Auto floor cleaning Robot

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Abstract— **Automation and Human Machine Interaction (HMI) have become essential in this era of mod**

ernization. Imagination has surpassed knowledge in importance. Vacuum cleaners, for example, are effective, but they still require the presence of a human to direct their operation. As a result of these issues, we've come up with the idea of creating a clever and advanced autonomous cleaning robot that cleans and sanitizes without the need for human interaction. Human beings are now occupied with a variety of tasks. People have inconsistent and strenuous work schedules. People will always find a method to save time and reduce workload in such a situation. Robotics are now taking over manual labor. The robot, which is capable of gulping, mopping, obstacle recognition, and water spraying, performs an autonomous and manual mode in the suggested article. The robot is primarily intended for the elderly, disabled, and working women. Raspberry Pi is in charge of both the hardware and software functions.

Keywords— Automatic Floor cleaning, Robotics, Raspberry pi.

I. Introduction

People in today's world are extremely busy. People in cities labor irregularly and for lengthy periods of time. In such a case, one will constantly look for methods to save time. In addition, there is a scarcity of home employees during a pandemic. Technologies are an integral aspect of human existence and aid in the completion of tasks. Cleaning the premises might be done in a variety of ways. However, such procedures were time-consuming, frightening, and required a significant amount of work. People clean their homes using a sweep and a mop. Cleaning became harder for working individuals to fit into their schedules.

The majority of individuals sweep their floors with a hand-controlled mop. As a result, there may be opportunities to cut personnel and human effort. The use of a traditional floor cleaner necessitated a great deal of work and monitoring on the part of the user. Because of these issues, the existing system was not thought to be an effective strategy. With the advancement of technology and the use of automation, this work has become much more efficient and simpler.

Cleaning a house is at the top of the list of household duties most people detest. A self-cleaning floor robot is being developed to assist individuals in completing their cleaning tasks. The building of an autonomous floor cleaning robot utilizing the Raspberry Pi as a platform for processing and managing the input and output is shown in this technique. When opposed to using a manual vacuum cleaner, an autonomous vacuum cleaner robot is supposed to make cleaning easier. The concept is to use a sensor to identify any item and communicate the information to a Raspberry Pi, which will control the robot's movement. With the water spray feature, this robot can vacuum and wipe. It's also configured to travel in a zigzag pattern so that the robot may clean every part of the house while avoiding obstacles on its own. To guarantee proper cleaning, this robot has three ultrasonic sensors and two brushes in front of it. It is intended to be used on a flat surface. This self
contained multi-function floor cleaning robot is ideal for use in homes and small businesses.

II. Literature Survey

The robot plan method in an indoor environment is presented by Zhifeng Wang et al. [1. The sweeping robots cleared the floor using random collision and infrared detection, which was ineffective and time-consuming. The robots' path is tumultuous, and certain sections may require many cleanings. Because the robot must avoid obstacles along its path, inadequate coverage may be a concern. The robot is designed to fit into the interior environment using an elastic route planning algorithm based on a U-shaped trajectory. To prevent colliding, the robot may adjust the length of the journey. Instead of employing an obstacle avoidance strategy, an intelligent algorithm is used to recover the area that was lost due to the obstacle-avoidance. A method is also developed to allow the robot to remember the cleaned area, preventing the robot from cleaning the same area repeatedly. In actuality, after being tested in tests, the robot's coverage rate could reach 94.61 percent, which is greater than random cleaning mode robots and consumes less power than traditional ones..

Anshu Prakash Murdan et al [2] Nowadays, commercial autonomous cleaning robots for homes are relatively widespread. However, a cleaning and mopping robot that is both autonomous and remote-controlled is rather costly. This research presents the design and development of a smart autonomous floor cleaner with an Android-based controller. In the implementation, an Arduino MEGA microcontroller, a floor cleaning system, and a mobile application with wireless communication are employed. The Android app has a secure user login mechanism and uses Bluetooth to connect to the robot cleaner. It may be used to direct

the robot's mobility to vacuum or clean the floor in a specified direction. The user has full control over the robot in either autonomous or remote-controlled mode. The cleaning system is made up of four parts: a power supply (rechargeable dc battery), a motor system (driving wheels, rotating brush, vacuum fan, and water pump), a communication system (Bluetooth control, HC 06 Bluetooth module), and software (Android remote- controlled). Following the implementation and testing of this prototype, it was revealed that the robot functions as planned and has the majority of the functionality of a commercially available state-of-the-art house cleaning robot.

