

Solid Waste Management using IoT

S. Anusha¹, M. S. Chaithra², G. V. Gowri³, B. Maheshwari⁴, S. Suma⁵

^{1,2,3,4}Student, Department of EEE, Vidya Vikas Institute of Engineering and Technology, Mysore, India

⁵Professor, Department of EEE, Vidya Vikas Institute of Engineering and Technology, Mysore, India

Abstract: With increase in population, the scenario of cleanliness with respect to garbage management is degrading tremendously. Sometimes, up to 60% of waste is not being collected; it is often simply burned by the roadside. The overflow of garbage in public areas creates the unhygienic condition in the nearby surrounding. It may provoke several serious diseases amongst the nearby people. Waste collection method in such countries is an on-going challenge and many struggle due to weak institution and rapid urbanization. By 2030, almost two-third of the world's population will be living in cities. This fact requires the development of sustainable solutions for urban life, managing waste is a key issue for the health. So to maintain green and hygienic living place it is necessary to control the overflow of garbage bin and also to perform garbage management. The proposed system makes use of an embedded system based on Global System for Mobile communication (GSM) technology. The proposed system detects the filled garbage bins of particular area and sends SMS to Garbage Monitoring Section (GMS), which is maintained by the municipal officers of particular area. So that those filled garbage bins can be cleared immediately to control over full of garbage bins.

Keywords: Arduino Uno, GSM, WMS, GMS and sensors.

1. Introduction

Nowadays, there are tons of flats and apartment which have been built in the rapid urbanization area. This is due to high housing demands which have been drastically raised as a result of migration from villages to cities to find works. In order to accommodate the growing population in the urban area, the government has built flats, apartments or condominiums, to provide shelter for them. Besides, flats become popular mainly in the developing countries like India [1]. The Central and Environmental Engineering Organization (CPHEEO) has estimated that waste generation in India is much as 1.3 pounds per person per day, more tons of waste than U.S. per year. Solid waste management system that can take good care of the waste and resulting problem of pollution is the need of the hour. Hence Smart Garbage Monitoring is considered in this project. In our city many times we see that the garbage bins or dustbins placed at public places are overflowing. It creates unhygienic conditions for people. Also it creates ugliness to that place. At the same time bad smell is also spread. It is a scientific and faithful approach to achieve garbage free, disease-free and healthy locality by providing the local government within a system which uses number of basic technologies at reasonable price. The sensor is placed in the garbage bin. When the garbage

bin reaches to the threshold value, a SMS will be sent to the respective Garbage Monitoring Section (GMS). Then that person can send the collection vehicle to collect the filled garbage bins. We have observed that the municipal officer or the government authorized person will monitor the status of garbage bin. Or generally we see that they have a regular schedule of picking up these garbage bins. This schedule varies as per the population of that place. It can be once in a day or twice in a day or in some cases once in two days. However we see that in case there is some festival or some function, lots of garbage material is generated by people in that particular area. In such cases the garbage bin gets immediately full and then it overflows which creates many problems. So in situations, with the help of our project the government authority person can get SMS immediately.

2. Literature survey

This provides the various surveys done with the references for this project which is been designed by using various hardware components, software tools, new technologies, wired and wireless communication techniques and methodologies.

The following are the brief discussions of the papers referred to do this project are

- This paper describes how information got through sensors is transmitted over the Internet to a server for storage and handling systems. It is utilized for checking the everyday determination of waste containers, in view of which the courses to pick a few of the waste receptacles from various areas are chosen. Consistently, the labourers get the refreshed advanced courses in their navigational gadgets. The huge element of this framework is that it is intended to refresh from the past experience and choose on the day by day squander level status as well as the anticipate future state as for factors like movement blockage in a territory where the waste containers are set, fetched proficiency adjust, and different elements that is troublesome for people to watch and examine. In view of this chronicled information, the rate at which squander canisters gets filled is effortlessly dissected. Therefore, it can be anticipated before the flood of squanders happens in the waste canisters that are set in a particular area. The framework configuration requires the sonar that can be utilized as a part of this

model ought to give estimation from 2cm to 400cm with 3mm precision, which is sufficient for the waste bins, e.g., Ultrasonic Ranging Module (HC-SR04). The information gathered is sent to remote server by means of remote connection. Wi-Fi is considered as a system get to information MySQL is utilized for store of all information gathered by the sensors and the trucks.

- This paper describes the usage of four Infrared Obstacle Line Sensors fitted on the upper edge of a dustbin the sensor framework can be introduced in both top based containers and without top canisters. The IR sensors are interfaced with a Raspberry Pi 2 board. The board is fitted with a Wi-Fi Card/GSM Module that is linked to Internet. At the point when the dustbin fills up, the board informs the framework. The framework is a Python based Web Application that handles all warnings from the receptacles and sets up their areas on a guide. The framework at that point plans the gathering design and gives an improved course. The accumulation times of different dustbins can be loaded into the Azure Machine Learning System to get future anticipated circumstances,
- Implementation of hardware is discussed in this paper about the system design is made out of three section, for example, gateway, portal and control station The functions are to get the updated real time bin information, process the information and transmit the information to a server via the gateway. Process the data and transmit the data to a server through the gateway. Smart Bin An arrangement of detecting and correspondence innovations involves the brilliant container.

