

Original Article

Smart Waste Bin Monitoring System Using Arduino

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Received Date: 16 December 2023

Revised Date: 19 January 2024

Accepted Date: 20 February 2024

Abstract: Our main aim of this “SMART WASTE BIN MONITORING SYSTEM USING ARDUINO”, provides a smart technology for waste management system, which results in healthy, and waste ridden environment. By using SOLAR PANEL, the electrical energy is stored in a Battery source. This Battery is used for the total circuit, which does not need any power source from any street posts. The Humidity sensor is placed for the separation of the waste as the dry waste and wet waste to help the worker to separate the waste easily. Ultra sonic sensor is installed to sense the level of the bin. When the bin is almost full, a message is sent to the Truck driver of that area with the help of GSM Module. If it isn't cleared, a secondary message is sent to the Head of the Truck department. Even if it wasn't cleared, a final message is sent directly to the Management of Waste Department. This bin is placed under the ground by opening the door, when clearing the waste. So, we can be able to stop the waste being thrown by the people. When the truck driver reaches the place of bin, the bin is moving up using MECHANICAL LIFT. And then, he started to clear such waste. By this, we can be able to keep our society clean from this waste ridden environment and such spreading diseases.

Keywords: Solar panel, Battery, GSM Module, Humidity Sensor, Ultrasonic Sensor, Mechanical Lift.

I.INTRODUCTION

Waste management is the processes and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process and waste-related laws, technologies, economic mechanisms. Waste can be solid, liquid, or gases and each type have different methods of disposal and management. Waste management deals with all types of waste, including industrial, biological, household, municipal, organic, biomedical, radioactive wastes. In some cases, waste can pose a threat to human health. Health issues are associated throughout the entire process of waste management. Health issues can also arise indirectly or directly: directly through the handling of solid waste, and indirectly through the consumption of water, soil and food. Waste is produced by human activity, for example, the extraction and processing of raw materials. Waste management is intended to reduce adverse effects of waste on human health, the environment, planetary resources and aesthetics. The aim of waste management is to reduce the dangerous effects of such waste on the environment and human health. A big part of waste management deals with municipal solid waste, which is created by industrial, commercial, and household activity. Waste management practices are not uniform among countries (developed and developing nations); regions (urban and rural areas), and residential and industrial sectors can all take different approaches

II.EXISTING METHOD

1. Encouraging individuals or businesses to separate waste at its source into categories such as recyclables, organic waste, and non-recyclable waste. This can be done through education, incentive programs, and convenient collection systems.
2. Using mechanical processes such as conveyor belts, screens, magnets, and air classifiers to separate different types of waste based on their physical properties such as size, weight, and magnetic susceptibility.
3. In facilities where mechanical sorting is not feasible or efficient, manual sorting by workers can be employed to separate waste into different categories. This method is commonly used for recyclable materials.
4. Employing biological processes such as composting or anaerobic digestion to treat organic waste and convert it into valuable products like compost or biogas.
5. Utilizing chemical processes such as oxidation or hydrolysis to break down hazardous or non-biodegradable waste into less harmful substances.
6. Implementing monitoring systems in landfills to track parameters such as gas emissions (e.g., methane), leachate production, and groundwater contamination. This helps to ensure compliance with environmental regulations and detect any potential issues early on.
7. Employing RFID tags or barcodes on waste containers to track their movement throughout the waste management process, from collection to disposal. This enables efficient logistics management and accountability.



8. Installing weighing scales and data management systems at waste collection points and treatment facilities to accurately measure the quantity and composition of waste streams. This data is valuable for planning, resource allocation, and performance evaluation.

III. NECESSITY OF OUR PROPOSAL

- To optimize collection waste
- To monitor the fill level of underground dustbins in real-time
- To prevent the environment from the overflow of the waste.
- To cleaner and more hygienic urban environments.
- To ensure nonstop operation.
- To collect and analyze data from humidity and ultrasonic sensors.

IV. IMPORTANCE OF WORK

- To promote cleaner and more hygienic urban environments
- To ensure public health and quality of life.
- To monitor the fill levels of underground dustbins, waste collection processes can be optimized.

