

Design and Development of an Automated Floor Cleaning Robot for Domestic Application

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Abstract - With the advancement of technology, robots have gotten more attention of researchers to create lifetime of mankind easy. The actual project presents the look and development of Floor Cleaning Robot using IEEE Standards. Developing Bluetooth controlled mobile robot. Scan the obstacles ahead of the robot and to avoid collision when the robot is in motion. Raspberry Pi3 is that the main component won't to control the cleaning robot. An ultrasonic sensor which transmits the ultrasonic waves from its sensor head and again receives the echo waves and sends its output to the Raspberry Pi3. The ultrasonic sensor is connected with the servomotor, which helps within the rotation of ultrasonic sensor. The ultrasonic sensor measures the space between the robot and therefore the obstacle ahead of it. The Pi3 model will stop the robot immediately and also the buzzer are actuated. The mopping operation will be started or stopped at any point of your time as per the need. The mopping brush is actuated by the DC motor fixed thereto. Signal to the present motor is fed by the controller. An LCD displays each and each operation applied by the robot. Buzzer is an audio signalling device that provides the indication of operating status of the robot.

Keywords - *Raspberry Pi 3; Sensors; Buzzer; LCD; DC Motor.*

I. INTRODUCTION

These day's humans lead a sophisticated life. People within the cities don't have regular and have long working times. In such a situation someone will choose time saving methods. Thus robots have taken the manual works. For career oriented and job going women it becomes hectic to handle home and office together. Traditionally floor is cleaned with the assistance of mop or wet mop using the hand as a possible tool. they need to clean hard on the surface. The cleaning includes cleaning of varied surfaces basically cement floors, highly polished wooden or marble floors. Among these floors the rough surface floor like cement floor, mostly present in semi urban areas are covered with such a lot dust which needs longer for cleaning. For saving the time the necessity was of House Cleaning Robot, which is an automatic system that works and cleans on its own without human control/intervention. Autonomous robot for floor cleaning application reduces much time in lifestyle. It performs sweeping and mopping tasks at a time, it also does obstacle detection, and also has automatic water spray. Service robots are getting popular recently these robots operate semi- or fully

automated to perform services helpful within the well-being of humans and equipment. Robots of types including medical robots, underwater robots, surveillance robots, demolition robots and other styles of robots those do a multiple jobs. they'll clean floors, mow lawns and guard homes and can also help in assisting old and disabled people, perform some surgeries, checking pipes and sites that are highly dangerous to people, fight fires and defuse bombs.

II. LITRATURE SURVEY

Floor cleaning robot may be a trending concept in these recent days. By reviewing different paperwork and techniques of used several cleaning robots, we've started acting on our design of floor cleaning robot which is predicated on Raspberry Pi 3 model. The papers surveyed for literature review are as follows:

Aishwarya Pardeshi et. al, [1] This paper presents the look, developed and fabricated model of programmed cleaner robot. this type of robot performs automated function with extra features like choose and place mechanism and dirt container with air vacuum mechanism. this type of labour is straightforward and helpful in betterment of life variety of a mankind.

Ajith Thomas et. al, [2] proposed an autonomous robotic for floor cleaning program. it's able to perform sucking and cleaning, detection of obstacles, and water spraying. Furthermore, it's also able to add manual method. All hardware and software functions are manipulated by Raspberry pi3 model.

Vaibhavi Rewatkar and Sachin T. Bagde [3] provided a comprehensive overview of the technological advantages helped within the real world for the convenience of just about all of the people that are extremely busy. Consequently, this has led to arriving up with a goal of constructing an automatic home appliance. The review includes computerized cleaner having components to DC motor operated wheels, the dustbin, cleansing brush, mop cleansing and obstruction avoiding sensor. A 12V battery is employed for supplying power. Special technique of ULTRAVIOLET germicidal cleaning technology. The study has been done keeping in mind economical expense of product.

Vinod J Thomas et. al, [4] designed a cleaner robot for domestic application. The robotic contains a cleaning module which may be used for cleaning. The Robot was created in order that it may well be capable of reach almost every space and corner of any room that it must be as compact as possible. The working robot is handled using an Android phone using Wireless Bluetooth Technology. The robot was created with an Arduino microcontroller at its core. The microcontroller is complemented with communications modules like Wireless Bluetooth motors and dirt Suction System to work accordingly.

