Smart Waste Management Using IoT

Yash R. Maheshwari, Yatharth R. Varma, Yash A. Pawde, Yashraj S. Nalawade, Swarnim P. Yawale, Yuva Teja Goud B., Arati V. Deshpande

Abstract—This research paper explores the designing and implementation of a waste level monitoring system for a dustbin using NodeMCU and Internet of Things (IoT) technology, along with an ultrasound sensor.
This study aims to develop a low-cost, accurate, and efficient system for the management of waste levels in dustbins, which can help improve waste collection services and reduce unnecessary transportation costs.
The proposed system consists of an ultrasonic sensor that is mounted inside the dustbin to detect the level of waste, a NodeMCU module that connects with the sensor and sends the data to the cloud, and an IoT platform that stores and analyzes the data. The data can be accessed by waste management authorities, who can use it to optimize their waste collection routes and schedules. Overall, the research demonstrates the potential of using NodeMCU and IoT technology in waste management systems, and how it can help address the challenges faced by waste management authorities in managing waste collection services. The proposed system has the potential to reduce costs, improve efficiency and promote sustainable waste management practices.

Keywords — Blynk Application, Dustbin, Garbage Level Monitor, NodeMCU, Ultrasonic Sensor.

I. INTRODUCTION

The human race is moving towards a new dawn, in the future world, we are forgetting about the threats we are posing to nature. According to the report "What a Waste 2.0", by the World Bank, the world generates 2.01 billion tons of municipal solid waste annually, with at least 33% of that – extremely conservatively – not managed in an environmentally safe manner. The report also states that, worldwide, an average person generates 0.74 kg of waste every day, but ranges very widely, between 0.11 to 4.54 kgs per day per person.
So, as a measure of this problem, we need to have effective waste collection systems. Furthermore, we need to have proper systems to treat the waste depending on its type.
As we dwell in our surroundings, we observe large dumping sites and also see large dustbins overflowing with solid waste. We need to overcome this problem with the help of existing authorities. Authorities need to timely collect the waste so that it does not overflow and prevent various types of pollution caused by it.
We have decided to devise a system, which would alert the authorities when the dustbins are full so that they could come and collect the waste and treat it properly

II. METHODOLOGY/PROCEDURE

A. Material

1.Blynk Software: Blynk is an IOT platform, for android and iOS devices, which is used to control Arduino, Raspberry Pi, NodeMCU, Node JS, etc. via the internet. This application is used to create a GUI on Human Machine Interface (HMI) by compiling and providing the appropriate address on the available widgets. We have used it in our project with NodeMCU to enable mobile notifications for the alert system.
2.NodeMCU: We have used a NodeMCU ESP8266 for our project. NodeMCU is mainly used for the wi-fi modules.
3.Ultrasonic Sensor: Ultrasonic sensor detects the presence of obstacles in its range. We need to detect the level of waste in the dustbin and warn if it exceeds a limiting value.

B. algorithm
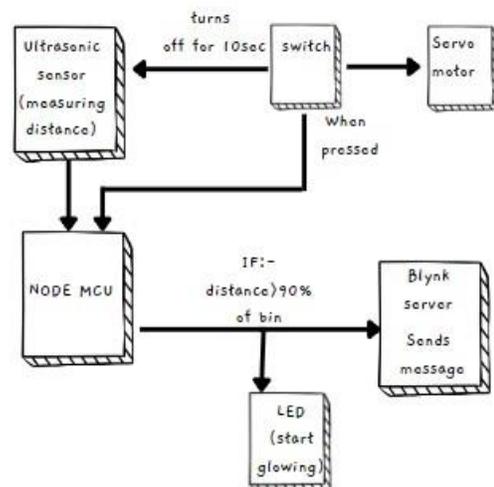
The entire circuit is connected together by the NodeMCU microcontroller using jumper wires, the ultrasonic sensor is used to measure the distance of the lid from the trash, and once the threshold value(which can be changed by the user) is reached, a notification is sent to the user via blink app, and a LED on the bin starts glowing.

A switch is installed in the bin to make sure no accidents occur and no useless notifications are sent to the authorities, as when the switch is on, the bin opens up and the ultrasonic sensor goes off for 10 seconds.

III. RESULTS AND DISCUSSIONS

We have designed this smart waste management system to optimize the process of collection of waste. Also, by incorporating sensors and IoT technologies, these systems have the potential to improve the efficiency of waste management processes. It also monitors real-time waste management.

However, there are several challenges in implementing this system. The accuracy of the sensors plays a very important role in this system. Especially in public dustbins, we can have a lot of problems in maintaining the sensors. Also, the communication protocols need to be kept in mind, and linking the sensors with the wi-fi module needs accurate precision.

