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# Solar Powered Highway Dust Cleaner

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**ABSTRACT:** The Road side dust collector machine proposed in this project has been designed and fabricated keeping in mind the stumbling blocks of the dust on the road sides in India. At designing autonomous robotic system that helps to people to maintain easily in their highway cleaned during their rush times and also help the highways neat and clean. This can be achieved with a combination of a micro-controller based on the solar powered using a hardware cleaning module and solar system. In this project an efforts has been made to develop a mechanically operated sweeping machine so that it can be an alternative for small space cleaning. On other hand in rural area the road cleaning is done by an manual operated which renders fatigue hazards like asthma, bronchitis etc to the worker. the cost of mechanically operated sweeping machine is less as compare to electric operated sweeping machine and the machine is economical and comfortable for operating in rural area and it is suitable on small spaces, it is eco-friendly to user.

**KEYWORDS:** Solar panel, Drive circuit, Relay, DC Motor, Microcontroller

## I. INTRODUCTION

Robot plays an important role in all the fields of life. It is used at homes, restaurants, schools, hospitals, etc. In this work “Solar Based Road Cleaner” has been designed for various purposes. The communication between the robot and remote is wireless with the help of RF modules. In previous researches, cleaner robot called “MINT”. This robot has automatic water direction controlling task. In this research work a microcontroller based road cleaner robot have been developed. This is not same as the vacuum cleaner robot which performs the sweeping task. RF modules have been used in the manual mode for upto 10m range. Good sanitization and cleaning leads to proper health of human beings. It directly effects the environment and the surrounding. In recent years cleanliness is becoming an important factor for the betterment of the nation and so, to support the cause we have conducted a study, prepared a design and working of an Automatic Multipurpose Road Cleaner. The cleaner is an approach to deliver easy and time efficient cleaning of roads, by reducing human efforts. There are innumerable functions of the remote operated cleaner mainly. Cleaning of roads by brushes or broom like structures. A function by which pipes and manholes can be cleaned. A picker (arm like structure) use to pick and place various objects. unemployment is more and hence there is a need to develop less labor-oriented cleaning machine. Hence, the present work is aimed to design, development and evaluation of a manually operated floor cleaning machine. In recent years, conventional floor cleaning machines are most widely used in airports, railway stations, malls, hospitals and in many commercial places, as cleaning is one of the important parameter for the sanitation and government regulations. For maintaining such places, cleaning the floor is the major task which is necessary. There are conventional floor cleaning machines available to perform floor cleaning operations in above said places. Generally a conventional floor cleaning machines requires electrical energy for its operation. In India, especially in summer there is power crisis, in majority of places. Hence cleaning the floor using the conventional floor cleaning machines is difficult without electricity.

## II. THE INDUSTRIAL SWEEPER

The S.A.E. standard details various sweeping machines, all with subtly different operating requirements. Our research is aimed at developing lorry based vacuum sweepers for highway use. In these machines drivers have manual



control of the sweep-gear as well as having to drive the vehicle safely on the public highway. Adding the pressures on the driver to minimize downtime as well as drive the vehicle safely the result is that often the sweeper settings are set at the beginning of a shift and not changed regardless of load road conditions or brush wear. The brush setup is important. It is generally accepted that the cup- or channel-brush sweeps about 80% of the debris and the configuration of this brush is therefore especially important. Drivers have cab controls which deploy or retract the brushes, but on standard vehicles the load applied to the brush in operation cannot be varied while an optional extra only allows manual variation of the brush loads. Hence with the lack of reliable data about brush performance and sweepability, the knowledge required to operate such machinery must be acquired through user experience. The mechatronic Sweeper Concept to enable safer and more efficient sweeping it is proposed to develop a semi-autonomous sweeping vehicle as illustrated. A forward-looking sensor will inspect and classify debris lying on a road surface. Using knowledge from the brushing process for the particular debris group detected predictive information concerning the required cup brush conditions will be sent to the control system. In addition to setting the brush characteristics (axial force, brush speed, etc.), the control system will track the edge of the road so that the cup brush is in the best position and orientation to remove debris in the road gutter. By this means driver fatigue will be reduced, brush wear will be minimized and debris removal will be improved. Vehicle emissions should also be reduced.

