

IoT Based Smart Garbage Collection System

¹ AarthiSelshiya, ² Prathisha G, ³ P.Veerlakshmi

1, 2 Student, Prince Shri Venkateshwara Padmavathy engineering college, Chennai-600127, India

3 Associate Professor, Prince Shri Venkateshwara Padmavathy engineering college, Chennai-600127, India

Abstract

The garbage monitoring system will keep our cities and the environment clean. In this, we are going to propose a system for the immediate cleaning of the dustbins to reduce the overflow of the dustbins. This project presents the development of a smart garbage collecting system to measure waste levels in the garbage bin in real-time and to alert the municipality, via SMS. This system is consisted of the ultrasonic sensor to measure the waste level, the GSM module to send the SMS, and an Arduino Uno which controls the system operation and an LED to make an alert for peoples about the level of the bin. It sends the warning messages to the municipality via SMS when the waste bin is full or almost full, so the garbage can be collected immediately. Moreover, this system is also connected to several LEDs, in red color, to alert all the residents regarding the bin status.

Keywords: IoT, Smart bins, GSM Module, sensor, Industry.

1. INTRODUCTION

Internet of things (IoT) is not a new technology it is around 16 years old. But the idea of connecting devices is much older than IoT itself, it has been around us at least for the past three decades. But this concept was known to people as "embedded internet" or "pervasive computer". The term "Internet of Things" was coined by Kevin Ashton in 1999 [1]. The concept of IoT gained popularity around the year 2010 and since then various applications of IoT have been developed for its use in different platforms.

IoT has played a big role in Industrial Automation too. There are various instances where IoT is being applied in industries to make smart predictions based on previous data collected and these IoT devices deployed are capable of making accurate decisions as compared to humans by collecting and communicating real-time data.

Industrial monitoring is an important part of industries nowadays. This monitoring device will monitor the industrial equipment and it is also used to know the working status of the machines and industrial components. There are many methods to monitor the industrial process but the most efficient and most used is the "Internet of Things".

The **Internet of Things (IoT)** refers to a system of interrelated, internet-connected objects that can collect and transfer data over a wireless network without human intervention.

A garbage or waste management is a big challenge in urban areas in India. There are several phases of the garbage management process and these phases include garbage monitoring, collection, transportation, processing, and disposal. There are several issues observed during the garbage monitoring process such as difficulty in locating the garbage system, lack of information about overflowing garbage, locating collection vehicles, or identification of biomedical / hazard waste. This project is the development of a smart garbage collecting system to measure waste levels in the garbage bin in real-time and to alert the municipality, in particular cases, via SMS. It is observed that sensors are popular in the implementation of garbage monitoring systems. An Ultrasonic sensor, which detects the level of the garbage inside the bin and also helps in continuously monitoring the weight of the garbage in the dustbin before generating the required alert of garbage overflow. In the future, an integrated, efficient, and intelligent Internet of Things (IoT) based garbage monitoring system will be designed with due considerations observed during this study based on literature survey and contextual inquiry. This system is also connected to several LEDs, in red color, to alert all the residents regarding the bin status and to alert all the residents about the overflow of the garbage in the bin.

2. RELATED WORK

Industrial IoT is an enduring and active topic for all scientists and engineers. It has solved many issues in the industries and also introduces new technologies every year to the industries. In this section, we discuss the existing environmental monitoring and management issues and previous systems.[1][2]

Luca Catarinucci, Riccardo Colella, Stefano Iron Consalvo, Luigi Patrono, Claudia Rollo, IllariaSergi proposed IoT- Aware Waste Management System Based on Cloud Services and Ultra-low-power RFID Sensor-Tags .The main objective of this project is to provide smart technology for the waste system in this we are using the concept of the Internet of Things and the limitation of this project is Implementation cost is high.TeohJi Sheng, Mohammad Shahidul Islam, Norbahiah Misran proposed An Internet Of Things Based Smart Waste Management System Using LoRa And Tensorflow Deep Learning Model. The main objective of this project is To evaluate the condition of equipment using predictive maintenance techniques in this w are using a concept of Internet Of Things main limitation in this project is the Detection accuracy is less. Imran, Shabir Ahmed, Do Hyun Kim proposed Quantum GIS-Based Description And Predictive Data Analysis For Effective Planning Of Waste Management, the main objective of this project is To design the reliable data analysis is required to produce the result that can facilitate the planning process. The limitation of this project is Data Confidentiality is less in this we are using a concept of Data Analysis.[3][4]

