Floor Cleaning Robot

Mansi Ramesh Joshi[1], *Shraddha Dilip Pawar*[2],
Vrushali Bandu Sable[3], and *Madhavi Waghmare*[4]

Abstract

The cleaning robot takes significant place in automated examination. Floor cleaning robot is utilized in indoor spots like rooms, enormous workplaces etc. Cleaning physically is troublesome and dreary work and there is chance that the person cleaning leaves some part messy. Furthermore, it is tedious and bothering. The cleaning activity is more mechanized and therefore, the cleaning robot helps people. The robot is in small in size and is lightweight, so it can be used in a packed spot. Enormous workplaces have huge cleaning requirements, and physically it is not productive. Robots are advantageous for this reason.

Keywords : Controller device, motor driver, Raspberry Pi, Raspberry Pi Camera, ultrasonic sensor, vacuum

I. INTRODUCTION

The invention of a cleaning robot ready to do vacuum tidying up of rooms, or even a whole house, is definitely not a colossal task. Cleaning of house or enormous places like clinics and rail line stages is a physically troublesome and tedious task. In a quest to complete such undertaking, some suppositions were made. Cleaning robots perform work that is valuable to people. A robot is a trained gadget. Robots work as per the calculations for the task to be carried out, so the calculation needs to be productive. Robots are simply getting all the more remarkable as humans these days. For the most part, an ordinary human uses 2-3 robots each day for work. The robot vehicle is a programmed robot which helps people in everyday life. Cleaning is fundamental work which is significant in our lives and robots makes it simple.

II. PROBLEM STATEMENT

Floor cleaning is too long an activity if it is done physically which can't be refined without a staggering measure of expertise. Cleaning of huge places like a complete house or workplace is tedious and testing. We utilize a self-sufficient mechanical vacuum cleaner which can assist with cleaning productivity. It gives the right outcome and dispenses with manual mistakes. A vacuum cleaner robot consequently cleans without the assistance of humans. Its catches simply need to be turned on. The expense of having one is a fixed cost and additional cost on specialists need not be incurred.

III. RELATED WORK

Numerous researchers have come up with various ways and distinctive methods for floor cleaning. Here,

a portion of unmistakable work done in this field is being talked about. Floor cleaning robot [1] is a small framework that offers support in rooms and large workplaces. If a floor is cleaned by a human, there are odds of leaving out some part. Additionally, these devour more time to clean a floor. The advance innovation of mechanical technology has details like hindrance aversion, cleaning, and programmed framework [2]. For making a robot we need sensors, regulator gadget, motor etc. [3]. This paper proposes the framework of without vacuum robot having separable mop for wiping. Additionally, it has different parts like engine driver, engine regulator, and LCD show to see the robot. In [4], normally self-governing mode is guided by calculation for robot and it is a significant factor which affects productivity in cleaning. A number of diverse calculations are used. In this paper, calculations are arbitrary walk, twisting 's' shape pathway and divider stream [5]. Way arranging for the most part use for self–governing cleaning robot [6]. The plan proposed in the paper has double modes. In one of the modes, the robot is completely self-sufficient and choice is the premise of yields of sensors subsequent to being prepared by regulator gadget. In the manual mode, the robot can also be used to clean a specific area of a room by controlling it manually from a laptop with a graphical user interface (GUI) in Visual Studio (C# programming language) by means of Bluetooth connectivity [7]. The robot has two modes : on and off. The robot is associated through Bluetooth with Android. It has four IR sensors, out of which three are utilized for impediment aversion and one is for start and stop point. The robot is given beginning and stop points with a blue imprint. The robot will be off at end point consequently. This will be done through IR sensor. It will tidy up a room utilizing mop programmed water splash.

IV. IMPLEMENTATION

The primary idea for executing the venture is first making model of cleaning automated viable machine and adding highlights into it for better cleaning. The robot is planned keeping in mind the following modules of activity :

(1) Dry cleaning system directional control with programmed deterrent aversion.

(2) Video gushing with assistance of Raspberry Pi camera module which can be seen live in work.

