

Robotic Dustbin on Wheels



G. Ignisha Rajathi, R. Vedhapriyavadhana, L. R. Priya

Abstract: A serene environment is mandatory for habitation, not only for luxury, but for the girdling environment to be a healthy one. The overflowing garbage bins left unattended are the root cause of unhygienic environment and it leads to plethora of diseases. Various awareness initiatives are executed by the government for a hygienic atmosphere. On such flow, this research focuses on unfolding a new technological upgradation, to keep the surrounding unsoiled by introducing a system where the dustbin comes along a way in a lined path and blows out a buzzer when it stops at some check points so that the trash can be thrown inside it. The dustbin is loaded with ultrasonic sensors that will detect the garbage level and a notification will be sent to the corporation to empty the dustbin when it is full and also the status of the dustbin is uploaded in the webpage using a Wi-Fi module. This system pledges a tidy place for inhabitants.

Keywords : Robotics, Ultrasonic Sensors, IR Sensors, Wi-Fi Module, Waste Management .

I. INTRODUCTION

Non-degradable wastes pose a serious threat across the world because it pollutes the environment as well as the society. Therefore, a quality of life is at high demand and the government lacks with insufficient resources in handling the wastes. Waste management, however, often overlooked, is very essential and it consumes enough time consuming and effort to keep the surrounding clean. Garbage disposal which comes as a part of the waste management is often exploited due to lack of time, labor, pickup truck, etc. to empty the bins. It is obvious that in many places the garbage overflows. This overflowing of wastes can challenge the quality of life in that surrounding which is highly unhygienic [1] and can lead to life threatening diseases [2]. Another important factor would be the operating costs to empty the bins and possible ways were studied and observed to reduce the fuel consumption. Few studies suggest that, an optimal route to collect the wastes can save fuel on an average of 7.5 per day [3]. Therefore, with the help of the modern technologies a smart dustbin can help in overcoming the issues and thereby upgrading the cities into smarter ones. The technology behind smart dustbin is upgrading day by day.

As of now the municipal worker collects the garbage by wheel barrow which is cumbersome and is a time-consuming, heavy work than it seems. So our model ensures that it reduces the work done by the corporation by automatically collecting and managing the garbage efficiently. Besides it also reduces the tiring work of the garbage collectors as they need to collect the waste by pushing the wheel barrow. The cleanliness of the place relies on the necessity of the dustbin [4], and it requires immediate attention when full in the case of a smart waste management system [5,6]. So, in order to serve the purpose, a ultrasonic sensor which is placed on the bin's top communicates with the operator by transmitting information when the garbage has reached its maximum level. This helps in evacuating the garbage at the earliest. Most smarter cities [8] make use of Internet of Things (IoT) which uses different sensors [7], aiming for betterment of the people. Similarly, robots [10] too were utilized. These robots, thereby, reduces the number of smart bins that are required and can be on time to clean the bins which can reduce the unnecessary odour. This initiative can improve the quality of living and can help the people to live happily free from all kinds of diseases.

The organization of this paper is as follows: The detailed explanation of the proposed methodology is given in the section II. The working principle of the proposed method is given in the section III. The result discussion and the overall conclusion of the smart dustbin are discussed in section IV and section V respectively.

II. PROPOSED SYSTEM

A system is proposed to keep the surroundings clean where the robotic dustbin comes along your way in a lined path with the help of two IR sensors that are positioned at the base of the robot facing forward. And an obstacle sensor is placed at the side of the robot when it senses black color it blows out a buzzer indicating that it is stopped at that point for fixed time duration so that you can throw the trash inside it. Similarly, to detect the garbage level, at the rim of the dustbin an ultrasonic sensor is placed. Figure 1 shows the block diagram of the robotic dustbin workability.

Revised Manuscript Received on November 30, 2019.

