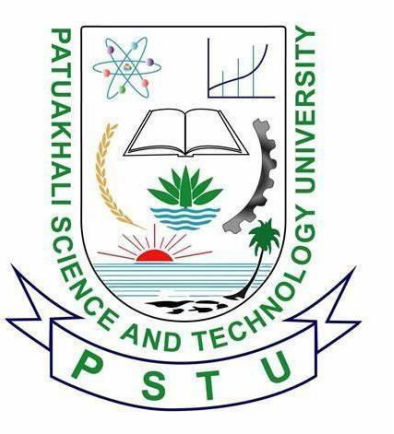

PATUAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY

COURSE CODE EEE-212

Electrical Technology Sessional

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Report on: **Smart vacuum cleaner robot**

Abstract

Nowadays, people are becoming more career oriented and due their irregular working schedule it becomes challenging to maintain both home, office and others working place together especially for women. Most of the cases, they hire the cleaners to clean the home, office etc., but no trust on cleaners. To overcome the problem, Smart Vacuum Cleaner has come up with the more advancement in technology and is designed to automate cleaning process. The application is used to initiate the robot. The navigation of the robot is according to the help of sensors it detects and avoids obstacles. To save the time of the people the smart vacuum cleaner helps to clean the surface of the floor without any human intervention.

List of Tools

No.	Tools
1	Arduino UNO x1
2	Gear motor x4
3	Robot wheel x4
4	L293D Motor Driver x1
5	Ultrasonic sensor x1
6	Li-ion battery x2
7	Li-ion battery holder x1
8	Jumper wires
9	Cock sheet x1
10	Switch x1
11.	Bottle
12.	Small Fan

Introduction:

In the modern era robots are playing an important role in life of mankind with their advance technologies, making the human life easier and comfortable. The cleaning

robot are effective in assisting humans in floor cleaning applications at homes, hotels, restaurants, offices, hospitals, workshops, warehouses and universities etc. For example, the Smart vacuum cleaning is built based on obstacle avoidance with low cost. This work gives the design and development of smart vacuum floor cleaning robot. The robot can be used in domestic and industrial purpose for cleaning the floor periodically without human intervention.

Objectives:

The objectives of the project are as follows:
1. To automatically detect and avoid the obstacles.
2. To collect the dust particles into the vacuum.
3. To control the robot through application.
4. To reduce human effort.

Description of Tools

1.Arduino Uno: The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced with various expansion boards and other circuits.

2.Gear Motor: A geared motor is a component whose mechanism adjusts the speed of the motor, leading them to operate at a certain speed. geared motor have the ability to deliver high torque at low speeds, as the gearhead functions as a torque multiplier and can allow small motors to generate higher speeds.

3.Robot Wheel: A robot wheel is a wheel with rollers attached to its circumference. These rollers are positioned diagonally or at 45-degree angle to the axis of rotation of the wheel. This makes the wheel exert force in diagonal direction when moving forward of backward.

4.L293D Motor Drive H-Shield: The Motor Driver is a module for motors that allows you to control the working speed and direction of two motors simultaneously. This Motor Driver is designed and developed based on L293D IC. L293D is a 16 Pin Motor Driver IC. This is designed to provide bidirectional drive currents at voltages from 5 V to 36 V. Rotation of a motor depends on the enabled pins.

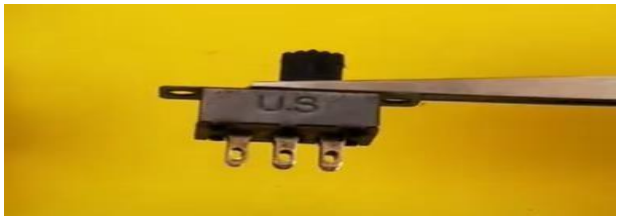
5. Ultrasonic sensor: An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound. Ultrasonic sensors have two main components: the transmitter and the receiver.

