Automatic Floor Cleaning Robot

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Abstract - *The world today is governed by automation. When complex operations are made automated to simplify tasks, the benefits of automation can also be tapped to perform simple household tasks. One such task is cleaning. Cleaning, though undermined for its nature of work, is extremely vital. Cleanliness begets a healthy life. However, in hustle and bustle in today's world cleanliness has been neglected. Our automatic floor cleaner is autonomous controlled cleaning machine used to simplify and achieve the task of cleaning. By means of its dry mode all round cleaning and hence good health is achieved. This synopsis describes a smart floor cleaning robot that allows cleaning the floor by giving instructions to the robot. This robot makes floor cleaning process easy and fast utilizing a wireless robotic cleaning system. This wireless system consists of a micro controller application which allows the robot to follow its logic programmed in its micro controller. The proposed robot consists of Arduino controller which has twelve digital input/output pins, cleaner with vacuum pump for efficient cleaning.*

Key Words: **Microcontroller, UART, Zig Zag, Path, Cleaning, Vacuum, Arduino, vSLAM**

1. INTRODUCTION

Cleaning is essential and often overlooked task. In today's world where time is money cleaning has been viewed as time-consuming task. However, cleanliness and hence health cannot be compromised. Many initiatives were taken towards building of automatic floor cleaners. However, most of these robots were either wired or not much efficient. AUTOMATIC FLOOR CLEANER is a smart floor cleaning robot best suited for household & office purposes. It has Automatic control mode. Also, the robot performs dry cleaning parallel saving time and power consumed. The time needed for cleaning may depend on area of the room. Thus, the user can focus on his primary task depending on the cleaning to the robot. Also, our robot as compared to other robots is cost effective.

1.1 Problem Definition

In day to day life we have already done a manual cleaning at some point. But, here an attempt is made to create a robot which minimized the human workload by working autonomously. Hence, completing the dedicated job more accurately and efficiently. The algorithm of the robot directs the robot to an Intelligent path and thus, making it easy for robot to sense and work accordingly. At the same time the cleaning operation is done simultaneously to fulfil its purpose.

2. LITERATURE SURVEY

Many of the cleaning devices uses vacuum for cleaning and autonomous operation is a rare feature in those robots.

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[3]] Uman Khalid , Muhammad Faizan Baloch , Haseeb Haider , Muhammad Usman Sardar , Muhammad Faisal Khan, Abdul Basit Zia1 and Tahseen Amin Khan Qasuria Faculty of Electronic Engineering, Ghulam Ishaq Khan "Smart Floor Cleaning Robot (CLEAR)" Institute of Engineering Sciences and Technology, Pakistan Hamdard Institute of Engineering & Technology, Hamdard University, Karachi, Pakistan 2015.
[4]Manya Jain, Pankaj Singh Rawat "Automatic Floor Cleaner" International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 04 | Apr -2017 e-ISSN: 2395 -0056 p-ISSN: 2395-0072.
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[8] The MI floor cleaning robot launched in market as a new concept in Technology uses Ultrasonic sensors for obstacle detection.
[9] The robot performs only vacuum cleaning. The robot uses vSLAM for mapping and it is also provided with Bluetooth control.