We are utilizing two DC engines to drive the robot and control the engines we are utilizing L293D engine driver. We are expecting it to be the left side and the privilege of the robot in equal so the rationale will go like side must be 1, 1 and the correct side to be 0,0. So the vehicle will turn left and tight clamp versa for right turn. Ultrasonic sensor is utilized for the major distance while moving. The framework which we expect to make is an independent floor cleaning robot, which makes easy cleaning for a busy individual. The robot will clean the floor with better precision than humans. Our center is to acquire an easy precise cleaning in such a way that each individual can use it everyday with no trouble in taking care of it. Degree incorporates the potential functionalities which are here expected to be given by the engineer/planners which are enigmatically named as 'Cleaning the floor naturally'.

Devices and Technology Required

(1) Hardware requirements
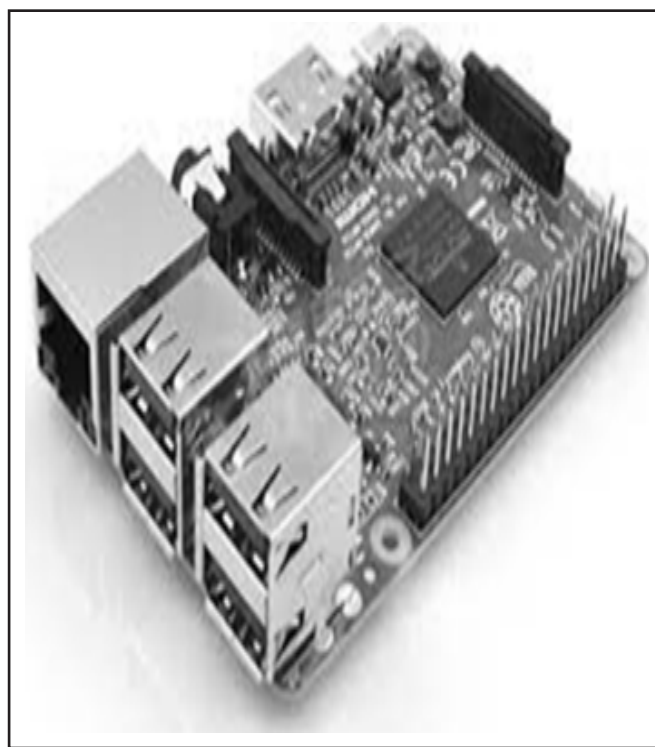
(a) Raspberry Pi

