LITERATURE REVIEWS:

Numerous studies by government and environment health specialists have shown indoor air to be a significant environmental threat to human health. Exposure to these contaminants led to a health concern known as “sick building syndrome” or “SBS”. . Studies in China show that 40% - 53% indoor air pollution sources are caused by contaminated ducts of central air-conditioning system. Statistics show that 1 out of 5 (50 million) Americans suffer from allergies caused by substances found in the home and office. Deaths related to asthma have risen 40% in the past two decades. More than 75% of the air ducts are highly contaminated. However, research shows that mildew and bacteria in air will not be diffused if they did not attack dust .The dust spreading medium must be cleared in order to cut down the source of contamination. Therefore, the air duct of central air-conditioning is supposed to be cleaned regularly.

3. METHODOLOGY:

The proposed air duct cleaning robot is to clean the rectangle air ducts. This proposed system is composed of monitor and control device, remote robot and dust

collection device. The guiding device is proposed and designed to ensure the remote to move in straight route and turn automatically at corner. Inspect the inner of air duct and record the "before" condition of the duct. Clear the wall of air ducts and blow dust forward. Collect the dust and other contaminants. Record the "after" cleaning condition of the duct. Remove the air cell.

3.1HARDWARE AND SOFTWARE OF BOT:

Our duct cleaning Robot is movable which we are able to operate with the help of NRF module. It is able to move in all possible directions operating with joystick. Rotating brush is also operated ON and OFF. We are using our product, the duct cleaning robot as a frontend system.

For programming purpose embedded system is used. Embedded C a predefined library are used to create accurate database. Arduino is the main controller of our system. In our robot we use Arduino Uno module.

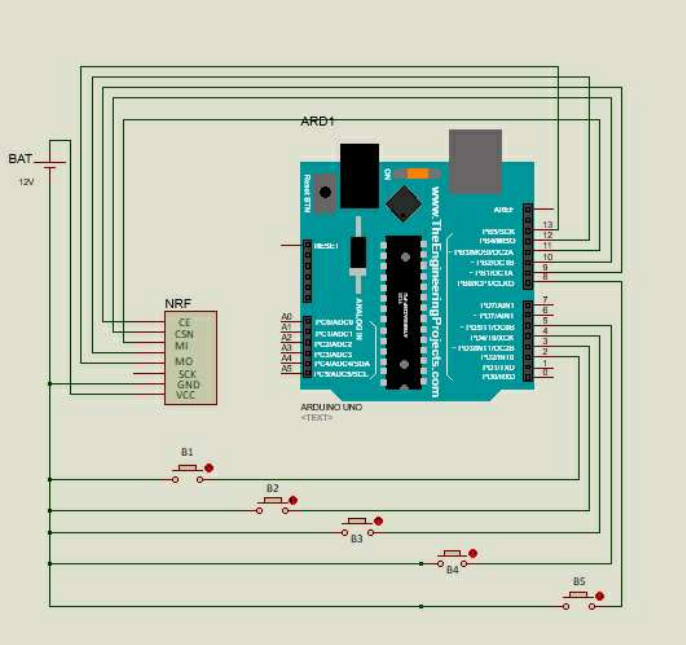

Fig.1 Transmitting Section

Arduino connection of the transmitting section with joystick and NRF module

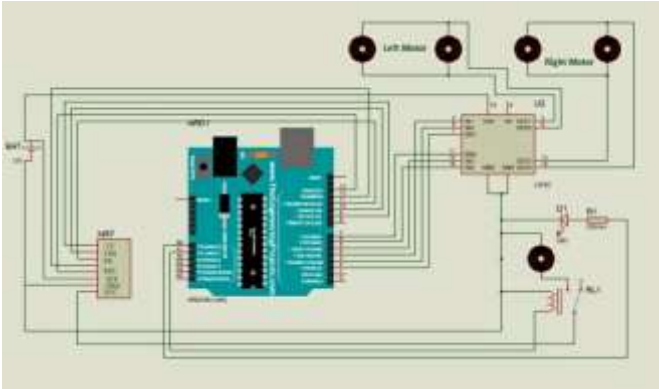

Fig.2 Receiving Section

Connection of Arduino, motor driver circuit, relay module, in the receiving section.

3.2 IMPLEMENTATION

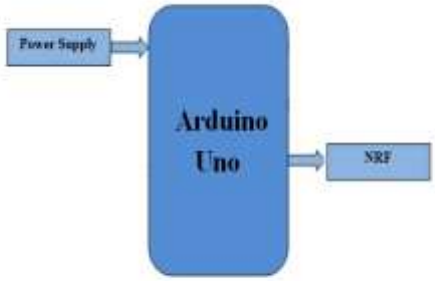

Fig.3 Block diagram of transmitting section

In this project the motion of the robot is controlled through joystick. The robot consist of a four wheeled mechanism for the movement inside the ducts. Joystick gives command to NRF transciever to change its directions and the clockwise rotating brush can be turned ON or OFF. For the detection of flaws and leakage we added one IP camera seperately giving its separate power supply.

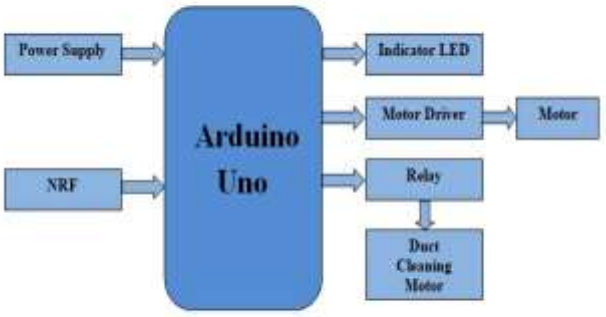

Fig.4 Block diagram of receiving section

The transceiver gets the input signal from the transmitting section. Motor driver circuit used to rotate in all four directions. The slider movement of attached four wheels provide better gripping and overcome friction. The batteries are powerful enough to empower the tires with the help of motors. The wireless control and its coding is managed by Arduino uno. Camera output can be seen in mobile phone directly. The cleaning brush empowered by the motor provides clockwise movement for better efficiency. A single brush is attached in the back in horizontal plane beneath the robot which is also used for the cleaning purpose.

4. RESULT AND DISCISSION:

The project result is as follows:

As we know human cleaners are not able to enter the duct network from larger access points. Once the robot enters the duct it is operated as remote-controlled and requires human operator. The cleaning robot is equipped with a camera which allows the operator to steer them.

The robot duct cleaner can be made small, allowing the duct cleaner to move through small ducts which humans often capable of. Daily use of our air duct cleaning robot can reduce many concerns like pollen, allergens, gaseous contaminant, and pests. There are some more contaminant such as dust, tobacco smoke. After cleaning from the brush the ducts get cleaned and removes all fungi, bacteria and makes it dust free duct with better air conditioning.

5. CONCLUSION:

Our air duct cleaning robot can be serviced in every major home, mall, hospitals, office, factories, and other public area. Human workers are less in need. Our robot clean air with improved air conditioning. And also reduce annual cost of repair and maintenance. Considering the future problems air duct robot is a onetime investment product with many benefits. This product is a great help in air conditioning industry as it provides cleaning of duct and it also has the detection capability. The camera provides the ability see the crack and other dust affected area. Thus, this paper above summarizes the air duct cleaning robot method developed and tested.

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