3. DESIGN & IMPLEMENTATION DETAILS

This section is divided into following parts—

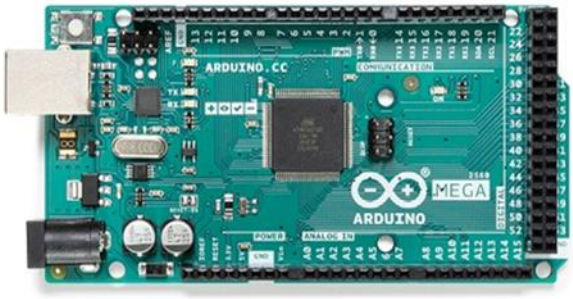
3.1 Components Required

3.2 Block Diagram
3.3 Implementation
3.4 Flow Chart

3.1 Components Required

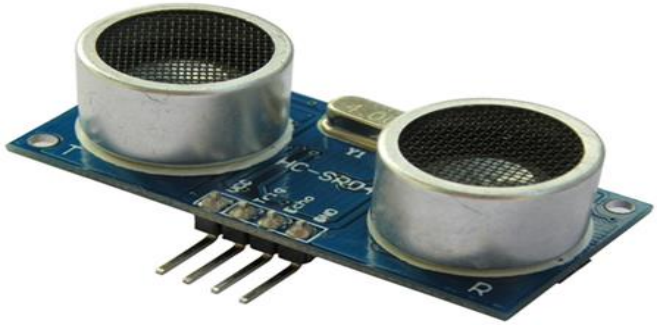
a. Arduino Mega 2560

A micro controller board based on Atmega2560. It has 54 digital I/O pins. 14 can be used as PWM output, 16 Analog inputs, 4 UART (hardware serial ports), 16 MHz crystal oscillator, a USB connection, a power jack, an ISCP header, and a reset button.



b. Ultrasonic Sensor HC-SR04

HC- SR04 is an ultrasonic sensor ranging module that provides 2cm to 400cm non-contact measurement function. The ranging accuracy can reach to 3mm and effectual angle is less than 15 degrees. It can be powered from 5V power.



c. Motor Driver L298N

Double H-bridge drive chip: L298N..Logical Voltage: 5V. Drive Voltage: 5-5V..Logical Current: 0-36 Ma. Drive current: 2A..Maximum power: 25W. Dimensions: 43x43x26mm. Weight: 26g.

d. Jumper Wires

Jumper wires are used for making connections between items on your breadboard and your Arduino's header pins. They are basically divided ino three categories Male-Male, Male-Female, Female-Female.

e. DC motor (geared)

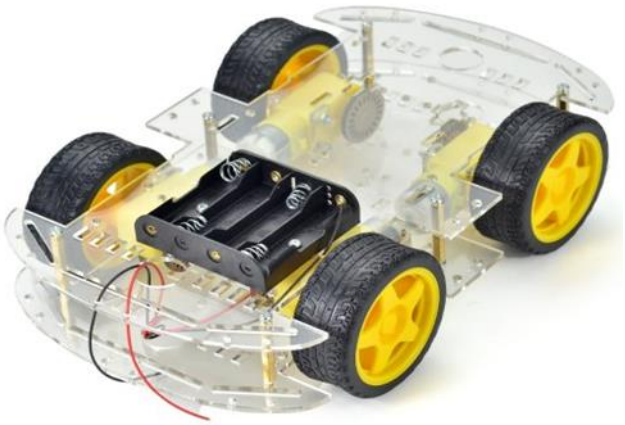
A gear motor is an all-in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output.

f. Vacuum Pump

A vacuum pump is a device that draws gas molecules from a sealed volume in order to leave behind a partial vacuum.

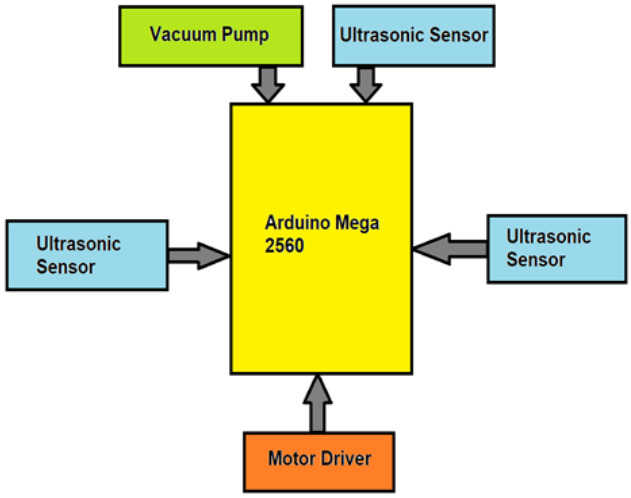
g. Body Chassis

This is a Longer version of 4 wd double-layer smart car chassis. It comes with the four pairs of Geared Motors and Wheels. All the products included in this car kit are quality products. The chassis used in this kit is transparent to create dynamic handling of the components mounted on your robotic vehicle.