Manya Jain et. al, [5] discussed the event of Automatic Floor Cleaner. The project is often used for domestic and professional purpose to scrub the surface automatically and manually. When it's turned ON, it gulps within the dust particles by moving everywhere the surface (floor or the other area) because it moves over it. the driving force control mechanism are often wont to drive the motors where robot having the ability to manoeuvre and also the also few sensors are accustomed detect and avoid the obstacles. this can be often useful in making the approach to life better for humankind.

Abhishek Pandey et. al, [6] reviewed the requirement of a residence Cleaning Automatic robot. For keeping time there's a requirement of programmed system that cleans alone without person interventions. Also, they considered how precisely to help those that have physical disabilities. Because that they had to induce this done, they needed a cleaning system that may add accordance from what we are saying, thus supporting a physically someone.

Karthick.T et. al, [7] is intended to create up an autonomous automatic robot which will move itself without constant human instruction. The autonomous cleanser robot involves low power consuming electric components and it can operate at very low power. Electric parts are the controller board Atmega 2560, Ultrasonic detectors, transformer IC and motor driver circuit. Mechanized part is motor unit with gearbox founded. Ultrasonic detectors will identify obstructions in line with the program being executed. A 12V, 4.5Ah rechargeable lead acid electrical device is that the energy source for this proposed cleaning automatic robot.

Manreet Kaur and Preeti Abrol, [8] came up with the working of automatic robot Floor cleaning. This automatic robot can add any of two methods. All hardware and software functions are handled by AT89S52 microcontroller. This automatic robot is in a position to perform sweeping and mopping job. RF modules is getting used for cordless communication between remote (manual method) and automatic robot has range of 50m. This robot is given with IR sensor for obstacle recognition and automates water sprayer pump. Four motors are being employed, two for cleaning purpose, one for pump and one for tires. Dual relay circuit is employed to work the motors one for the pump and another for the cleaner. In previous works, there's no use of automated water sprayer and works only in programmed mode. With the automated mode automatic robot controls all the functions itself and alter the road if just in case there's hurdle detection and moves back again. With the manual method, the keypad will be accustomed execute the expected job and operate automatic robot. In manual method, RF component is employed to transfer the knowledge between remote and automatic robot and display the data associated with the hurdle detection on LCD. the entire circuitry is associated with 12V electrical device pack.

Zelun L, Zhicheng Huang, [9] designed a cleaning automatic robot predicated on the ultrasonic basics. With the sole chip microcomputer AT89C52 and ultrasonic detectors the robotic can do the characteristic of practical impediment avoidance, programmed manage and programmed sweeping. Within the cleaning automatic robot, a revolving cylindrical brush is used before the automated robot and it sweeps garbage in to the dustbin along the way of motion, and a mop is used behind the automated robot, and it can sweep the ground when the automated robot is functioning.

Rupinder Kaur [10] designed a swabbing automatic robot which is extremely good for cleaning jobs especially in homes, Office buildings, Industries where sanitation could be a significant matter. Many research organizations are active in locating the most effective results through the unreal intelligence. Certainly, artificial intellect could be a branch of technology which makes computers sounds like mind. This product will sweep, and mop the bottom area with clean and other wiping components; and yes it collects the dust particles and other small parts in it. Mapping is wont to instruct this small device. These devices is just too simple to use, very affordable and cleans every nook of the region. Being autonomous, it could add one's absence.

S Monika, K Aruna Manjusha et. Al [11] This research paper presents that floor cleaning is worn out a neater way and efficiently by robot utilizing wireless system. This proposed robot saves the time and economy of labour. within the previous research papers like robot household appliance and automatic floor cleaner robot had some drawbacks like colliding with objects before of it and this vacuum couldn't reach to small areas and left those areas unclean and therefore the automatic floor cleaner robot collects the dirt but the downside up here is that it doesn't clean the wet floor. Few of the drawbacks during this project paper are overcome. Amit Sharma,

Akash Choudhary et. al [12] the target of this project is to form a totally automated hybrid home cleaning robot. Which is fully automated and may perform tasks like mopping and cleaning of floor. After the testing we discover that it can perform all tasks fine with none hurdle. We tested our robot on various parameters like path following, obstacle avoidance, navigation, mopping and vacuum mechanism.