* Correspondence Author

G. Ignisha Rajathi*, Assistant Professor, Department of Computer Science and Business Systems, Sri Krishna College of Engineering and Technology, Coimbatore, India. Email: ignisharajathig@skcet.ac.in

R. Vedhapriyavadhana, Professor in the Department of Electronics and Communication Engineering, Francis Xavier Engineering College, Tirunelveli, India. Email: vedhapriya.vadhana@gmail.com

L. R. Priya, Professor in the Department of Electronics and Communication Engineering, Francis Xavier Engineering College, Tirunelveli., India. Email: lrpriya11@gmail.com

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

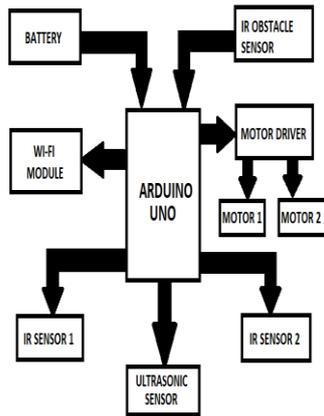


Fig. 1. Block Diagram of Robotic Dustbin System

The flowchart for the proposed system shows that the robotic dustbin begins to move from the source to the destination in a lined path in Figure 2. It blows out a buzzer to indicate that it stops at some check points to collect wastes and then keeps moving towards the destination. Once when the bin gets filled it sends a notification to the corporation indicating the bin is full and it needs to be emptied immediately in order to further collect the wastes. It also updates the status of the dustbin whether it is full or empty in a webpage using Wi-Fi module. If the bin is still not emptied it waits till the bin gets emptied or goes back to source once it is emptied to again collect the waste.

III. WORKING PRINCIPLE

Power supply is used to convert AC to DC supply. It is given to all components. In this project uses ATmega 32P that is Arduino. It consists of 14 digital input/output pins. The controller sends the signal to the motor driver. The motor driver used in this project is L293D. It consists of 4 motors, the driver is used to drive the left motors and right motors which depends on the driver signal it enables the wheel to move forward or either right or left. An obstacle in the pathway is sensed by the IR sensor as and when it emits IR signals that sends a signal to the microcontroller where it senses black color and the system stops at that point. Then the controller sends a signal to the ultrasonic sensor which generates sound waves and measures the distance of the waste inside the dustbin. Suppose, if it is full, a message is passed to the corporation and the same is updated in the bin using a Wi-Fi module.

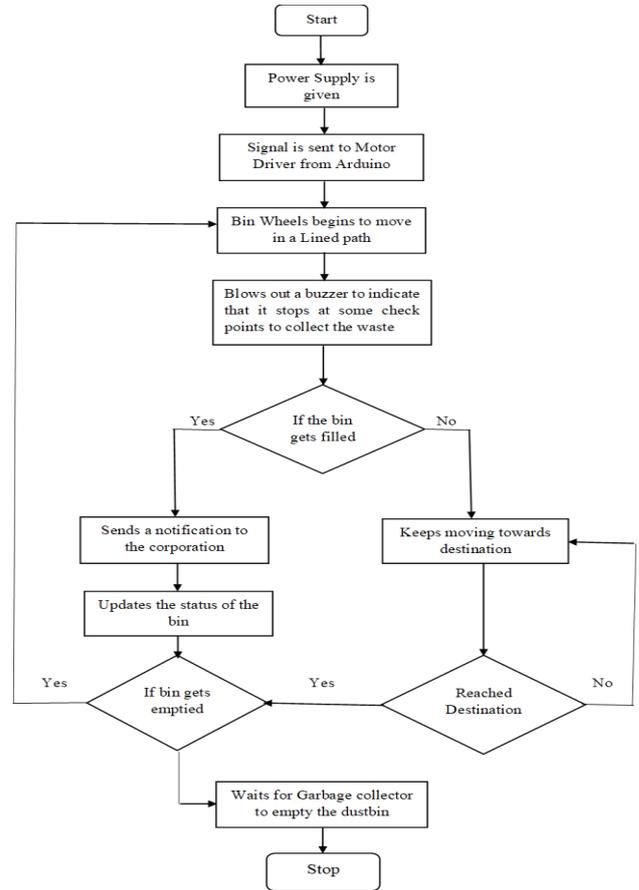


Fig. 2. Flow Chart of Robotic Dustbin System

IV. RESULTS AND DISCUSSIONS

The robotic dustbin system was tested for complete operation and successfully verified. After detailed examination of each and every part the accuracy of the system has been tuned to maximum. The proposed system has been developed by integrating features of all the hardware components mentioned. Thus the project has been successfully designed and tested.