Fig. 1. Raspberry Pi
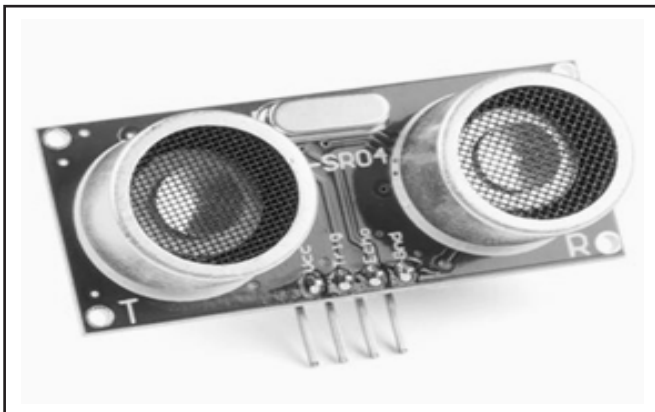
(b) Wheels

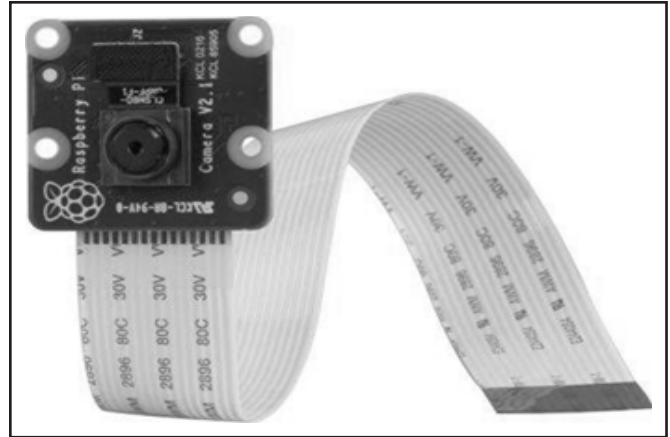**Fig. 2. Wheels**

(c) Vacuum

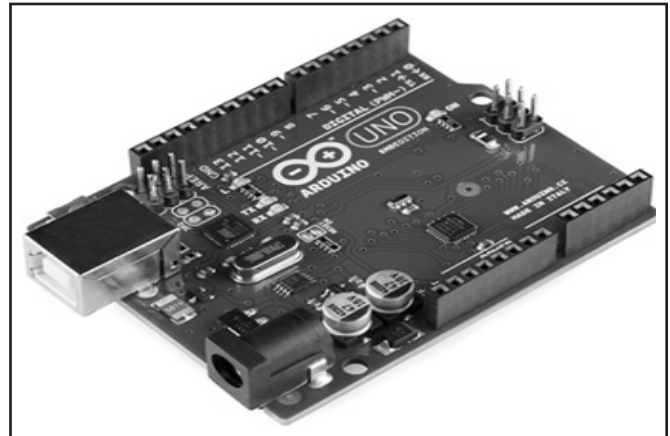**Fig. 3. Vacuum**

(d) Ultrasonic Sensors

Fig. 4. Ultrasonic Sensor

(e) Raspberry Pi Camera

Fig. 5. Raspberry Pi Camera

(f) Controller Device

Fig. 6. Controller Device

(g) Motor Driver

Fig. 7. Motor Driver

(2) Software Requirements

(a) Raspberian

(b) Controller IDE

V. DESCRIPTION

The depiction comprises of :

↳ Methodology
↳ Block Diagram
↳ Flow Chart
↳ Circuit Diagram

A. Methodology

(1) Obstacle Avoidance : Hindrances (objects of various shapes and sizes) are to be avoided. Ultrasonic sensors are used to recognize impediments and check persistently with the program directions to not fall in as dead circle. At the point when the snag is available, the calculation assists with staying away from the hindrance.

(2) Vacuum Cleaning : Vacuum cleaning comprises of vacuum cleaner and earth removal box. The robot will do cleaning with the attractions arranging it in the removal box. At the point when the force supply is given, it will consequently begin cleaning.

(3) Raspberry Pi Camera Module : The Pi camera module is a versatile light weight camera that upholds Raspberry Pi. It is regularly utilized in preparing a picture, AI or in observation projects.

(a) Block Diagram

Ultrasonic sensor associated with Raspberry Pi trades the qualities. Raspberry Pi associated with engine driver will control the DC engine. Fig. 8 shows the block diagram.

(b) Flow Chart

The robot continues forward. The distance is judged by the ultrasonic sensor. The progression of the moving robot is : when the circle starts, ultrasonic sensor figures the distance ; if it senses deterrence in the middle, it turns right, else it keeps on moving forward. Again it calculates the distance and decides whether to go ahead or turn. All things are considered directly while it is in circle and this is the procedure by which the robot proceeds.