Among the sensors, some are appended with the drawback of the container cover and the other is at the base side of the container. The principal detecting components contains temperature, dampness, and accelerometer, ultrasound and hall sensors. Gateway is used to send the data about the bin status data based is used to parse and store the data this same data is sent to control centre through gprs network. DBMS is used as a database in control station which is hosted by a server all the data are received through gate way about the bin status a web based user interface is used for user interaction to monitor these stored data can be used to improve the feed programs like data parsing programs, routing and scheduling process. Waste management is the one of the biggest problem now a day's faced, which causes diseases and attract animals. So to overcome this problem automation is needed which must inform the municipal cooperation to empty the bins to maintain the cleanliness of the city.

3. Problem identification

Recent days in India multiple metro and other cities are enlisted under smart city project which uses different

technologies to achieve. Smart cities include the building the infrastructure like road sewage system etc major problem almost the cities are facing is to manage the waste that are generated daily. Currently emptying of the bin is done by corporation vehicles they need to visit the bin every day in a specified route some time bin will be overflowing by the garbage which attracts dogs and cattle's these animals will make the garbage to spill on the road secondly people won't go near to bin to throw their waste due to overfilled bins currently there is no bin is monitored remotely so complete automation is needed to monitor the bins remotely by the concerned persons and can inform the collecting vehicle to empty the bin when its full by doing in these method fuel can be saved and spillover of waste can also be avoided.

4. Methodology

The block diagram of the proposed method is as shown below, which represents main input blocks, control blocks and power supply.

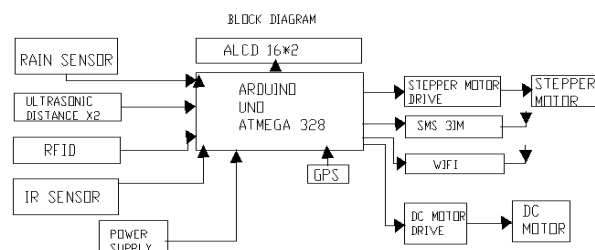


Fig. 1. Power supply

A. Power supply

The power supply circuit will provide necessary power requirements for circuit. The circuit is powered off a 9V battery. The Arduino Uno powered by 5V. GSM Module powered by 12v power supply.

B. Garbage bins system

Garbage bins System consists of sensors to detect the filling of the garbage bin. When the garbage bin is filled to the threshold level then garbage bins system sends garbage bin filled indication to the arduino. Then the arduino sends action command to GSM.

C. Arduino Uno

An open source platform which consists of both physical programming circuit board (micro controller) and a piece of software (integrated development environment). Arduino board is interfaced with pollution sensing sensor, WTS, GBS and GSM module. Arduino collect the information from interfaced modules and sensors, sends action commands to GSM.

D. Ultrasonic sensor

Ultrasonic sensor are used to detect the level of bin. A set of two ultrasonic sensors are been placed at angle of 120 degrees from each other so that the whole area of the bin is covered.

E. GSM Module

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through fixed telephone line while a wireless modem sends and receives data through radio waves.

GSM module is used to send messages. We have to insert a SIM card into this GSM module. Arduino Uno sends the commands to GSM module to send SMS to GMS and WMS. These commands are sent through serial communication port. Whenever garbage bin got filled then the GSM sends a message to the GMS along with the detail of particular area of garbage bin. GSM sends message to Water Municipal Section, when the water tank is filled to threshold level.

F. Garbage Monitoring Section (GMS)

Receives a message from GSM that garbage bin of particular area is filled, then GMS send municipal person to remove garbage from garbage bin of that area immediately.

G. Higher Municipal Officer

If the filled garbage is not cleared then the indication will be sent to the higher municipal officer. The indication sends in the form of SMS by GSM module.

5. Objectives

The following are the goals of the work.

- Design a unit of automatic sensing system with dedicated apparatus.
- Extract the bin position using indoor supported ubloxgps.
- Send the information regarding bin to control centre using cc2500 wireless.
- To provide gate way on Mqtt protocol for secured communication with reserved internet protocol.

6. Advantages and application

- To collect garbage bins placed at public places in city on time.
- Real time information on the fill level of the garbage bin is provided to authority.
- Deployment of garbage bin based on the actual needs.
- Cost Reduction and resource optimization.
- Improves Environment quality -Fewer smells -Cleaner liveable area
- Intelligent management of the services in the urban area.
- An effective system which supports Swachh Bharat Abhiyan.

7. Conclusion

The proposed system is expected to effectively monitor the garbage and saving the power using sensors, GSM module. This assures the cleaning of garbage bins soon when the garbage level reaches its maximum. If the garbage bin is not cleaned in specific time, then the SMS sent to the higher authority who can take appropriate action against the concerned contractor.

References

- [1] J Norfadzlia Mohd Yusof, Aiman Zakwan Jidin, and Muhammad Izzat Rahim, "Smart Garbage Monitoring System for Waste Management," Faculty of Engineering Technology, Universiti Teknikal Malaysia Melaka, Malaysia, MATE Web of conferences 97, 01098 (2017), ETIC 2016.
- [2] Vikrant Bhor, Pankaj Morajkar, Maheshwar Gurav, Dishant Pandya, "Smart Garbage Management Systems," International Journal of Engineering Research & Technology (IJERT), vol. 4, no. 4, March 2015.
- [3] Nimmi Pandey, Shubhashree Bal, Gajal Bharti, Amit Sharma, "Garbage Monitoring and Management using Sensors, RF- ID and GSM," International Journal of Innovative and Emerging Research in Engineering, vol. 2, no. 3, 2015, pp. 2394 – 5494.
- [4] A. M. Thomas, Annu Reji Philip, Tessa Elsa Peter, P. R. Nishanth, "Dust Bin Monitoring System," in International Journal of Advanced Research in Computer and Communication Engineering vol. 5, no. 3, March 2016.