III. LITERATURE REVIEW AT GLANCE

Sr. No.	Title of Paper	Further extension	Major Contribution
I.	“Automatic floor Cleaner”	Pick and place mechanism	Brings flexibility to do work
II.	“An Advanced Mobile Robot for Floor Cleaning”	Environmental friendly	Less time consuming
III.	“floor cleaning robot”	Auto disposal mechanism	Helps physically disabled people
IV.	“Automatic Floor Cleaner”	work automatically.	able to cover large floor areas.
V.	A Technological Survey on Autonomous Home Cleaning Robots	Dealing with some small pieces of garbage, such as paper chips, paper & soil block	Saves time, Helps physically disabled people

VI.	Simple Autonomous cleaner Robot”	Consumes less power	Saves time
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IV. PROBLEM STATEMENT

Nowadays, people lead a busy life. People in urbans have abnormal and long working hours. In such a situation an individual will always find ways of saving time.

- For career oriented and dealing women it's hard to handle home together with job work.
- Normally floor is cleaned with the utilization of dry mopped or wet mopped using the hand as a base tool. they need to be scrubbed hard on the surface.
- The cleaning module includes cleaning of varied surfaces like cement floors, highly polished wooden or marble floors.
- The rough surface areas like cement floor, are covered with heavy dust which consumes longer in cleaning.

V. SOLUTION STRATEGY

- For time saving purpose the House Cleaning Robot is important, which is an
- Autonomous robot for floor cleaning application reduces much time in existence. It does sweeping and mopping tasks at a time, it also detects obstacles, and has automatic water sprayer.
- Automated Floor Cleaner are designed for cleaning offices, homes also in collages. In one amongst the mode this robot is making decisions on the premise of humans or various sensors which are employed in this robot.
- Manual works will be replaced by the robot technology and lots of the related robot system applications are used.

VI. METHODOLOGY

Battery operated cleaning robot cleans and mops at the same time using the smartphone connection. Raspberry Pi 3 is the main controller used to control the cleaning robot. It is a Raspberry Pi 3 model based on Raspbian buster OS. Raspberry Pi 3 is open source software in which hardware can be easily used. Raspberry Pi 3 is energized by 12V, DC battery. Bluetooth electronics app controls cleaning robot with an android device. This app communicates using Bluetooth to an HC-05 Bluetooth module in the robot. An ultrasonic sensor is used for obstacle detection which transmits the ultrasonic waves from its sensor head and again receives the echo waves and sends its output signal to the Raspberry Pi 3 will stop the robot immediately and the buzzer will be actuated. The ultrasonic sensor is connected with the servomotor, which helps in the rotation of ultrasonic sensor. The ultrasonic sensor measures the distance between the robot and the obstacle in front of it. If any obstacle is present in front of the robot, IR sensor gives signal to an ultrasonic sensor is used for which it transmits the ultrasonic waves. L298N driver circuit is used to drive the DC motors simultaneously in all of the direction. Raspberry Pi 3 sends the signal to the motor driver circuit that controls and drives the wheel.

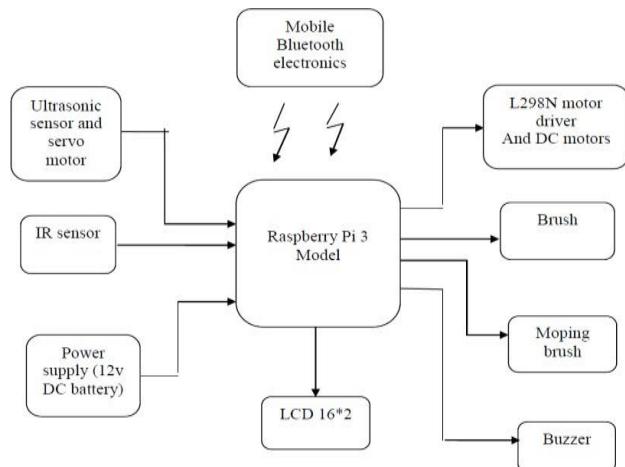


Fig 1: Block diagram of proposed methodology

According to the programming instructions in the Raspberry Pi 3, as the robot starts moving the brush fixed in the front part of the robot starts sweeping. The mopping operation can be started or stopped at any point of time as per the requirement. The mopping brush is actuated by the DC motor fixed to it. Signal to this motor is fed by the controller.

An LCD is a display device that receives signal from the Raspberry Pi 3 and displays each and every operation carried out by the robot. Buzzer is an audio signalling device that gives the indication of operating status of the robot.

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An LCD is a display device that receives signal from the Raspberry Pi 3 and displays each and every operation carried out by the robot. Buzzer is an audio signalling device that gives the indication of operating status of the robot.