V. BLOCK DIAGRAM

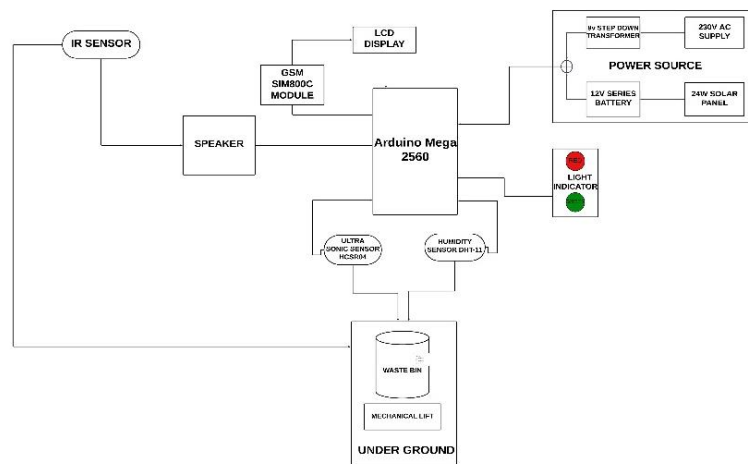


Figure 1: Block Diagram of Control System

The block diagram shows that the Ultra sonic sensor is used to detect the level of the waste bin, and the Humidity sensor is used to separate the waste automatically. GSM is used to send the message to the appropriate authority of the department. The whole process is controlled by the Arduino Mega. Light indication is used to indicate whether the waste bin is full or not. The power source used here is both the AC and DC sources. Solar panels are the major used power source in this proposal. LCD is used to display the level of the bin. And speaker is used to for an attraction purpose.

VI. PROPOSED SYSTEM

In this paper, the main theme is to separate the waste thrown by the people by using the humidity of the waste and to place the bin under the ground by opening the door, when clearing the waste. So, we can be able to stop the waste being thrown by the people. When the truck driver reaches the place of bin, the bin is moving up using **MECHANICAL LIFT** manually. And then, he started to clear such waste. By this, we can be able to keep our society clean from these waste ridden environments and such spreading diseases. Solar panels are used for the power supply.

VII. CONCLUSION

Finally, we conclude that the integration of ultrasonic sensors, humidity sensors, GSM modules, and underground dustbins represents a forward-thinking approach to modernizing waste management practices, addressing urban challenges, and creating cleaner, healthier, and more sustainable communities for current and future generations.

A. Future Scope

The future implementation of this project is to upgrade the smart dustbin to address a wide number of current shortcomings. A development of a software application to store the data of an entire dustbin in the city, like location cleaning time filled time complaint raising based on the dustbin rectifying data.

B. Acknowledgment

First and foremost, we thank God Almighty for His grace enabling us to complete this project work successfully. We thank our internal guide Mr. M. JEYAMURUGAN., M.E. for his untiring efforts, continuous encouragement and guidance in bringing out this project in a successful manner. We wish to extend our gratitude to our parents and all the staff members of the Department of Electrical and Electronics Engineering and our friends who gave inspiration and active assistance to our project.

VIII. REFERENCES

- [1] Kumar NS, Vijayalakshmi B, Prathana RJ, Shankar A. IOT based smart garbage alert system using Arduino UNO. In 2016 IEEE Region 10 Conference (TENCON) 2016 Nov 22(pp.1028-1034). IEEE
- [2] Fetulhak Abdurahman, Sileshi Aweke and Chera Assefa, "Automated Garbage Monitoring System using Arduino", IOSR Journal of Computer Engineering (IOSR-JCE), e-ISSN: 2278-0661, p-ISSN: 2278-8727, Volume 20, Issue 1, Ver. I, 2018, PP 64-76.
- [3] Selvaraj K, Chakrapani A. Smart dustbin monitoring system using LAN Server and Arduino. International Journal of Advances in Computer and Electronics Engineering. 2017 Apr;2(4):20-3.
- [4] V.Sowndarya, P.Saritha , S.Hepzibah Jebarani, " Smart Waste Segregation and Monitoring System using IoT" International Research Journal of Multidisciplinary Technovation, ISSN 2582-1040 March 2023.