Sweepy – The Smart Floor Cleaner

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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 the hustle and bustle in today's world cleanliness has been neglected. SWEEPY , the smart floor cleaner is both an autonomous and manual controlled cleaning machine used to simplify and achieve the task of cleaning. By means of its dry and wet modes all round cleanliness and hence good health is achieved

***Index Terms*—Arduino Mega, HC-05, Ultrasonic sensors**

I. INTRODUCTION

Cleaning is an essential and often overlooked task. In today's world where time is money cleaning has been viewed as a time consuming task. However cleanliness and hence health cannot be compromised.

Many initiatives were taken towards the building of smart floor cleaners. However most of these robots were either used for dry or wet cleaning. SWEEPY, is a smart floor cleaning robot best suited for household purposes. It has both automatic and manual control modes. Also the robot performs both dry and wet cleaning parallel saving time and power consumed.

The application developed to control the robot provides flexibility to a user. Thus the user is just a touch away from the robot that's cleaning even another room. Also SWEEPY as compared to other robots is cost effective.

II. LITERATURE SURVEY

[1] Performed autonomous motion using IR sensor assembly had vacuum suction. Both autonomous and manual operations.

[2] Uses random cleaning. It exhibits only dry cleaning with no wet cleaning mechanisms.

[3] Uses IR sensors for obstacle detection. had both manual and automatic operations. Autonomous motion involves random motion.

[4] Uses IR sensor for obstacle avoidance. Manual control using RF transmitter and receiver.

[5] uses collision to detect the obstacle and uses rectangular zigzagging to clean an area.

[6]This robot sweeps and mops the floor simultaneously. It follows spiral and random patterns for cleaning. The robot can be controlled through a remote and it costs around $386.

[7]The robot performs only vacuum cleaning. It follows random pattern for cleaning the surface. This robot is alsoprovided with WiFi control. It costs around $195.

[8]The robot performs only vacuum cleaning. It follows zigzag pattern for cleaning the surface. This robot is also providedwith WiFi control. It costs around $399.

[9]The robot performs only vacuum cleaning. The robot uses vSLAM for mapping and it is also provided with WiFi control. It costs around $698.85.

III. COMPONENTS REQUIRED

A. Arduino mega 2560:

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

B. HC-05 bluetooth module:

Range is approximately 10 meters(30 feet). It uses wireless technology standard for exchanging data over short distances (2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs).

C. Ultrasonic sensors 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.

D. L298N motor driver:

Double H-bridge drive chip: L298N..Logical voltage: 5V.Drive voltage: 5-35V.Logical current: 0-36 Ma.Drive current: 2A.Maximum power: 25W.Dimensions: 43 x 43 x 26mm.Weight: 26g

E. MPU6050 gyroscope and accelerometer:

The InvenSense MPU-6050 sensor contains a MEMS accelerometer and a MEMS gyro in a single chip. It is very accurate, as it contains 16-bits analog to digital conversion hardware for each channel. Therefor it captures the x, y, and z channel at the same time. The sensor uses the I2C-bus to interface with the Arduino.

