Auto floor mopping and cleaning bot

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Abstract— Robots have turned out to be an important part of day-to-day life due their effectiveness in assisting humans in various applications. In this paper, we are considering one of those applications in the form of cleaning. Considering this, we are proposing an Arduino controlled model that performs the required operation of cleaning. The main aim of this project is to develop a low maintenance, cost effective, versatile prototype robot that can perform dry as well as wet cleaning. It can operate in autonomous mode and is designed with some additional features like UV sterilization, vacuum cleaner. All these features turn out to be handy in improving the life style of humankind.

Index Terms— UV-sterilizer, Vacuum cleaner, Dry cleaning, Wet cleaning, Automated operation.

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1 INTRODUCTION

In recent times, robotic cleaners have taken major attention in research due to its effectiveness in assisting human in floor cleaning applications at home, restaurants, hospitals, office etc. Robotic cleaners are distinguished on their cleaning expertise like floor mopping, dry vacuum cleaning etc. In this paper, "automatic floor cleaner" is designed in such a way that it is fully automatic in terms of operation and capable enough to make decisions on basis of result of various sensors that are used in this cleaning robot. Arduino controller that also controls the motor with help of driving circuitry controls these sensors. Apart from this, the mechanical design aspect also includes vacuum cleaning mechanism, UV steriliser, and robotic arms to squeeze cloth and perform wet cleaning. The main objective of this project is to provide substantial solution to the problem of manufacturing robotic cleaners utilizing local resource while keeping it low in terms of cost. Apart from this, people who are not well acquainted with technology can use it, as it does not require much of human intervention for its operation.

2 LITERATURE REVIEW

In the [1] paper the operation of cleaning is done using mint cleaning robot that sweeps and mops hard surface floor using a special micro fiber cloth which was developed for this purpose. The Robot designed here is flexible only for hard surfaces, which is usually found in workshops, factories and other small manufacturing units. Since it cannot be employed on any other surfaces, which makes it undesirable from customer point of view. Whereas in [2] paper author describes about a new type of home intelligent cleaner robot that adopts grid scan algorithm which is placed on electric map to realize the floor coverage task and design synthesis detection based on sensor array finding method technology. The main drawback is the

complexity in design and it does not support wet cleaning. Apart from this, the user found it difficult because the user had to reset the location every-time it was used in new place. In [3] paper author have referred to the design of conventional floor cleaning machine for household and commercial places. The bots designed here use solar energy instead of traditional batteries making it ecofriendly but the cost and maintenance of the solar panels make it expensive. Apart from this, the feature of autonomous operation is not available which makes the task tedious as it is controlled manually and people who are not well acquainted with technology cannot use it with ease. The [4] paper explains about a sophisticated robot which can perform dry and wet cleaning but since chemical cleansing agents are used while performing wet cleaning which has harmful effect on health it does not seem satisfactory from users health point of view.

The shortcomings in above-mentioned paperwork have been over-come in our paper. The drawback mentioned in [4] is successfully overcome by using UV sterilizer a feature that is not available in many of existing floor cleaners. Using UV sterilizer does not have any side effect and it assures of purification of environment. In paper [3] the bots have made use of solar energy as traditional batteries do not last long, but from expense point of view it's not convincing so we have made use of two rechargeable batteries placed parallel to each other so that it can complete its operation and can be recharged from time to time thus not being a matter of concern from maintenance point of view. The [2] paper refers to design of bot which uses grid scan algorithm technique for cleaning operation where the location of floor coverage is set prior to operation which tends to be undesirable from user point of view as every now and then the user has to set the location and apart from this it does not support wet cleaning a feature

which is made available in our model. In the [1] the authors have designed the floor cleaner for specific surface that tends to be a disadvantage so the bot designed here is favorable to be employed on any surface.

3 COMPONENT DESCRIPTION

(1)-ARDUINO UNO

Arduino Uno board, which is the controller for the whole assembly. It consists of Atmega328 microcontroller. It is a flexible, small, and user friendly. In order to load new code on to the board one can simply use a USB cable and plays vital role in overall functioning of circuit.