(c) Circuit Diagram

We are utilizing Raspberry Pi as a screen gadget which will control the streaming which is going through camera module. The engines are constrained by engine driver which is associated with regulator gadget. The ultrasonic sensor is utilized for sang aversion which is additionally constrained by regulator gadget.
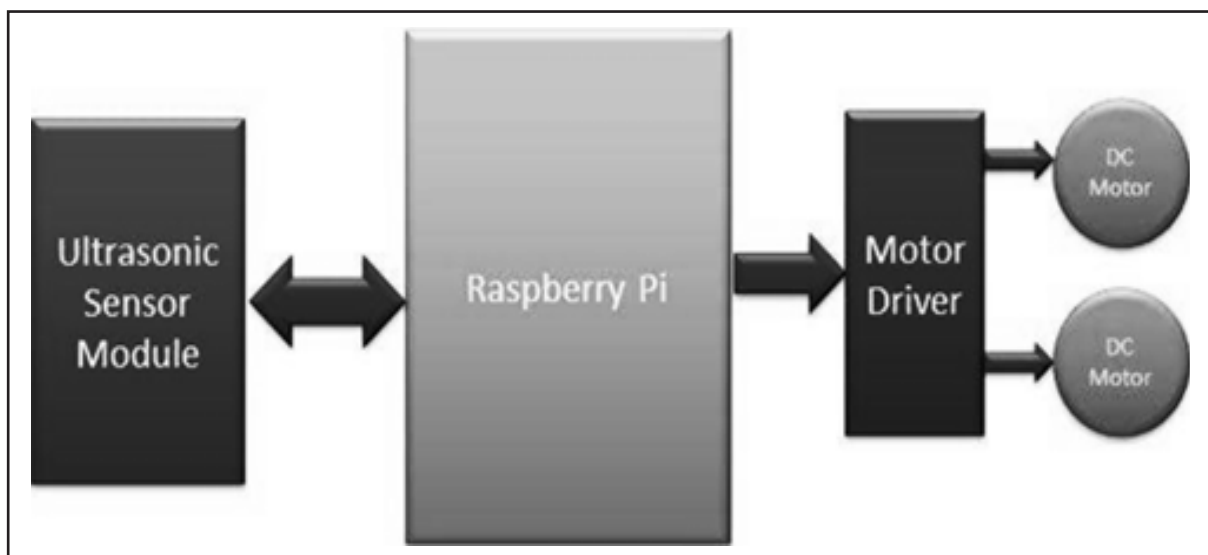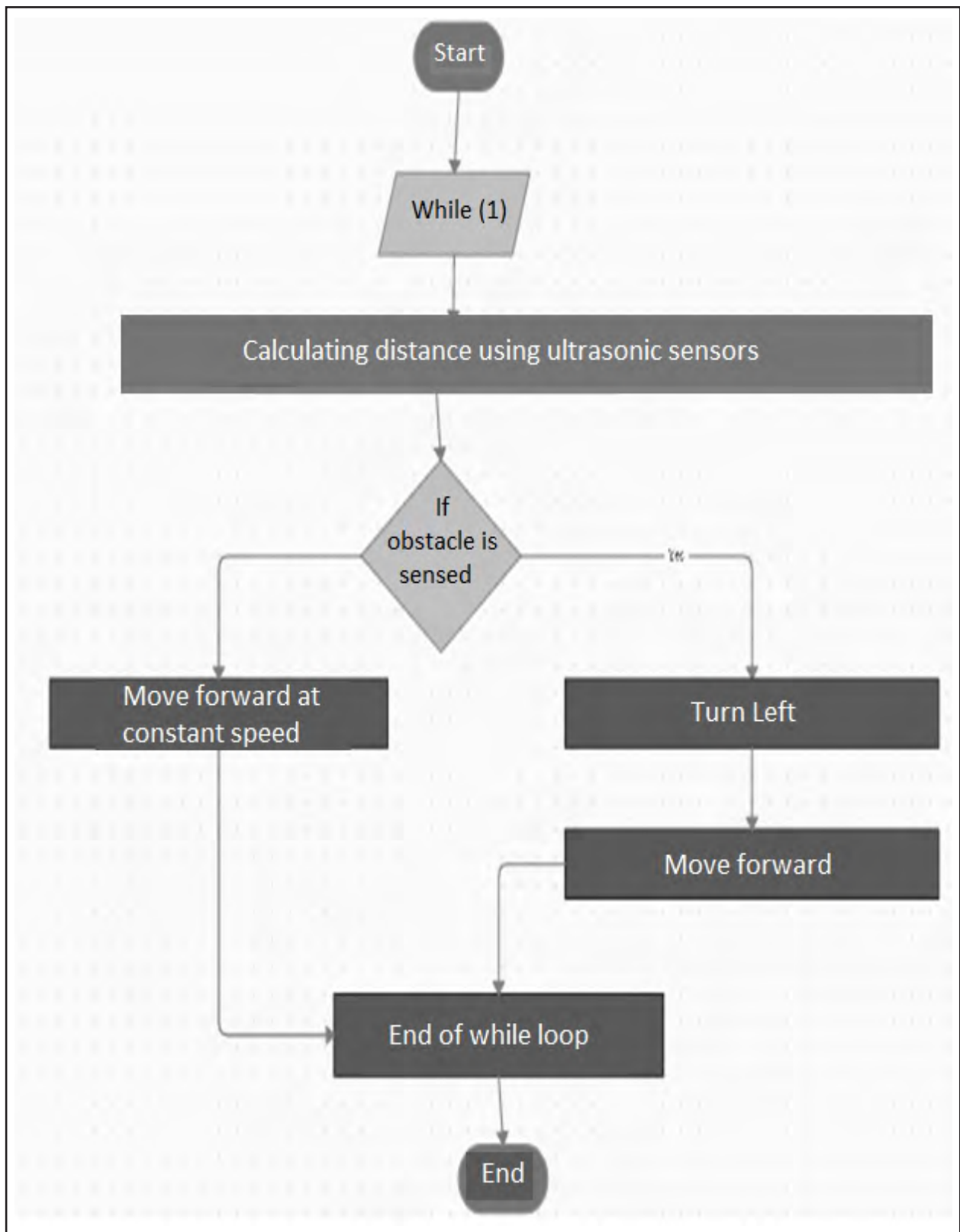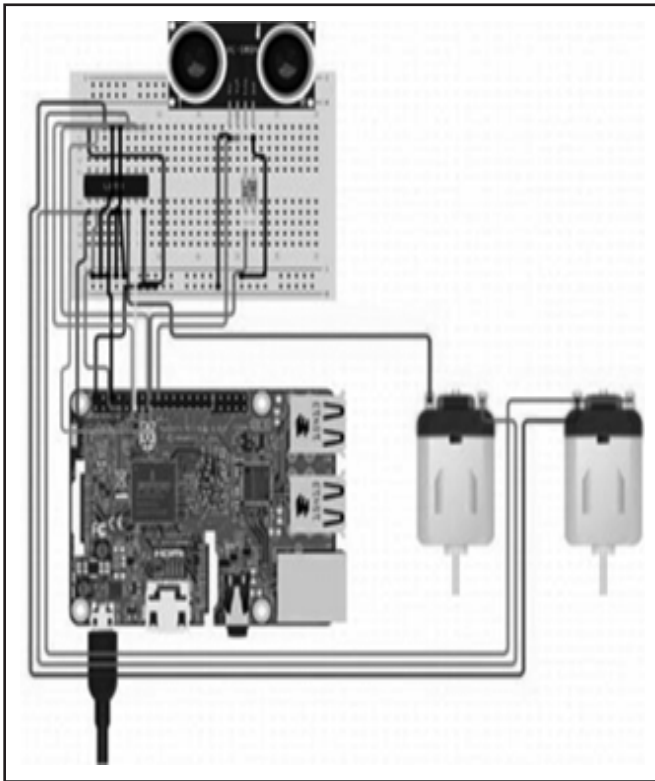