#### A. High-Speed Drive

The motor used in vacuum cleaners that are used commercially needs to be operated at least than 20 000 r/min. However, as in BLDC motors, the winding inductances can cause a phase delay of the phase current waveform at high-speed operation. Due to this effect, the waveforms of the current and EMF can be out of phase which will cause negative torque generation. It will also cause reduction of the total torque during the operation. Therefore, in this paper, two driving schemes for high-speed operation of the FRM are proposed. The commutation advanced technique and the conduction dwell-time technique. the commutation advanced technique simultaneously advances the switch-on and switch-off instants (angles). A simple model of the machine was proposed and used to simulate the high-speed drive. From the simulation results, it was shown that introducing an advanced angle to the turn-on of this machine could reduce the negative torque generated by the current delay. A prototype was manufactured based on this model, and the starting method proposed by this paper was justified by an experiment.

#### B. Field Survey

There is no such machine yet available anywhere, like the one described through this paper that not only saves human power but also saves time and money so it is important to find out what people are needed practically in the field. So interactions with the people who have been involved in road cleaning activities help us to identify the actual requirement of such machines. Following are some important suggestions and experience given by highly experienced individuals:- 1. Interaction with an employee of MCD having experience of more than 22 years. According to him his job has been made stressful, painful, tedious and hazardous. After cleaning the dust on the street continuously for four to five hours a day. It is very painful to their shoulder and arms. As suggested by him one should develop a machine or equipment which can lower the human effort while cleaning street. 2. Interaction with another women employee at Shaheen Bagh, Okhla, Delhi having experience for 10 years in road cleaning. According to her she has been suffering from asthma due to dust stowed in the air while brooming the streets, roadsides, payments, corner etc, so she gave the suggestion that if any semi-automated machine could be developed by the government to clean the roads, it will be better to her health as well as other people health also.

### III. OVERLOOK AT CURRENT TECHNIQUES

Some current techniques are:-

1. Manual sweeper
2. Vacuum cleaner rate
3. Shovel and spade

The manual operated machines are laborious, time consuming, hazardous, and tedious. On the other side of the flip the petrol and diesel operated machines are costlier. This problem ultimately starts to think for an alternative method which nullifies the disadvantages of former said processes. Further its initiation cost is low, the newly developed concept is a dust collecting machine is operated by human and dc motor power.

To accomplish this innovative idea, the current work is carried out by:-

1. Firstly, literature survey and the complete market review based on the street cleaning processes been done.
2. Prototype model was made to get the full view of the machine, ergonomics was studied for better comfort of the operator and some parts modification have been done out of it.



3. On the basis of the limited power the machined components are designed.
  4. On the basis of designed dimensions the fabrication work of the proposed road side dust collector machine is carried out.
  5. At last, the testing and traits have been taken to specify the load capacity of the machine and its feasible
- The material used is mild steel and thickness of metal sheet used is 0.1mm. The bucket conveyor is installed with the help of two supporting arms on wheel barrow. Conveyer has two rollers, driving and driven and 12 buckets. Conveyer is driven by a 12V DC motor through roller chain mechanism which is powered by the 12 volt battery both installed on wheel barrow. The metallic scoop is attached on bucket conveyer frame in front of the wheel barrow is made up of mild steel. The scoop is wired with a lever mechanism attached to the handle of the wheel barrow to lift the scoop upwards. The scoop also has guide path for dust entering using two metal plates.

#### IV. HARDWARE IMPLEMENTATION



**Figure:1. Hardware Implementation**

At designing an autonomous robotic system that helps people to maintain their highway cleaned during their rush times and also help the highways neat and clean. This can be achieved with a combination of a micro-controller based system, a hardware cleaning module and solar system.

#### V.CONCLUSION

In this paper, we designed and implemented an outdoor curbside sweeping robot for an urban street environment. These cleaning experiments show that the solar based robot is considered to be a robotic solution for a small and portable robot business or consumer product. The multiple applications provide a wide range of functions in which we can clean a pipe, remove metal particles harmful for the road, remove dust and dirt from the road, provide a pick and place mechanism by which obstacles can be removed. By application of simple engineering technology we learned in our engineering life we have assembled such a vehicle which has multiple features being cost effective at the same time. The low budget project is very useful for the society and being cost effective and energy efficient can play a vital role in cleanliness of India. Aiming at the practical problems existing in the existing road garbage cleaning device, this paper proposes a design and implementation scheme of road garbage cleaning device based on ZigBee gateway and image recognition.

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