Figure 3 shows the 50% output of the System Module. This module shows only the hardware implementation of the robotic dustbin system and the circuit connections were tested with the help of Multimeter.

Figure 4 shows the complete hardware model of the robotic dustbin system. Power supply is given to all components. Two IR sensors are positioned at base of the robot facing forward to move the robot in a lined path. Therefore, whenever an obstacle is encountered, it blows out a buzzer indicating that it had stopped at that point for some duration so that trash can be laid into it. Also, the ultrasonic sensor which is located at the rim level ensures the garbage level left in the container. Robotic dustbin system is programmed in Arduino IDE and loaded into the microcontroller chip.

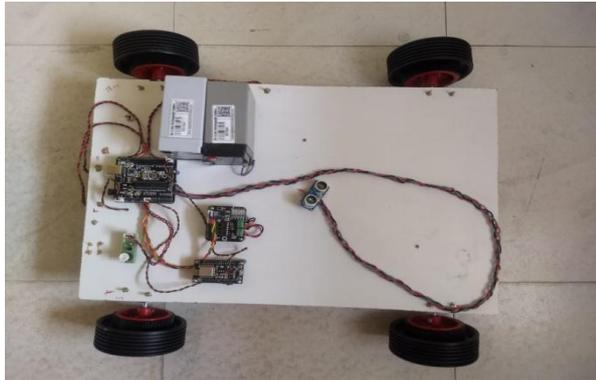


Fig. 3. Hardware implementation of System Module (50%)



Fig. 4. Hardware implementation of System Module (100%)

Figure 5 shows the working model of robotic dustbin system. The figure shows the dustbin moving in a lined path when it senses white colour and adjust its path by sensing black colour. The controller sends the signal to the motor driver. The motor driver used here is L293D. It consists of 4 driver motors to drive the left motors and right motors which depend on the driver signal it enables the wheel to move forward or either right or left.

Figure 6 shows the notification, being sent to the corporation operators. Once the bin gets filled, it sends a notification to the corporation indicating the bin is full and it needs to be emptied immediately in order to further collect the wastes.



Fig. 5. Working Model of Robotic Dustbin System

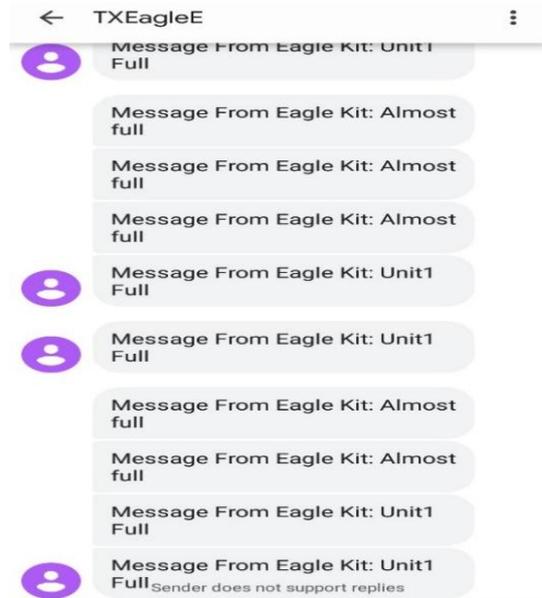


Fig. 6. Notification sent to the operators

Figure 7 shows the Status of the Dustbin that is uploaded in Webpage. It updates the status of the dustbin whether it is full or empty in a webpage using Wi-Fi module.

V. CONCLUSION

Smart cities aiming to be smarter can be benefitted with the use of the smart dustbins which can bring forth a tremendous change in the current garbage disposal system. With the increasing technology people opt for advanced gadgets and always choose for trending and comforting lifestyle to maintain hygienic atmosphere. Since we are busy with our lifestyle we cannot make an absolute maintenance about the cleanliness. A normal trash bin is not used by the people frequently but a wheel carrying trash can come along your way so that you can throw the trash inside, which will help us to maintain the cleanliness. This system can be implemented in various environments like residential areas, gated communities and vast areas like parks, potential gardens, sanctuary, zoo's etc. Hence in a nutshell, an IoT based system that is equipped with various electronic devices can make this world a better place to live. In future, a system for the immediate cleaning of the dustbins might be explored and implemented. Thus, we can reduce the littering of waste everywhere and hence many diseases can be avoided.