Shabir Ahmad, Imran, Faisal Jamil, NaeemIqbal, Do Hyun Kim proposed optimal Route Recommendation For Waste Carries Vehicles For Efficient Waste Collection: A Step Forward Towards Sustainable Cities, this the main objective of this project is The function is formulated, and the constraints affecting the objective functions. in this we are using a concept of Prediction and optimization algorithm, grid the limitation in this project is It is not highly secure.NarfadzliaMohdYusof, AimanZakwanJidin, Muhammad Izzat Rahim proposdSmart Garbage Monitoring System for Waste Management in this the main objective of this project is To ensure the waste disposal can be managed more properly and efficiently by constantly monitoring the bin status and garbage level the concept which is used in this project is the Internet of Things. The limitation of this project is the lack of interoperability. The main limitation of this project is implementation cost is high.SaadiaKulsoomMemon, Faisal Karimshaikh, Naeem Ahmed Mahoto, Abdul Aziz Memon proposed IoT based smart garbage monitoring & collection system using WeMos& Ultrasonic sensors which uses the concept of IoT the main objective of this project is The most efficient framework in dealing with the everyday garbage as it comprises of a major chunk of waste material in cities. [5]

3. PROBLEM DESCRIPTION

ARDUINO UNO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

GSM MODULE

Global system for mobile communication(GSM). It is used to send messages to the garbage depot if the Garbage Can exceed the set threshold level. With the help of the GSM module interfaced, we can send short text messages to the required municipal office. GSM module is provided by sim uses the mobile service provider and sends SMS to the respective authorities.

MQ-4 SENSOR

The sensoris made using Natural Gas Sensitive material. MQ-4 gas sensor is sensitive to tin dioxide. When the concentration of tin dioxide increases, the conduction levels of the sensor also increases. MQ-4 gas sensor is also sensitive to Methane, Propane, and Butane. The sensor is used to sense different burnable gases, mainly Methane. It is a low-cost sensor and suitable for different applications.

In the case where the bins are already full or almost full, then it will generate a warning message which will be sent to the municipality via SMS, by using the GSM module. This system is also connected to several LEDs, in green or red colors, to alert all

the residents regarding the bin status. At first, the level or the height of the garbage in each bin is measured by using the ultrasonic sensor. This information is then received and processed by the Arduino Uno. It will determine whether the garbage level has been overcome the threshold level or not. For this purpose, there are two threshold levels sets: the first threshold is at 70% of the bin height, and the second threshold is set at 90% of the bin height. If the garbage level in the bin is crossing the first threshold level, then the first warning message is generated and sent to the municipality. Besides, the green LEDs will be turned ON to alert all the residents on every floor. Next, if the garbage level in the bin is crossing the second threshold level, then the second warning message is generated and sent to the municipality. In this case, all the residents will be alerted when the red LEDs are turned ON. Figure 1 and figure 2 shows the block diagram and flow chart of our project.

BLOCK DIAGRAM

A garbage or waste management is a big challenge in urban areas in India. There are several phases of the garbage management process that include garbage monitoring, collection, transportation, processing, and disposal. The issues observed during the garbage monitoring process are the difficulty in locating the garbage system, lack of information about overflowing garbage, locating collection vehicles, or identification of biomedical / hazard waste.

In the existing systems, garbage is collected by the corporation, weekly once or by 2 days once. Though the garbage overflows the garbage bin and spread over the roads and pollutes the environment. That was a major Demerits of the Existing System It is time-consuming and frequent monitoring of the system is also required. Implementation cost is low. Using cost-effective sensors. Sending the warning/Alert message to the municipality. This saves time and is very efficient.