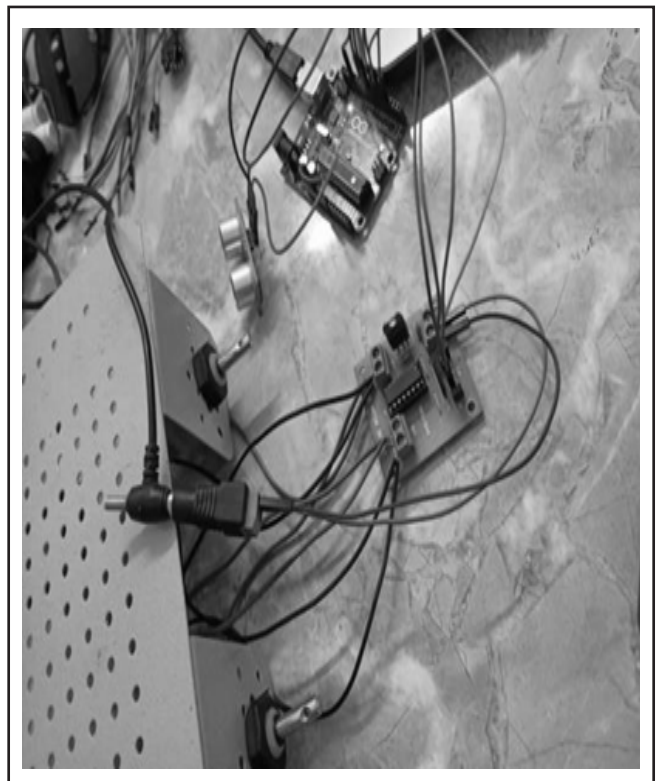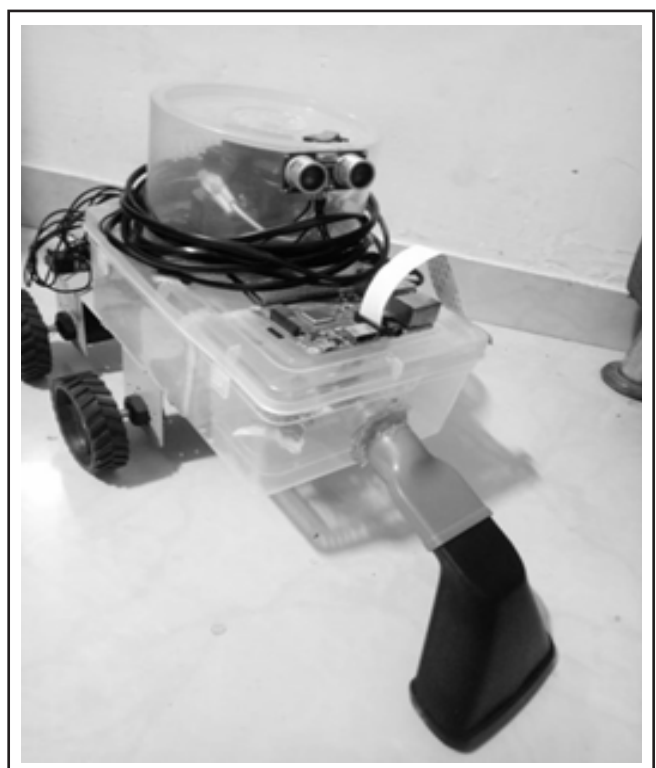**Fig. 8. Block Diagram**

