DESIGN AND DEVELOPMENT OF FLOOR CLEANING ROBOT

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ABSTRACT

Today's world the robots are getting more attention of researchers to make life of mankind comfortable. Now-a-days automation plays a vital role in all industrial application. The main aim of this paper is to develop a floor cleaning robot that can move itself without human guidance. Motor drive circuits and sensors are used for navigation purpose, cleaning and detecting the obstacles respectively. The advantage of using this robot will save time and it will be very much useful for people with mobility issues to clean the house without any difficulties. This paper presents about how the burden of cleaning can drastically be reduced by means of using an automatic floor cleaning robot. The autonomous cleaner robot consists of low power consuming electronic and mechanical parts and it does not need human guidance. The Robot can perform mopping operation. The main objective of this work is to provide a best solution for floor cleaning services with low cost.

Keyword : - *robot, floor cleaning robot, obstacle detection, automatic mopping, low cost automation*

1.INTRODUCTION

Today's world is becoming smarter and more automated. Robots are now available to perform a number of cleaning functions, presenting a promising alternative to costly human labor for anything from floor cleaning to window cleaning. It is also used as a supplement to human employees, cleaning robots eliminate the need for workers to perform many simple and repetitive tasks and allow them to focus more on complex, thought intensive tasks that robots cannot perform (at least, not yet)[1]. Robots introduce a new level of efficiency that human cleaners are simply incapable of attaining due to inherent limits of human productivity. Initially they introduced the cleaning robot only for sweeping the dust particles. Later on, the advancement of technology floor cleaning robot comes into the picture and it cleans the floor as well as it sweeps the dust particles [2]. There are certain benefits for floor cleaning robot like reduces the human effort, save the time of human beings and the human error.

2. FLOOR CLEANING ROBOT SYSTEM ARCHITECTURE

The block diagram of the proposed system is shown in Fig-1. The power supply is given to the proposed system either by using battery or from the main supply. The ultrasonic sensor is connected to the arduino board to measure the distance of the obstacle and the measured distance is displayed by using LCD display [4] [5] [6]. DC motor is used to drive the wheels of the robot by using motor driver L293D and the driver is used to change the robot wheels direction (either forward or backward) depends upon the obstacle position. Mopping unit runs by using dc motor and it is controlled by using a relay circuit. The water flow can be controlled by using the solenoid valve.

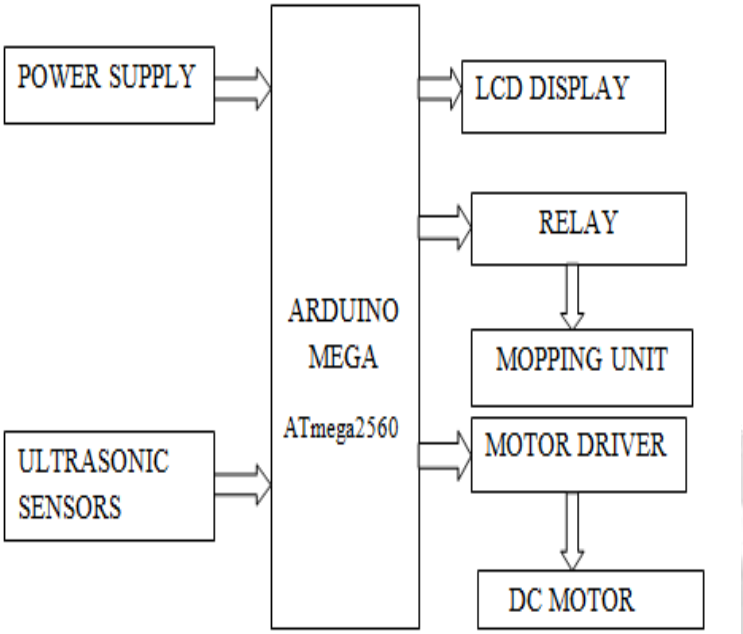

Fig-1: Block Diagram of floor cleaning robot

2.1 OBSTACLE DETECTION AND SOLENOID CONTROL UNIT

In this method the motion of the motor will run at fixed speed. The robot moves in forward direction until an obstacle is sensed by using ultrasonic sensor.