Overall, a smart waste management system using Blynk and NodeMCU has great potential to turn out into a great change in the field of waste management. Careful planning and implementation are a must for the success of the system

IV. HELPFUL HINTS

A. Figures and Tables
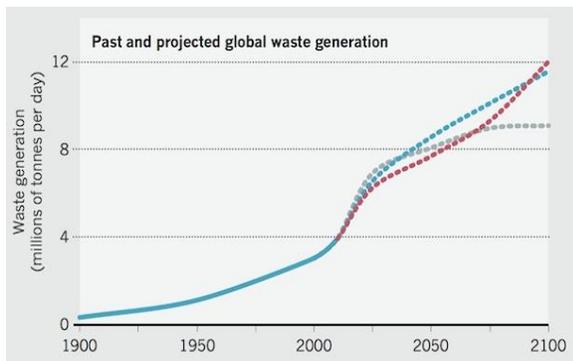
Graph. 1. This graph shows the growth of garbage created per day in past and projected growth in coming years.
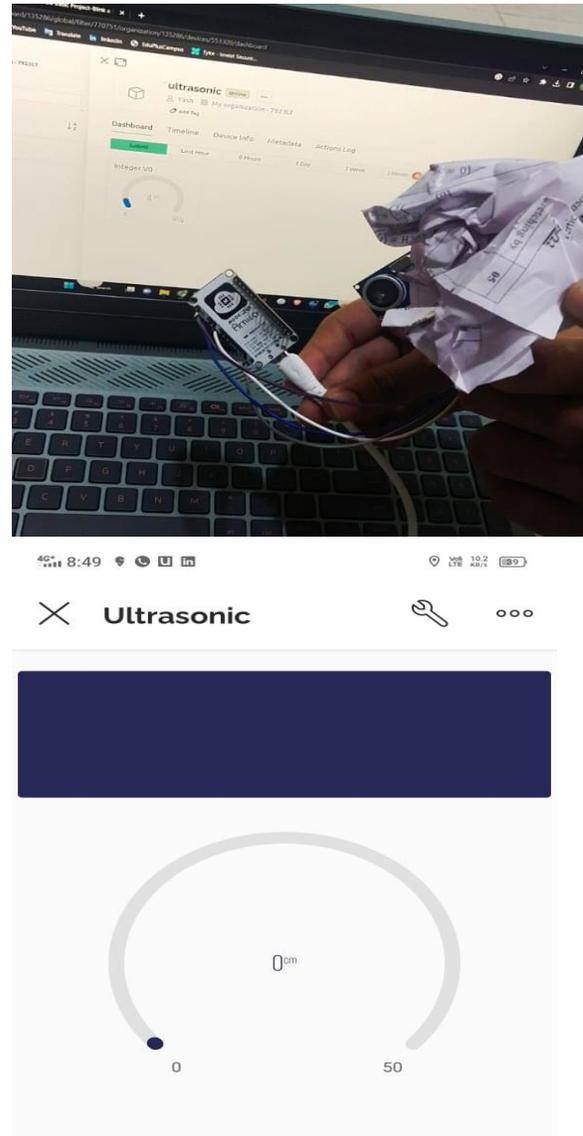
B. Implementation

Fig. 1. This figure shows the interface of blynk app made

V. FUTURE SCOPE

Smart waste dustbins using ultrasonic sensors have a lot of potential for improving waste management practices in the future. These dustbins are equipped with sensors that can detect the level of waste in the bin and send this information to a central database or waste management personnel.

1. Optimization of waste collection routes: Smart waste dustbins can help waste management companies optimize their waste collection routes by providing real-time information on which bins need to be emptied. This can lead to more efficient use of resources and reduced costs.

2. Integration with smart city infrastructure: Smart waste dustbins can be integrated with other smart city infrastructures and life traffic signals having solar panels to reduce the power dependency of the bin.

3. Assessment of environmental impact: The use of smart waste dustbins can help reduce the environmental impact of waste management practices. Research can be conducted to assess the extent to which smart waste dustbins can reduce waste, increase recycling, and reduce greenhouse gas emissions.

VI. CONCLUSION

Overall, this research demonstrates the potential of using NodeMCU and IoT technology in waste management systems in the coming years, and how it helps to address the challenges faced by waste management authorities while managing waste collection services. The proposed system has great potential to reduce costs, improve efficiency, and promote sustainable waste management practices in daily life.

We can conclude from the project that IoT has a great future and can be a great step toward the world of automation.

ACKNOWLEDGMENT

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