3.2 Block Diagram

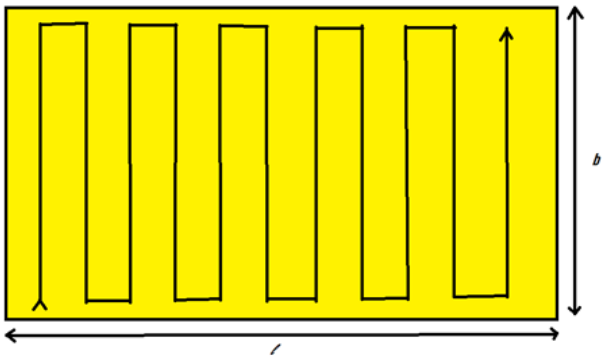
The Robot is designed to move autonomously throughout the room. Ultrasonic sensors that are interfaced to the Arduino Mega serves the role for obstacle detection. Robot continues to trace its path till an obstacle is detected. The vacuum cleaner is used to clean the surface. The Arduino is programmed to follow zig-zag path thus cleaning the whole room simultaneously.



3.3 Implementation

As the Robot traces a Zig-Zag path we can calculate the area of the room by given parameters as length(l) and breadth(b). The more the area of the room the more the time taken by the robot to complete cleaning operation. As mentioned above, Area for Rectangular room = l*b. Similarly, for room of the other shapes,

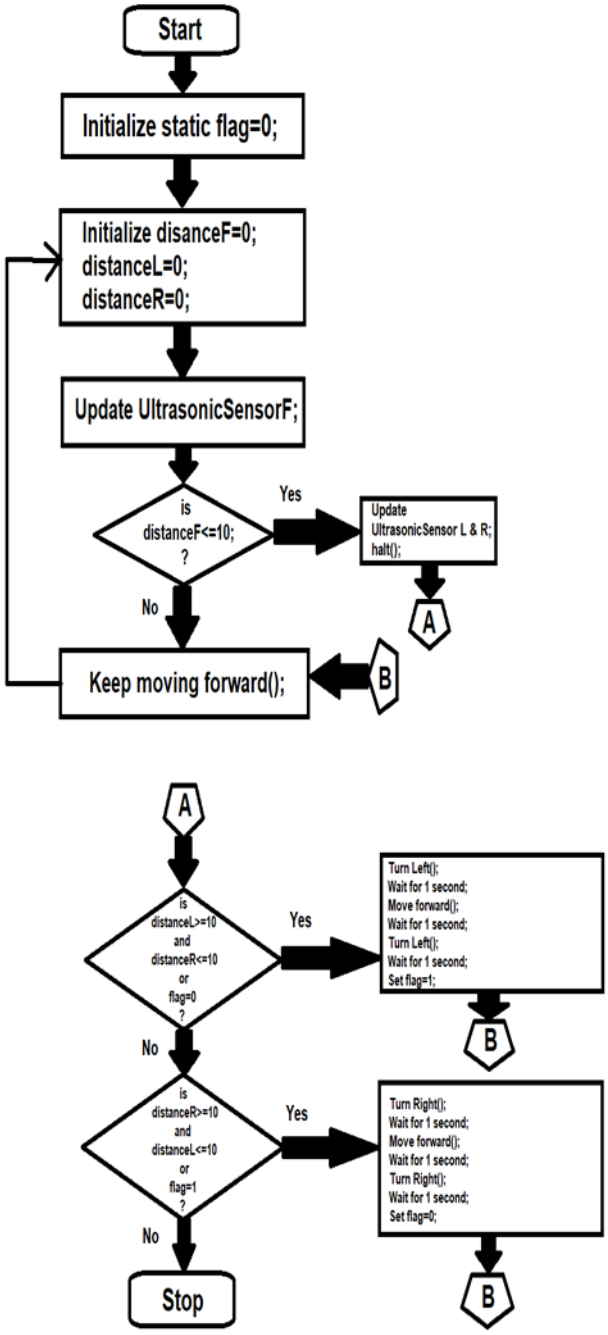
For Circle - A=(pi)r^2
For Square - A=(side)^2