P K Maduri et al [3] Presenting an Automatic Disinfectant Robot capable of cleaning, sanitising, and disinfecting the floor surface by eliminating hazardous microorganisms utilising vacuum cleaner, sanitizer, and UV ray disinfection techniques, respectively, without involving humans is becoming an inescapable necessity. Aside from dusting the floor, the robot must be able to clean the wall to the highest possible height. The suggested robot is intelligent enough to cover both simple and sophisticated pathways as required, allowing it to be employed in a range of scenarios. UV light is controlled for security purposes so that it does not hurt humans when it is exposed to a certain region of the surface for a set amount of time. All of these operational factors are combined in such a way that the robot can clean efficiently and safely around the clock. If the bot's activities must be controlled manually, a straightforward way for doing so must be accessible.

Manasa M et al [4] Currently, a vacuum cleaner is attached to an RC vehicle. An ultrasonic sensor is built into this device to help it avoid big obstacles like tables, chairs, and walls. The car drives in the direction where the distance between the obstacle and the car is higher, avoiding accidents with the obstructions, thanks to this sensor that measures distance. The vacuum cleaner has a CPU fan built in, and a hose is connected to the mouth of the bottle. The whole thing is run by batteries.

Yuda Irawan et al [5] explains how to use an Arduino and an ultrasonic sensor to create an autonomous floor cleaning robot. The Ultrasonic Sensor, Motor Shield L298, Arduino Uno microcontroller, Servo, and Dc Motor are among the components that make up the floor cleaning robot. The Motor Shield L298 controls the DC motor when the Arduino Uno microcontroller processes the ultrasonic sensor as a distance detector and a DC motor as a robot driver. When an ultrasonic sensor detects a barrier in front of the robot, it will seek a path that is not blocked. The sensor's distance value is calculated when the distance detected by the ultrasonic sensor is less than 15 cm. The value of the ultrasonic sensor distance was measured, and several circumstances were revealed as a result. At a distance of > 15 cm, the prototype cleaning robot for road floor cleaning achieves its condition, but at a distance of 15 cm, the prototype cleaning robot for street floor cleaning comes to a standstill.

III. PROPOSED SYSTEM

The block diagram of the proposed system is as shown in Fig. 1.

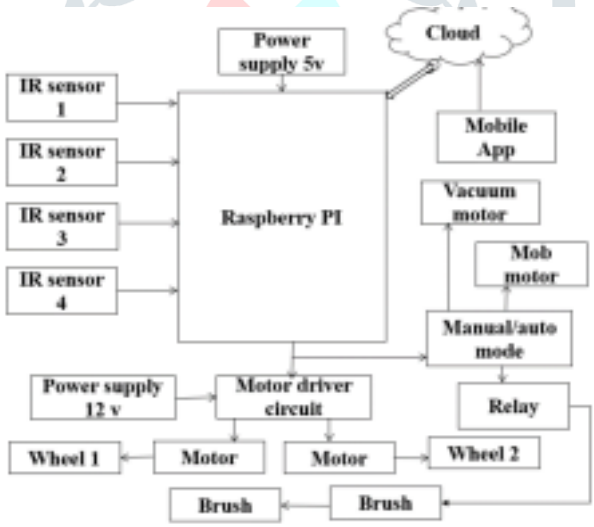

Fig. 1. Block diagram of automatic floor cleaning robot

Figure 1 depicts a block diagram of this research project to have a better understanding of the job to be done The block diagram is separated into two sections: automatic (robot) mode and manual (remote) mode. The power supply (12V), Raspberry Pi, Ultrasonic sensors, IR sensors, and other components are all integrated automatically. The Raspberry Pi is at the heart of this system, controlling all activities and running on 5V electricity. Because of its superior qualities, such as being a low-power, high-performance microcontroller, the Raspberry Pi is widely utilised. Ultrasonic sensors are used to identify obstacles. If an object gets in the path of the robot, the ultrasonic sensor detects it and sends a signal to the microcontroller,
which causes the robot to shift lanes automatically and resume cleaning. The wheels are driven by two motors, while the robot is driven by stepper motors.