7. Li-ion battery: A battery is an energy source consisting of one or more electrochemical cells and terminals on both ends called an anode (-) and a cathode (+). Here for the project, we used two battery of 3.7 volt each.

8. Li-ion battery holder: A battery holder is one or more compartments or chambers for holding a battery.

9. Jumper wires: A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is normally used to interconnect the components of a breadboard.

10.Switch: A switch is used for turning on the power of the vehicle. It controls the battery connection of the vehicle



Procedure

Step 1: Firstly, identify these components.
Step 2: Secondly, cut the foam board piece.
Step 3: Thirdly, glue the four gear motors to the foam board piece.
Step 4: Then, attach the motor shield to the Arduino board and glue it to the robot chassis.
Step 5: Next, dig two holes on either side of the Arduino board and insert the gear motor wire through these holes.
Step 6: Then, connect the motors to the motor driver shield. To do this, use the circuit diagram.

Step 7: Afterward, attach the servo motor and ultrasonic sensor.

Step 8: Next, connect the servo motor and the ultrasonic sensor using the circuit diagram.

Step 9: After, glue the battery holder and connect it to the driver shield.

Step 10: Now, attach the robot wheels and put the batteries to the battery holder.

Step 11: So, let's creates the program for this project. This program includes all three functions. We can run these separately.

Circuit Diagram

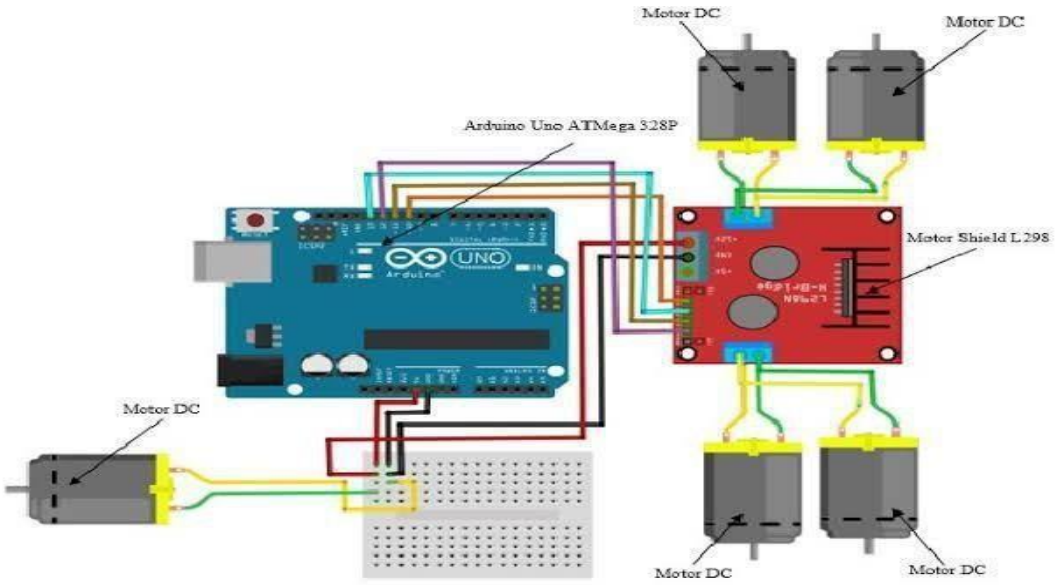


Fig. 3. Arduino Microcontroller Circuit with Motor Dc and Motor Shield

After finishing the project structure:

Coding:

```
#include <AFMotor.h>
#include <NewPing.h>
#include <Servo.h>
#define TRIG_PIN A0
#define ECHO_PIN A1
#define MAX_DISTANCE 200
#define MAX_SPEED 190 // sets speed of DC  motors
#define MAX_SPEED_OFFSET 20
NewPing sonar(TRIG_PIN, ECHO_PIN, MAX_DISTANCE);
AF_DCMotor motor1(1, MOTOR12_1KHZ);
AF_DCMotor motor2(2, MOTOR12_1KHZ);
AF_DCMotor motor3(3, MOTOR34_1KHZ);
AF_DCMotor motor4(4, MOTOR34_1KHZ);
Servo myservo;
boolean goesForward=false;
int distance = 100;
int speedSet = 0;
void setup() {
myservo.attach(10);
myservo.write(115);
delay(1000);
distance = readPing();
delay(100);
distance = readPing();
delay(100);
distance = readPing();
delay(100);
distance = readPing();
delay(100);
}
void loop() {
int distanceR = 0;
int distanceL =  0;
delay(40);
if(distance<=15)
{
moveStop();
delay(100);
moveBackward();
delay(300);
moveStop();
delay(200);
distanceR = lookRight();
delay(200);
distanceL = lookLeft();
  delay(200);
```

```
   if(distanceR>=distanceL)
   {
     turnRight();
     moveStop();
   }else
   {
     turnLeft();
     moveStop();
   }
  }else
  {
   moveForward();
  }
  distance = readPing();
 }

  int lookRight()
  {
     myservo.write(50);
     delay(500);
     int distance = readPing();
     delay(100);
     myservo.write(115);
     return distance;
  }

int lookLeft()
  {
     myservo.write(170);
     delay(500);
     int distance = readPing();
     delay(100);
     myservo.write(115);
     return distance;
     delay(100);
  }

  int readPing() {
    delay(70);
    int cm = sonar.ping_cm();
    if(cm==0)
    {
      cm = 250;
    }
    return cm;
  }

  void moveStop() {
    motor1.run(RELEASE);
    motor2.run(RELEASE);
    motor3.run(RELEASE);
    motor4.run(RELEASE);
    }
```

```
void moveForward() {

if(!goesForward)
   {
    goesForward=true;
    motor1.run(FORWARD);
    motor2.run(FORWARD);
    motor3.run(FORWARD);
    motor4.run(FORWARD);
   for (speedSet = 0; speedSet < MAX_SPEED; speedSet +=2) // slowly bring the speed up to avoid
 loading down the batteries too quickly
   {
    motor1.setSpeed(speedSet);
    motor2.setSpeed(speedSet);
    motor3.setSpeed(speedSet);
    motor4.setSpeed(speedSet);
    delay(5);
   }
  }
 }

 void moveBackward() {
    goesForward=false;
    motor1.run(BACKWARD);
    motor2.run(BACKWARD);
    motor3.run(BACKWARD);
    motor4.run(BACKWARD);
  for (speedSet = 0; speedSet < MAX_SPEED; speedSet +=2) // slowly bring the speed up to avoid
 loading down the batteries too quickly
  {
    motor1.setSpeed(speedSet);
    motor2.setSpeed(speedSet);
    motor3.setSpeed(speedSet);
    motor4.setSpeed(speedSet);
    delay(5);
  }
 }

 void turnRight() {
  motor1.run(FORWARD);
  motor2.run(FORWARD);
  motor3.run(BACKWARD);
  motor4.run(BACKWARD);
  delay(500);
  motor1.run(FORWARD);
  motor2.run(FORWARD);
  motor3.run(FORWARD);
  motor4.run(FORWARD);
 }
```

```
void turnLeft() {
motor1.run(BACKWARD);
motor2.run(BACKWARD);
motor3.run(FORWARD);
motor4.run(FORWARD);
delay(500);
motor1.run(FORWARD);
motor2.run(FORWARD);
motor3.run(FORWARD);
motor4.run(FORWARD);
}
```

CONCLUSION

The smart vacuum robot cleaner is fully operational that navigates according logic. It is operated to achieve cleaning of dry dust particles with more efficiency. Since robot is wireless device, it can navigate to cover the large area. It also makes less human interaction which reduces the human work. The robot cleaner can be further upgrade with the functionalities such as to sense and detect as well as to move in the direction of dust which results in better cleaning of the home, office and other places. Nowadays smart vacuum robot cleaner used everywhere and easier, comfortable in our life.