3.4 Flow Chart

The autonomous motion of the robot involves the zigzag movement of the robot, the zigzag motion occurs when the robot encounter the wall or any other objects. A person can wirelessly control the robot using the application as well. The robot can be switched between manual and autonomous at the push of a button on the application. The anterior of the robot sucks dust and the other particles using the vacuum pump. The MPU is used to enable the zigzag motion the robot takes in the automatic mode: In the beginning it is checked if the user has opted for the manual or the automatic mode of operation. In case of Manual Mode we can control the motion of the robot. In the autonomous mode the

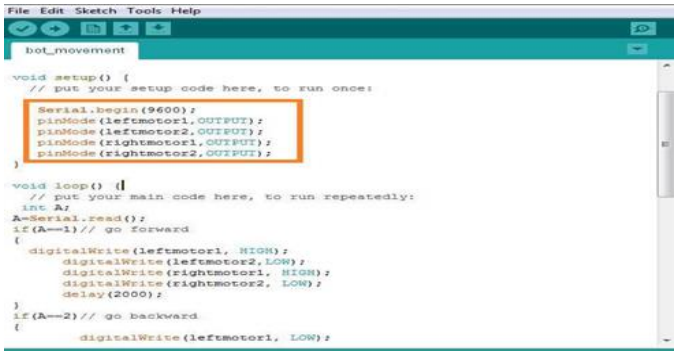
robot navigates the room taking turns with the aid of mpu6050.

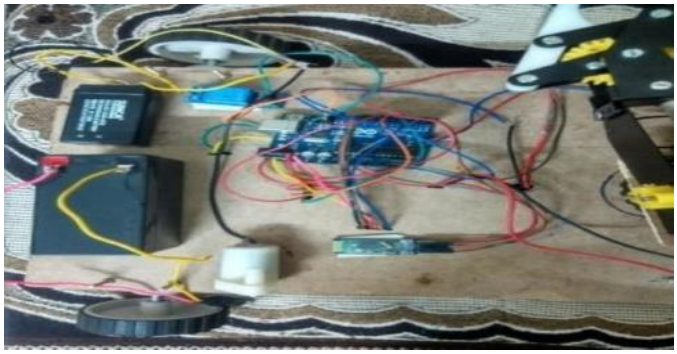


4. CONCLUSIONS

This research paper presents that floor cleaning process can be done in an easier manner and more efficiently by robot utilizing wireless robotic system. This proposed robot reduces the time and cost of labor. In the previous research papers like robot vacuum cleaner and automatic floor cleaner, robot had some drawbacks like colliding with objects in front of it and this vacuum cleaner couldn't reach to small areas and left those areas unclean and the automatic floor cleaner robot collects the dust but the drawback over here is that it does not clean the wet floor. These two drawbacks have been Overcame in this research paper.

5. RESULTS





6. FUTURE SCOPE

The future scopes of the robots are as follows –

- Using 2D mapping to generate a map of the surface to clean and clean it.
- Using disinfectants to kill bacteria using UV light.
- Using window cleaner.
- Reducing the time and cost of runtime operation.
- Efforts to overcome most of the manual work needed to optimize the product.
- Improving the life of the product thus making it more durable.
- Adding features into the operation and product design topology standards.

7. REFERENCES

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