In addition to auto and manual modes of operation, the robot may be controlled through IoT cloud via a mobile app. The Blynk app will have buttons for forward, reverse, left, and right to control the robot.

The system connects to an IoT via the Blynk IoT app when we select manual mode. This app runs on an Android phone and allows the user to send commands based on their input. Based on these commands, the transmitter sends movement commands to the robot. The transmitter is an Android device that enables users to send orders to the robot. When the microcontroller receives movement commands over Bluetooth from an Android device, it decodes them and operates the motors to achieve the desired motion. The sprayer and cleaning operation may also be controlled using the Android app. Cleaning the floor becomes a simple, quick, and painless process as a result of this.The "Automatic smart mop" has a very basic design and is simple to operate for everyone. The machine is also tiny and portable, allowing us to quickly transport it from one location to another. It can work in the event of a power loss and does not require human intervention.

IV. IMPLEMENTATION

Software Requirement

- *Language: Python*

Python is a general-purpose programming language with a wide range of applications & supports a variety of programming scripts as well as a syntax that allows you to utilize programmes written in a variety of languages, including C++ and Java. The language has constructs that allow for clear programming at all scales. Python is a basic and straightforward language to learn, and writing Python code is much easier than writing code in other languages.

Hardware Specification

- *Raspberry Pi*

The Raspberry Pi is a credit card-sized, low-cost computer that connects to a computer monitor or television and uses a standard keyboard and mouse. It's a handy little device that enables people of all ages to learn about computers and programming languages such as Scratch and Python. A Raspberry Pi is tiny computer that can use USB storage to emulate hard drives and consumes very little power.

Fig 3.: Raspberry Pi 3B+ model

- *IR Sensor*

The working principle of an infrared sensor is similar to the object detection sensor. This sensor includes an IR LED & an IR Photodiode, so by combining these two can be formed as a photo-coupler

Fig 4: IR sensor

- *Motor Driver L293D*

The L293D Motor Driver Module is a medium-power motor driver that can operate DC or stepper motors. The IC utilized is the L293 motor driver. It can switch four DC motors on and off, as well as regulate the speed and direction of two DC motors.

Fig 5 : Motor Driver L293D

· *12V DC Motor*

A geared motor is a simple DC motor with a gearbox connected. 150 RPM, 12 Volt DC Motor All-terrain robots, for example, might benefit from this. The middle of the shaft of these motors has a 3 mm threaded drill hole, making it easy to attach them to the wheels or any other mechanical assembly. In robotics applications, 150 RPM 12V DC geared motors are commonly employed.

Fig 6 : 12V DC Motor

· *Water pump*

The 370 Diaphragm 3-5V Self-Priming Compact Micro Vacuum Pump is compact, power - efficient, and performs well. It's a diaphragm pump that also functions as a water pump, a water suction pump, and a vacuum pump. It may be used with 3 x 5mm.

Fig 7 : Water pump

· *DC motor*

For high-speed operations, the "18000RPM Motor DC 12V" won a majority from Electronics Hobbyists. The best choice for electronic projects. This DC Motor, with its high 18000 RPM, is commonly employed in a variety of high RPM applications, such as remote-controlled model aircrafts and suction. This motor's 2mm diameter shaft is easily linked with commercially available Rotor blades.

Fig 8 : DC Motor

V. RESULT

Fig. 9. Hardware picture of automatic floor cleaning robot.

VI. CONCLUSION

The proposed approach includes a powerful floor cleaning equipment that can mop and sweep. This robot has a manual and automated mode of operation. The system also includes an ultrasonic sensor for obstacle detection. The detecting range for obstacles is 10 cm. The robot is primarily focused on saving time and is of great assistance to working women, the elderly, and the handicapped. The manual mode may be simply handled via the smartphone app.

VII. REFERENCES

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