Fig. 9. Flowchart

Fig. 10. Circuit *Diagram*

Fig. 12. Hardware Connections

Fig. 11. Camera Module

Fig. 13. Final Representation of Robot

TABLE I.

LOGIC TABLE FOR DIRECTION

LEFT		RIGHT		DIRECTION
+	-	+	-	
R	B	R	B	Forward
B	R	B	R	Reverse
R	B	0	0	Right
0	0	B	R	Left

VI. RESULT

The result consists of :

⌦ Logic table

⌦ Camera module

⌦ Hardware connection

⌦ Final representation of robot vehicle

A. Logic Table

We are using four motors on the wheels to drive the car and a motor driver which controls the motors. So, initially we created a logic table, so that we can control the motors which we put on controller device. The logic goes like if we want the car to move forward then the motors or wheels have to satisfy the conditions which are (1,1) (1,1) on each side and suppose on obstacle comes in, then the car has to turn right so the logic is (1,1) (0,0) so it will turn right. This is what the Table I describes.

B. Camera Module

We have utilized Raspberry Pi camera module for streaming reason. We have done attachment programming for streaming. Port 8000 is utilized for streaming it live on worker. For in statement of streaming we run the content which is there on Raspberry Pi and later the streaming begins. With the assistance of worker we can watch the live streaming.

C. Hardware Connection

We have utilized regulator contraption to control the headway of the robot and the engine driver which is controlling the wheels. For distance we have used ultrasonic sensor which is controlled by controller device.