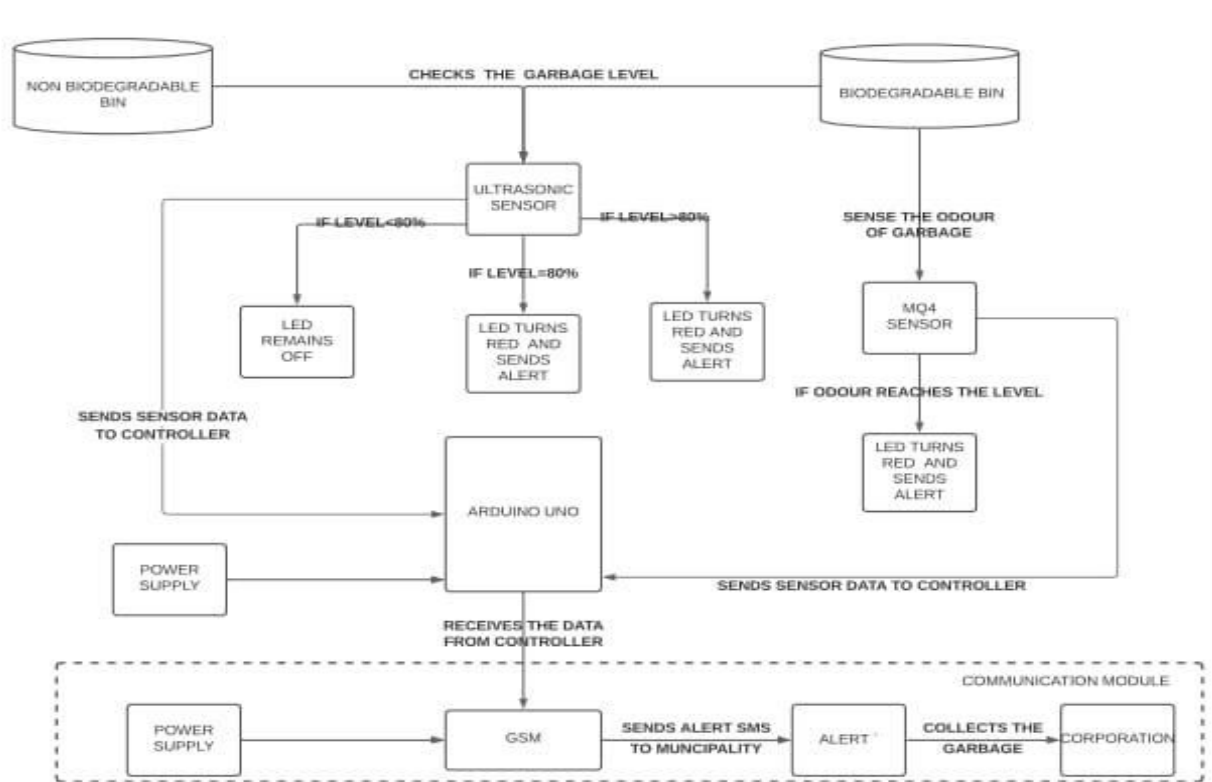


Fig 1: block diagram for garbage monitoring and collection system

Fig.1 This project involves the design of a smart garbage collection system to measure waste levels in the garbage bin in real-time and to alert the municipality, via SMS. It is observed that sensors are popular in the implementation of garbage monitoring systems.

The ultrasonic and the MQ4 sensors are attached to the biodegradable bin and the only ultrasonic sensor is attached to the non-biodegradable bin. An Ultrasonic sensor, which detects the level of the garbage inside the biodegradable, on biodegradable bins and also helps in continuous monitoring of garbage level. MQ4 sensors check the level of odor in the biodegradable garbage bin.

4.IMPLEMENTATION AND RESULT

The level or the height of the garbage in each level is measured by using the ultrasonic sensor. This ultrasonic sensor is placed on both the biodegradable and non-biodegradable bin. Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. And also it has a connecting device called a Global system for mobile communication (GSM). It is used to send messages to the garbage depot if the Garbage Can exceed the set threshold level. With the help of the GSM module interfaced, we can send short text messages to the required municipal corporation. GSM module is provided by SIM uses the mobile service provider and sends SMS to the respective authorities. The sensor is made using Natural Gas Sensitive material. MQ-4 gas sensor is sensitive to tin dioxide. When the concentration of tin dioxide increases, the conduction levels of the sensor also increases. MQ-4 gas sensor is also sensitive to Methane, Propane, and Butane. The sensor is used to sense different burnable gases, mainly Methane. It is a low-cost sensor and suitable for different applications.

In the case where the bins are already full or almost full, then it will generate a warning message which will be sent to the municipality via SMS, by using the GSM module. This system is also connected to several LEDs, in green or red colors, to alert all the residents regarding the bin status



Figure 4: The overview of the dustbin

At first, the level or the height of the garbage in each bin is measured by using the ultrasonic sensor. This information is then received and processed by the Arduino Uno. It will determine whether the garbage level has been overcome the threshold level or

not. For this purpose, there are two threshold levels sets: the first threshold is at 70% of the bin height, and the second threshold is set at 90% of the bin height. If the garbage level in the bin is crossing the first threshold level, then the first warning message is generated and sent to the municipality. Besides, the green LEDs will be turned ON to alert all the residents on every floor. Next, if the garbage level in the bin is crossing the second threshold level, then the second warning message is generated and sent to the municipality. In this case, all the residents will be alerted when the red.

5. CONCLUSION

By implementing this project, we will avoid overflowing garbage from the container in a residential area. It can automatically monitor the garbage level & send the information to the collection truck. This project on the whole looks promising. It maintains the level of cleanliness in the city and forms an environment which is better for living. The employees can check the status of these bins anytime on their mobile phones. This can prove to be a very useful system if used properly.

6. REFERENCES

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