(2)-ULTRASONIC SENSOR

Ultrasonic sensor is a device that can measure the distance to an object by using sound waves so that the kit can avoid the obstacles and continue its operation by changing its direction. This ultrasonic sensor will detect the objects that are in the proximity of this kit and thus it will help in having a smooth operation.

(3)-JOHNSON MOTOR

Two Johnson motors have been used to control the movement of entire kit in required direction. L298N driver IC has been used to control the movement of Johnson motors. 12V external power supply will be provided to maintain its speed.

(4)- UV STERLISER KIT

Ultraviolet germicidal irradiation (UGVI) is a disinfection method that uses short wavelength ultraviolet (UVC) light to kill or inactive microorganisms by destroying nucleic acid and disrupting their DNA, leaving them unable to perform vital cellular function.

FIG-(1) UV STERLISER KIT

(5)-STEPPER MOTOR

A single stepper motor is used for robotic arm movement and apart from this two additional stepper motors are used which rotate in anticlockwise and is used for squeezing purpose

(6)-IR SENSOR

IR sensors are capable of measuring heat being emitted by an object and detecting motion. Therefore, this sensor can detect any intruder in form of human and required action will be taken.
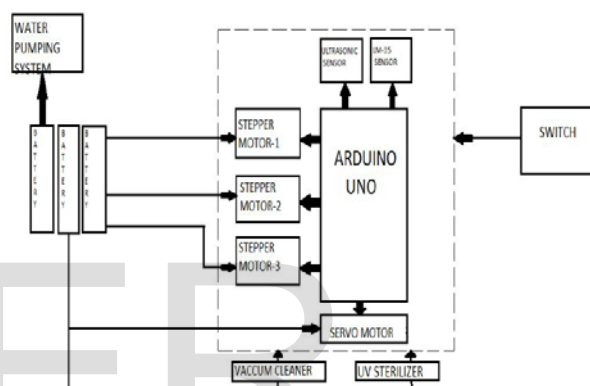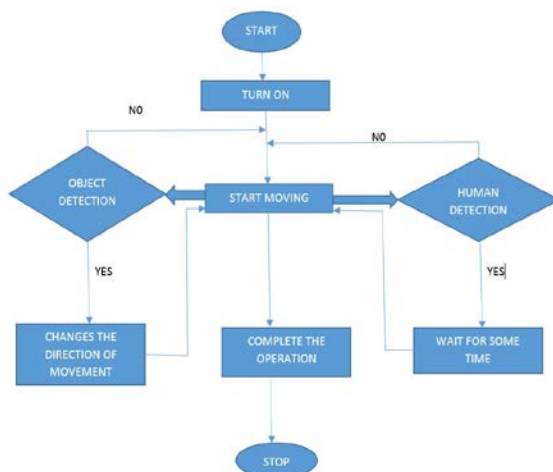
4 BLOCK DIAGRAM

FIG- (2)

5 METHODOLGY

FIG-(3) FLOWCHART

A wide variety of software and hardware implementation techniques is being used here for the purpose of design and

development of the "BOT". Two Johnson motors each of 60 rpm is used for the driving the kit i.e. for the bot's movement in forward, backward or cross directions. A vacuum cleaner is provided at the front end to facilitate dry cleaning i.e. it will use low air pressure to suck up dust and other small particles. The pressure level in area behind the fan drops below the pressure outside the vacuum cleaner and this creates partial vacuum inside cleaner. Water sprinkler is being used for the mopping purpose. A single stepper as shown in motor is used for the movement of robotic arm i.e. to lift the microfiber cloth towards the tank where the water is stored. In addition to this two additional stepper motor, which will operate in opposite direction to each other that, will help in squeezing the cloth and thus perform the required operation of wet cleaning. An ultrasonic sensor is used to detect an object that acts as an obstacle by using sound waves that measure distance by sending out a sound wave at a specific frequency and listening for that sound. On coming across any obstacle, the bot will both take a left or right turn and continue its operation. Apart from this, an IR sensor is used to detect the presence of human being. If a human being comes across the bot then it will wait for sometime and then continue its operation. The bot is equipped with UV steriliser kit which helps in eradicating germs effectively. UV exposure inherits a photochemical protection, which effectively damages the DNA molecule to such an extent that cell division can no longer occur. In this way, it will simplify the manual work and prove to be boon for users.