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IV. BLOCK DIAGRAM

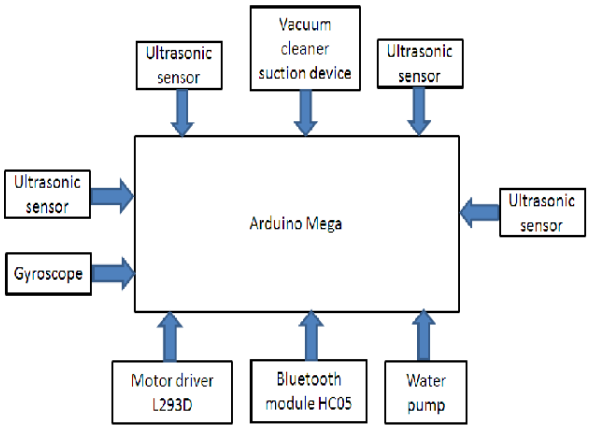


Fig.a block diagram

V. METHODOLOGY

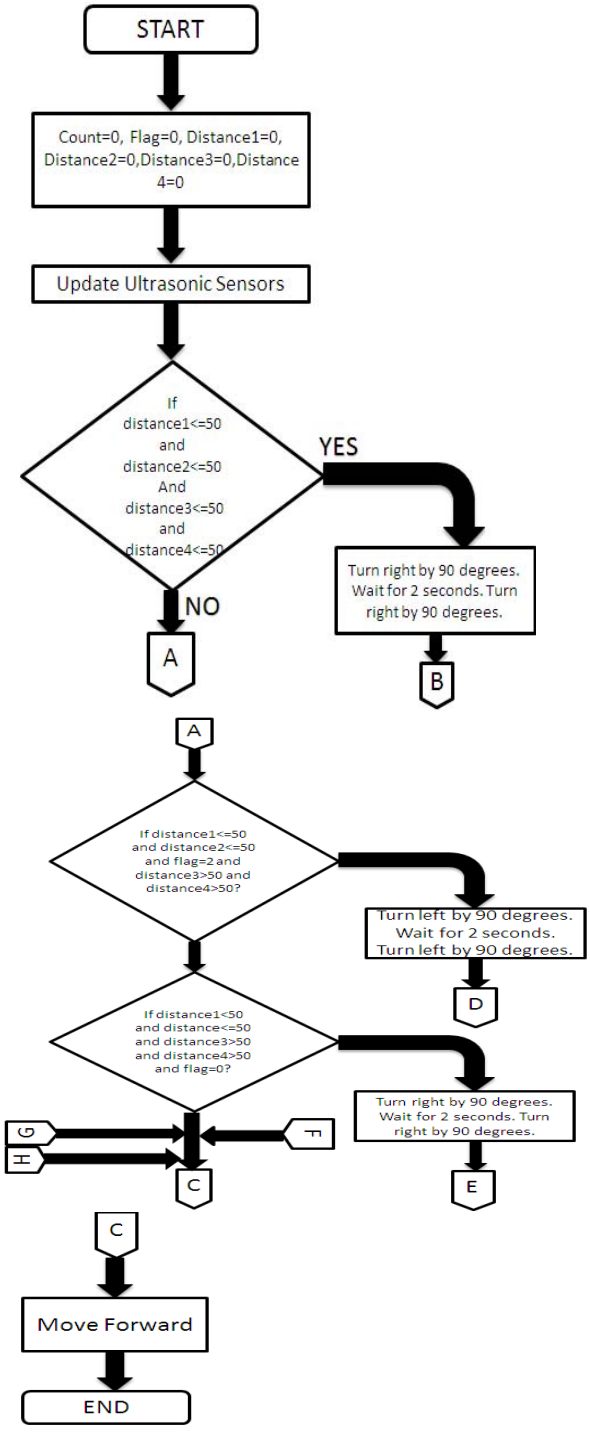
The robot is designed to move autonomously throughout the room. Ultrasonic sensors that are interfaced to the Arduino Mega serves the role for obstacle detection. Moreover, a manual control of the robot is established by using the Bluetooth module HC05 and an application is designed to control the robotic movements. In one sweep simultaneous sweeping and mopping is facilitated. The water pump allows the flow of water to mop an area. A vacuum cleaner is used to suck out the dust and dirt encountered by the robot. The app allows the user to control the accessories on the robot thus enabling a judicious use of power and water**.**

The autonomous motion of the robot involves the zigzag movement of the robot, the zigzag motion occur when the robot encounters the walls or other objects. A person can wirelessly control the robot using the application as well. The robot can be switched between autonomous or manual operation at the push of a button on the application. The anterior of the robot sucks dust and other particles using the vacuum pump. The bottom of the robot performs the mopping enabled via wiper. These accessories can be controlled using the app as well. A drying equipment is placed on the posterior end to dry the area that is mopped.

