Microcontroller Based Floor Cleaning Robot

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Abstract: Many of the robotic appliances are being used extensively. Here represents the technology that proposed the working of the floor cleaner using RF technology and GSM module. This robot works on the manual mode. It performs sweeping task **upto 50m range.** *Here RF technology have been used to provide wireless communication between the user and the robot. In the existing system there were many disadvantages like it performs poor cleaning, costly, we need to preclean before using the machine and, it is carried out using wired communication. In the proposed method we have used five motors, one for cleaning and four for movement of wheels. All operations are controlled by PIC16F877A microcontroller. Microcontroller is the brain of robot where program is written and sensors are connected as input and actuators as output LCD is used to display the information in which direction of robot has been moved. In the manual mode the expected task is performed with the help of keypad. If any obstacle is detected then it sends message to the user's mobile which is connected with GSM module. L293D motor driver is used to drive the motors. Five motors are used in this robot and this motors are controlled by the motor driver. The whole circuit is connected with the power supply.*

Keywords: LCD, Keypad, RF Module, GSM Module

I. INTRODUCTION

Robot plays an important role in all the fields of life. It is used at homes, restaurants, schools, hospitals, etc. In this work "microcontroller based floor cleaner" have been designed for various purposes. This floor cleaner operates on manual mode. The communication between the robot and remote is wireless with the help of RF modules. In previous researches, the automatic floor cleaner robot called "MINT" was introduced by Jen Steffen. This robot performs both sweeping and mopping task. Here the clothes are attached for the mopping task and mopping purposes. This robot has automatic water sprayer for completing the mopping task.

In this research work a microcontroller based floor cleaner robot have been developed. This is not same as the vacuum cleaner robot which performs the sweeping task. RF modules have been used in the manual mode for upto 50m range. Five motors are used, one for cleaning and four for wheels. L293d motor driver is used to drive the motors of wheels. In the manual mode,the user itself operates the robot.

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In manual mode, RF module has been used to transmit and receive the information between remote and robot and display the information related to the hurdle detection on LCD and the direction of the robot is also displayed in the LCD. The whole circuitry is connected with power supply of 12V.All the information like starting of the robot and its processes are displayed on LCD. Movement of the robot is controlled by the user and the information are displayed on LCD.

II. RELATED WORKS

In the paper, design and development of floor cleaner robot[1] which works on both automatic and manual mode. This robot is controlled by AT89S52 microcontroller. This robot detects the obstacles in its path by the IR sensor. It uses dual relay circuitry, one for pumping the water and the another for driving the motors. This robot is designed like if it detects an obstacle in its cleaning path, it changes it lane and move back,in its automatic mode. Obstacle detection and hurdle detection in the path of the robot are displayed on LCD.

In the paper The Social Impact of a Systematic Floor Cleaner [2], the robot named Mint was developed to clean and mop the hard surfaces of the floor using clothes was designed. It reveals the works of the robot which works automatically and helps the human being in their daily lifestyles. Mint was designed for the systematic cleaning and it automatically change itself with respect to the surface in which it works.

In this paper "smart floor cleaning robot (CLEAR) [3]" is used for the consumer in the office, hospital environment to reduce the human effort and helps in cleaning the floor. This clear works in the automatic as well as manual mode.In the autonomous mode the decisions are made based on the infrared proximity sensors, ultrasonic sensors and tactile sensors after all the works are being processed by Arduino (mega) controller and control the actuators by the H-bridge driving circuitry. In the manual mode, the robot clean the specific area of the room and all the works are controlled from laptop by using Graphic User Interface in visual studio using the Bluetooth connectivity of the system.

This paper represents a robot which is designed with the Swedish wheels. This robot can perform in the autonomous mode and can be used in the crowded places like hospitals, railways platforms, houses and airports. This robot can turn around without a shaft. It has the power management ability and avoids the obstacles. the kinematics for its control and controlling methods are studied and demonstrated. Its high working efficiency are verified by experimentation. It uses the ultrasonic sensors for the detection of obstacles. This robot can perform the robot cleaning [4].

III. DESIGN METHODOLOGY
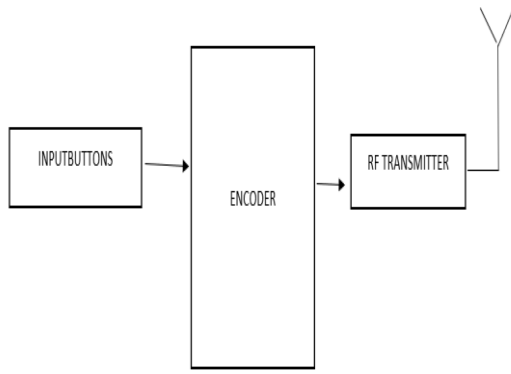
Block Diagram of Transmitter and Receiver:
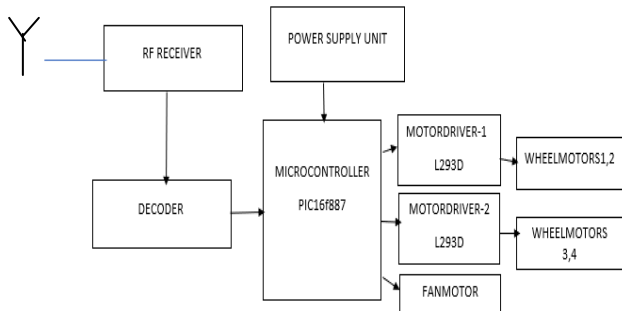