7 RESULTS

Our project prioritizes on changing the lifestyle by creating more leisure time for people and contribute in a small way of creating a healthy and sustainable environment. The floor cleaning bot proposed here will operate in automated mode thus overcoming the fact that people who are not so well acquainted with technology can use it with ease. The fact that our proposed bot can perform dry as well as wet cleaning and is equipped with UV steriliser makes our floor cleaner user and eco-friendly.
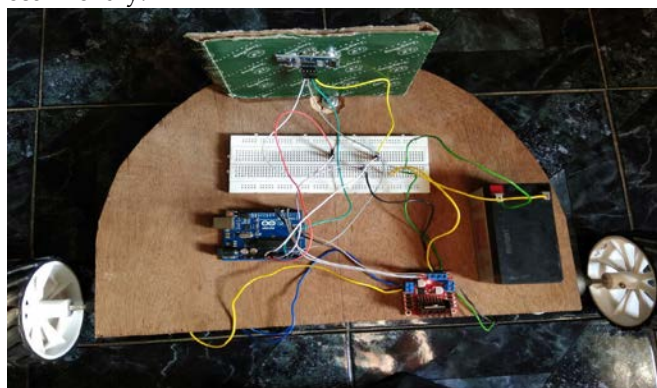

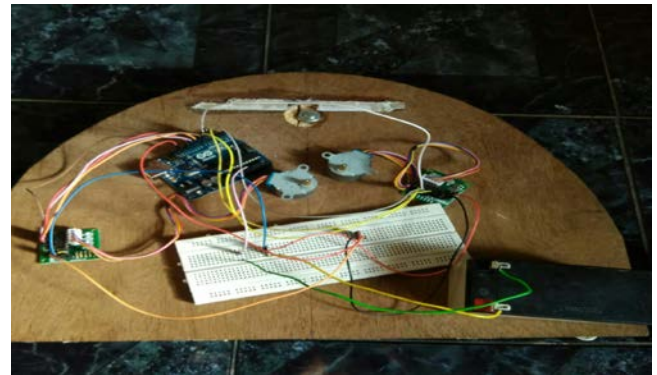FIG-(3) INTERFACING OF ULTRASONIC SENSOR AND IR SENSOR WITH ARDUINO

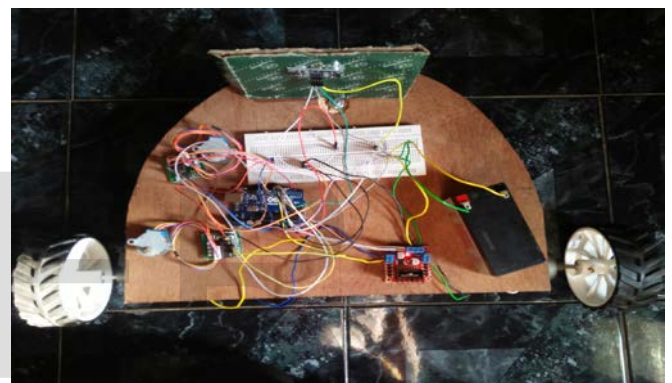FIG-(4) INTERFACING OF STEPPER MOTOR WITH ARDUINO FOR SQUEEZING PURPOSE

FIG-(5) INTERFACING OF STEPPER MOTOR, JOHNSON MOTOR AND SENSORS WITH ARDUINO BOARD

8 CONCLUSION

Robotics and its application is evolving at breakneck speed today. The first generation floor-cleaning robot could not perform wet cleaning i.e. it could perform only dry cleaning nor it was automated in terms of operation and neither could it detect obstacles accurately. However, further advancements made it possible to have wet cleaning but it made use of chemical cleansing agents that left footprints behind and had many health impacts. Apart from this, most of the bots were developed for specific kind of surface. Considering all these factors, we have a put-forth a model that will overcome all the issues. Our bot will perform first dry cleaning followed by wet cleaning and the UV kit will help in sustaining a healthy and sustainable environment thus overcoming the impacts of chemical cleansing agents. Presently these bots are operated

using manually rechargeable batteries and in future, they can be replaced with self-rechargeable batteries and from design point of view, it can be designed in such a way that it can go beneath the furniture and clean every nook and corner of room.

9 REFERENCE

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