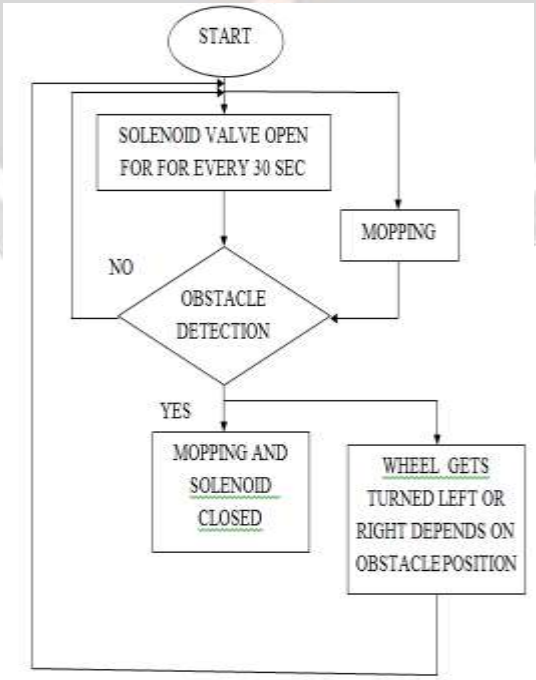

Fig-2: Flowchart for mopping unit, solenoid valve and obstacle detection unit

Once the obstacle is detected ,the robot turns depend upon the obstacle direction(if the obstacle is in right side, the robot will move in the left direction and if the obstacles is in left side ,the robot will turn in right direction) as shown in fig-2. For every 30 seconds, the solenoid valve gets open and it supplies the water to mopping unit. The mopping unit runs with the help of dc motor and it is controlled by using relay circuit. When the dc motor is ON, the mopping unit cleans the surface until an obstacle is detected. When the obstacle is detected both mopping and solenoid valve gets closed [3], and the robot wheels get turns left or right depends of obstacle position. Once the robot wheels are turned the solenoid and mopping unit get open and continue their process.

2.2 ALGORITHM FOR OBSTACLE DETECTION USING ULTRASONIC SENSOR

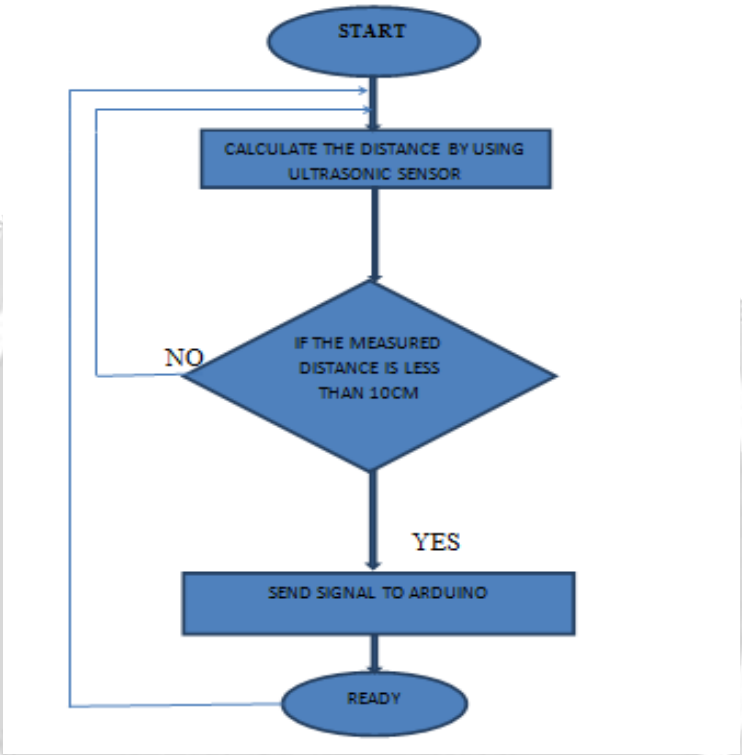

Fig-3: Flowchart for obstacle detection using ultrasonic sensor

STEP1: Start the program

STEP2: If there is any obstacle, the distance has to be calculated by using the ultrasonic sensor

STEP3: The obstacle distance can be calculated by using formula

Distance= (t*s)/2

Where, t=time to bound back the ultrasonic sound

s=speed of the sound, '2'=sound has to travel back and forth

STEP4: If the measured distance is greater than 10cm, the robot will keep on moving either in forward or backward direction.

STEP5: If the measured distance is less than 10cm we have to send a signal to the Arduino and it turns the robot depends upon the obstacles position

STEP6: If there is no obstacle it will calculate the distance and process continuous.

3. PROTOTYPE

The arduino is connected with battery it starts working and it is indicated by LED.When the obstacle is placed in front of the sensor it will measured the distance and the measured distance is displayed by using LCD display.

Fig-4: Final setup of the robot model

If there is no obstacle, the ultrasonic sensor will measure the distance and displayed in the LCD display. If the relay gets ON, the mopping clean the surface as well as solenoid valve starts to spray the water. The prototype of the system is shown in fig-4.

4. CONCLUSIONS

Now-a-days we need everything automated. Home automation helps the people to finish their task in easy manner. The cleaning robot uses a controller to detect obstacles and manipulates its direction as per the inputs and cleans the surface perfectly. An automatic mopping unit consists of water sprayer which sprays water for mopping purpose and thus it cleans the floor. Thus, the proposed system has got a lot of benefits including reduced labor cost, efficient cleaning as well as saves a lot of time. Moreover in certain scenario, it is necessary for the robot to run more than once through the floor to ensure complete cleaning and GSM module helps to enhance its performance by proper communication between user and robot.

5. REFERENCES

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