Fig. 3.1 Block diagram of transmitter

Fig. 3.2 Block diagram of receiver

The block diagram of the transmitter and receiver in proposed work "Microcontroller based floor cleaning robot" is shown in the Fig.1 and 2.The manual part is the integration of power(12V), PIC16F877AMicrocontroller, GSM module, RF module, LCD, Motor Driver. Microcontroller is the main part of the system and energized with 5V. PIC16F877A Microcontroller is used because it has many better features like, low power consumption, high speed CMOS flash technology, five ports, has internal Analog to digital convertor, universal Asynchronous Receiver Transmitter, Universal Synchronous Asynchronous Receiver Transmitter for the serial communication. RF modules provides the communication between the remote and the robot which is wireless. RF module operates at 5V power supply and its operating range is 50meter. Five motors are interfaced with the microcontroller, one for the cleaning and another four for controlling the movement of the wheels. Here the RF module is used for the wireless communication between the robot and the keypad which is in under control of the user. In the path of robot if it detects any obstacles it is intimidated to the user through message using GSM module. The keypad is used to give the direction to the robot by the user.

IV. RESULT AND DISCUSSION

Simulation Output

The design is simulated using Proteus Software to ensure the proper operation of the entire floor cleaning robot.
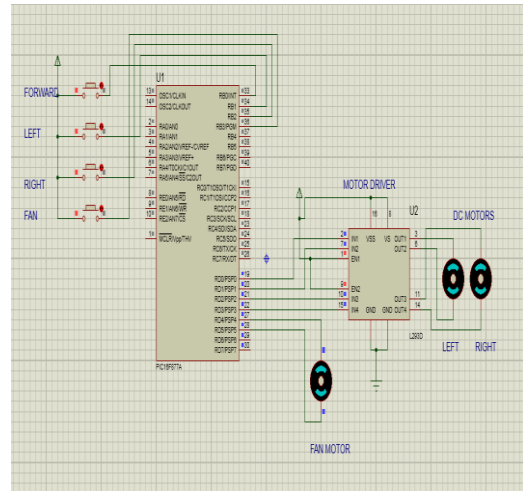

Fig. 4.1.1 Initial stage of circuit

4.2. Hardware Output

Fig. 4.2.1 Indication of the starting state of the floor cleaner
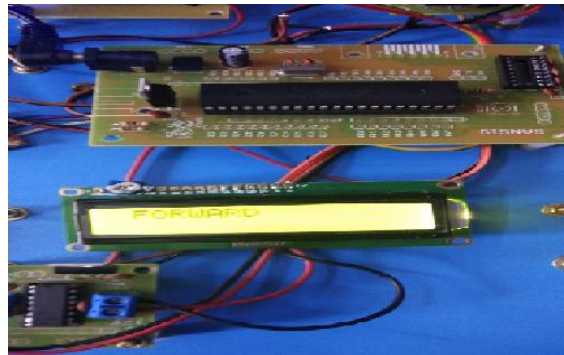

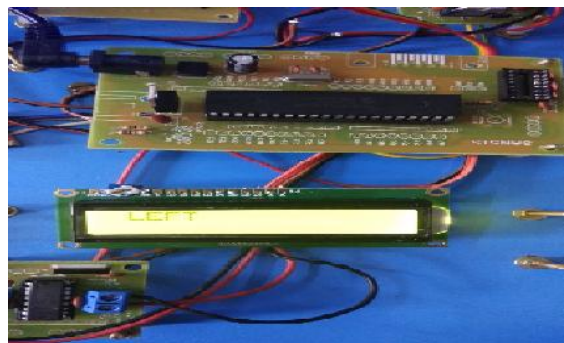**Fig. 4.2.2 Shows the robot movement in forward direction**

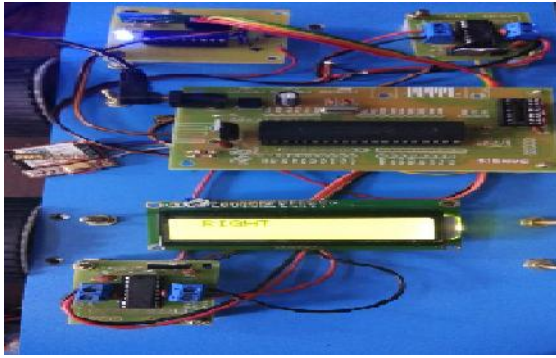**Fig. 4.2.3 Shows the left movement of the robot**

Fig. 4.2.4 Shows the right motion of the robot

These are the output of the floor cleaner showing the movement of the cleaner in the user desired direction.

V. CONCLUSION

In proposed technique we implemented microcontroller based floor cleaning robot to sweep the dust and unwanted waste in the floor. In future enhancement of the project we can use different types of brushes for sweeping the floor based on the nature of the floor. The user has to change the brushes according to the floor manually. In manual mode user itself can control the robot. The project can be extended to municipality corporation for cleaning rough surface by using IOT instead of GSM Module.

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