REFERENCES

1. Jayshree Ghorpade, Anagha Wadkar, Janhvi Kamble, Utarksha Bagade, Vijayendra Pagare, "Smart Dustbin: An Efficient Garbage Management Approach for a Healthy Society", International Conference on Information, Communication, Engineering and Technology, 2018.
2. Surendran D, "Rare Disease Detection and Alerting System to the Health Department", International Journal of Advanced Research Trends in Engineering and Technology, Vol.4, Specila Issue 7, Pg. 4-8.2017.
3. Aksan Surya Wijaya, Zahir Zainuddin, Muhammad Niswar, "Design a Smart Waste Bin for Smart Waste Management", IEEE 2017.

- Poonguzhali.A, Soundarya. R,Priyanka, Tejaswini.A, Pavithra.M, "Smart Garbage Detection System Using IOT Through Mobile App", Vol 5, Issue 5, 2018, International Journal of Engineering Research in Electronics and Communication Engineering.
- Balamurugan S, Abhishek Ajith, Snehal Ratnakaran, S.Balaji, R.Marimuthu, "Design of Smart Waste Management System", IEEE 2017.
- Vincenzo Catania, Daniela Ventura, "An Approach for Monitoring and Smart Planning of Urban Solid Waste Management Using Smart-M3 Platform ",15th Conference of Fruct Association.
- Suresh Kumar A, Surendran D, Keerthana S, Kiruthika, "Inertial measurement sensor for accurate detection and notification using internet of things", Pakistan Journal of Biotechnology, Vol.13, Pg.375-378,2016.
- Krishna Nirde, Prashant S. Mulay, Uttam M.Chaskar, "IOT Based Solid Waste Management System For Smart City", ICICCS 2017.
- Dr.N. SathishKumar, B.Vijayalaksmi, R. Jenifer Prarthana, A. Shankar,"IOT based Smart Garbage alert system using Arduino UNO", IEEE, 2016.
- Sateesh Reddy Avutu, Dinesh Bhatia, B. Venkateshwara Reddy, "Design of Touch Screen Based Robot with Obstacle Detection Module for Autonomous Path Navigation", 2017 IEEE Region 10 Conference.

AUTHORS PROFILE



G. Ignisha Rajathi is working as Assistant Professor in the Department of Computer Science and Business Systems at Sri Krishna College of Engineering and Technology, Coimbatore, India. Having completed her Bachelor of Engineering and Master of Engineering as a rank holder, in the discipline of Computer Science and Engineering under Anna University, Chennai, she is pursuing her Doctorate in the Faculty of Information and

Communication Engineering under Anna University, Chennai. This research scholar has marked her areas of interest with Medical imaging, Segmentation and Classifications, having published her research articles in high-impact journals.



Dr. R. Vedhapriyavadhana received B.E degree Biomedical Instrumentation Engineering from Avinashilingam Deemed University in 2005. She received the M.Tech degree in Computer and Information Technology from Manonmaniam Sundaranar University, Tirunelveli in the year 2009 and Completed her Ph.D in Information and Communications in Anna University Chennai by July 2019 .At Present

she is working as Associate Professor in Electronics and Communication Engineering Department of Francis Xavier Engineering College, Tirunelveli Tamil Nadu, India. She has authored / coauthored over 30 research articles in various Journals and Conferences in the areas of Image and Video Processing, Embedded System and Bio Medical Instrumentation.



L. R. Priya received B.E degree Electrical and Electronics Engineering from Anna University in 2005. She received the M.E degree in VLSI Design,Karuna University, Coimbatore in the year 2007 and Currently pursuing Ph.D in Information and Communications in Anna University Chennai .At Present she is working as Assistant Professor in Electronics and

Communication Engineering Department of Francis Xavier Engineering College, Tirunelveli Tamil Nadu, India. She has authored / coauthored over 15 research articles in various Journals and 21 Conferences in the areas of Network on chip,4G Technologies, Video processing, MEMS materials.