VII. OBJECTIVES

- Developing Bluetooth controlled mobile robot.
- To scan the obstacles earlier than the robot and to avoid collision when the robot is in motion.
- To test the trail status using IR sensor.
- To create a robot this carries out sweeping operation efficiently.
- To try to mopping operation whenever needed along with sweeping.

VIII. CONCLUSION

The robot is specially built on the use of modernised technology. it's all the features that are required for a floor cleaner. It works automatically and manually. it's auto drain feature. this could be locally manufactured smart floor cleaner robot. Meanwhile it's scheduling features which can be operated by computing only, android and windows app can make it little more user friendly.

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REFERENCES

- [1] P. Aishwarya, S. More, D. Kadam, V.A. Patil, "Automatic Floor Cleaner", IJECT vol. 8, 2017.
- [2] T. Ajith, M. S. Rohith, J. Febin, J. Cherian, R. Mary George, "An Advanced Mobile Robot for Floor Cleaning", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 5, no. 3, 2016.
- [3] R. Vaibhavi and S. T. Bagde, "A Review on Design of Automated Floor Cleaning System", International Journal on Recent and Innovation Trends in Computing and Communication, vol. 3, no. 2.
- [4] V. J Thomas, B. Xaviour, J. K George, "Cleaner Robot", International Journal of Emerging Technology and Advanced Engineering, ISSN 2250-2459, ISO 9001:2008 Certified Journal, vol. 5, no. 12, 2015.
- [5] M. Jain, P. S. Rawat, J. Morbale, "Automatic Floor Cleaner", International Research Journal of Engineering and Technology (IRJET), vol. 4, no. 4 , 2017.
- [6] A. Pandey, A. Kaushik, A. K. Jha, G. Kapse, "A Technological Survey on Autonomous Home Cleaning Robots", International Journal of Scientific and Research Publications, vol. 4, no. 4, 2014.
- [7] T. Karthick, A. Ravikumar, L. Selvakumar, T. Viknesh, B. Parthiban. and A. Gopinath, "Simple Autonomous cleaner Robot", International Journal of Science, Engineering and Technology Research (IJSETR), vol. 5, no. 3, 2016.
- [8] R. Vaibhavi and S. T. Bagde, "A Review on Design of Automated Floor Cleaning System", International Journal on Recent and Innovation Trends in Computing and Communication, vol. 3 no. 2.
- [9] J. T. Vinod, B. Xaviour, J. K. George, "Cleaner Robot", International Journal of Emerging Technology and Advanced Engineering, vol. 5, no. 12, 2015.
- [10] M. Jain, P. S. Rawat, J. Morbale, "Automatic Floor Cleaner", International Research Journal of Engineering and Technology (IRJET), vol. 04, no. 4 , 2017.
- [11] A. Pandey, A. Kaushik, A. K. Jha, G. Kapse, "A Technological Survey on Autonomous Home Cleaning Robots", International Journal of Scientific and Research Publications, vol. 4, no. 4, 2014.
- [12] T. Karthick, A. Ravikumar, L. Selvakumar, T. Viknesh, B Parthiban. and A. Gopinath, "Simple Autonomous cleaner Robot", International Journal of Science, Engineering and Technology Research (IJSETR), vol. 4, no. 5, 2015.
- [13] M. Kaur, P. Abrol, "Design and Development of Floor Cleaner Robot (Automatic and Manual)", International Journal of Computer Applications (0975 – 8887), vol. 97, no. 19, 2014.
- [14] [12] Zelin L, Zhicheng Huang, "Design of a type of cleaning robot with ultrasonic", Journal of Theoretical and Applied Information Technology 31st January 2013. Vol. 47 No.3, ISSN: 1992-8645
- [15] K. Rupinder, "An extremely cost efficient Swabbing Robot", International Journal of Engineering and Computer Science ISSN: 2319-7242, vol. 6, no. 1, 2017.
- [16] S Monika, K Aruna Manjusha, S V S Prasad, B.Naresh "Design and Implementation of Smart Floor Cleaning Robot using Android App" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-4S2 March, 2019.
- [17] S. Amit, A. Choudhary, A. Gaur, and A. Rajpurohit, "Fully automated hybrid home cleaning." International Journal of Engineering Technologies and Management Research, vol. 5, no. 3, pp. 219-225, 2018.
- [18] N. Fathima, A. Ahammed, R. Banu, B.D. Parameshachari, and N.M Naik, "Optimized neighbor discovery in Internet of Things (IoT)," In Proc. of International Conference on Electrical, Electronics, Communication, Computer, and Optimization Techniques (ICEECCOT), pp. 1-5, 2017.