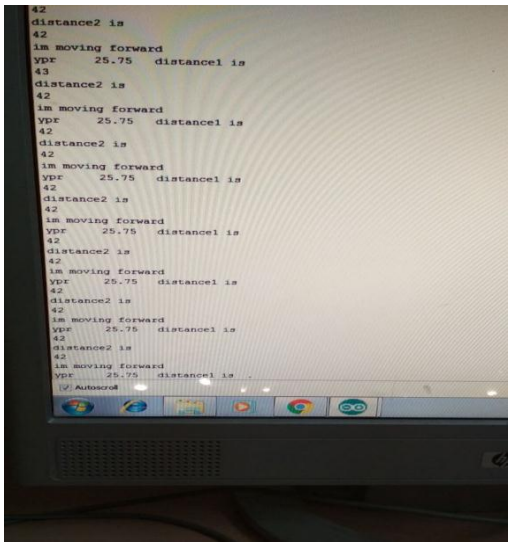
The MPU is used to enable the zig zag motion the robot takes in the automatic mode.

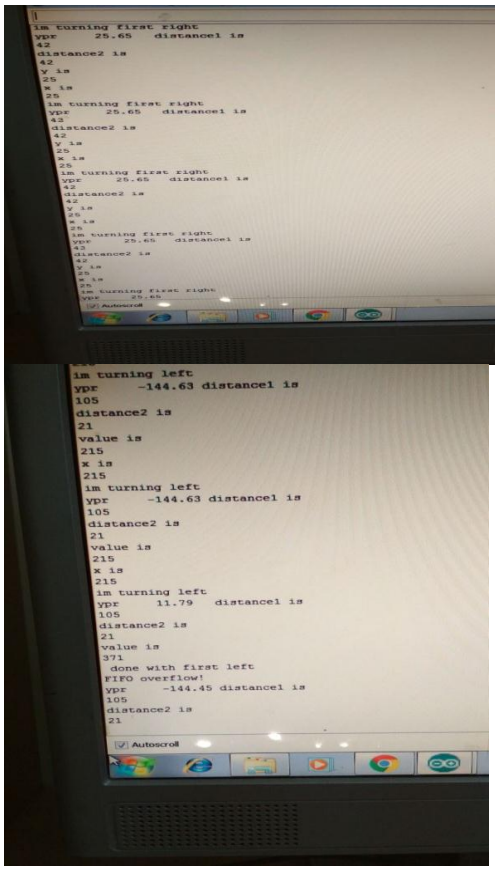
In the beginning it is checked if the user has opted for the manual or the automatic mode of operation. In case of manual mode the user can control the motion of the robot. In the autonomous mode the robot navigates the room taking turns with the aid of the mpu6050.

VI. FLOW CHART



VII. RESULTS





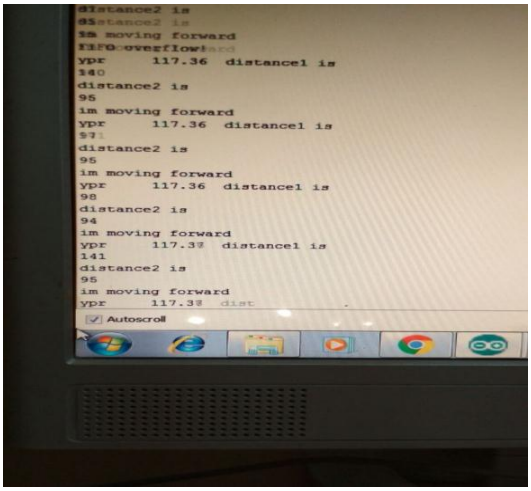


Fig.a the zig- zag motion simulation with the MPU6050 yaw values

VIII. FUTURE SCOPE

- 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

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