VII. CONCLUSION

This paper comes out with clear floor cleaning measure which should be possible in a fundamental way and is more purposeful for floor cleaning robot. This robot decreases time and cost of labor. We made it with parts that are easily available. We have used some new development while building it. The cleaning robot has extraordinary quality and advantage as it can work fast. Features of this robot can be connection with mapping and resolution.

VIII. FUTURE WORK

As the assignment execution is done for certain essential modules, we further need to add more limits into this autonomous cleaning robot, for example, self-charging, self-buildup evacuation, and less and ideal chance for cleaning. We can in like manner join a mop for watery cleaning with vacuum interface. We have merged the live streaming, so we plan to store it in device for extra usage. Consistent testing is required with all likely commitments to make our model more precise and more helpful with steady customers. We further wish to test all the modules and aggregate them into one.

AUTHORS' CONTRIBUTIONS

Shraddha Pawar came up with the idea of making a robot. Initially the idea was to justify the basic need of cleaning the floor. Then it was modified with a smart cleaning robot. Mansi Joshi developed the methodology, circuit arrangements, and flow of the project. Vrushali Sable extracted research papers and analyzed them. Shraddha extracted the keywords and developed the final data for the project and the paper. Mansi, Shraddha, and Vrushali jointly wrote the paper in consultation with Dr. Madhavi Waghmare.

CONFLICT OF INTEREST

The authors certify that they have no affiliations with or involvement in any organization with any financial interest.

FUNDING ACKNOWLEDGMENT

REFERENCES

[1] R. Senapati, "Automation and controlling of automatic floor cleaner," B. Tech. Thesis, Dept. of Mechanical Eng., *National Inst. of Tech.,* Rourkela, Orissa, India. [Online]. Available: http://ethesis.nitrkl.ac.in/7500/1/147.pdf

[2] S. Monika, K. A. Manjusha, S. V. S. Prasad, and B. Naresh, "Design and implementation of smart floor cleaning robot using Android app," *Int. J. of Innovative Tech. and Exploring Eng.,* vol. 8, no. 4S2, pp. 250–252, 2019.

[3] M. Jain, P. S. Rawat, and J. Morbale, "Automatic floor cleaner," *Int. Research J. of Eng. and Tech.,* vol. 4, no. 4, pp. 303–307, 2017.

[4] K. M. Hasan, Abdullah-Al-Nahid, and K. J. Reza, "Path planning algorithm development for autonomous vacuum cleaner robots," *2014 Int. Conf. on Informatics, Electronics & Vision (ICIEV),* 2014, pp. 1 – 6. [Online]. Available : 10.1109/ICIEV.2014.6850799

[5] U. Khalid, M. F. Baloch, H. Haider, M. U. Sardar, M. F. Khan, A. B. Zia, and T. A. K. Qasuria, *"Smart floor cleaning robot (CLEAR),"* 2015. [Online]. Available: http://www.standardsuniversity.org/wp-content/uploads/Smart-Floor-Cleaning-Robot-CLEAR.pdf

[6] T. B. Asfa, T. M. Afonja, E. A., Olaniyan, and H. O. Alade, "Development of vacuum cleaner robot," *Alexandria Eng. J.,* vol. 57, no. 4, pp. 2911 – 2920, 2018. [Online]. Available: https://doi.org/10.1016/j.aej.2018.07.005

[7] A. Pardeshi, S. More, D. Kadam, and V.A. Patil, "Automatic floor cleaner," *Int. J. of Electronics & Communication Technol.,* vol. 8, no. 1, pp. 60 – 63, 2017. [Online]. Available: http://www.iject.org/vol8/issue1/13-aishwarya-pardeshi.pdf

About the Authors

Mansi Ramesh Joshi is pursuing Bachelors of Engineering. She is interested in Robotics.

Shraddha Dilip Pawar is pursuing Bachelors of Engineering. She is interested in Robotics.

Vrushali Bandu Sable is pursuing Bachelors of Engineering. She is interested in Robotics.

Dr. Madhavi Waghmare is Professor at Vidyavardhini's College of Engineering and Technology.