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IoT based garbage monitoring system

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ABSTRACT

A big challenge in the majority of cities all over India is that of waste management. The key issue in waste management is that the garbage bins at public places get overflowed well in advance before initiating the next cleaning process. Improper management of waste can be a major factor for environmental pollution resulting in several health issues. The traditional way of manually monitoring garbage bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with present technologies. In order to handle such issues, we propose an IOT based smart waste management system which checks the waste level over the dustbins by using sensors. The ultrasonic sensors are interfaced with Arduino Uno 3 Microcontroller to obtain and send the level of garbage to the server of concerned authority after waste is filled up to particular level. Then authority can take required action by employing a worker to empty out the bins. So through this system, the real-time status of waste is monitored. Therefore one can ensure proper management of waste and this can be a step towards a quality environment which ultimately bodes well for human beings and other life-forms.

Keywords— IoT (Internet of Things), Waste management, Sensors, Microcontroller, Smart garbage bins, Alerts

1. INTRODUCTION

The garbage management and monitoring system is a challenging problem in today's scenario of metropolitan cities. There is a need for well-organized waste collection and disposal system.

According to one of our survey for the Navi Mumbai Municipal Corporation we have witnessed an unprecedented growth in last 24 years which is reflected as per census-2011 population around 11.20 Lac per day, garbage generation within the area of Municipal Corporation is about 700 metric tons. Almost the entire amount of garbage is collected from the doorsteps of 6,443 housing societies, 800 commercial and educational institutions and industrial premises on a daily basis. A major challenge in urban cities is solid waste management. Hence, the smart dustbin is a system which can eliminate this issue or at least lessen it to the minimum level.

The current Prime Minister of India, Narendra Modi, has taken initiative to implement projects for making smart cities in our country. "Swachh Bharat Abhiyan" was initiated in order to ensure an unpolluted environment. Hence, the need is felt for solving the problem of garbage management and its monitoring. Even though there are many existing mechanisms available for handling as well as managing waste, the major challenging task is gathering information. This occurs because there is a lack of coordination among government, people and the local authority for shipping and processing waste.

Thus in this project, we are designing smart bin with the help of IoT, based on which waste management and monitoring can take place in the smart city.

Amounts of waste are largely determined by two factors: firstly, the population in any given area, and secondly, the consumption patterns in an area. As reported by the UN, the world population between now and 2026, will increase exponentially to reach 8.3 billion inhabitants (from 7.1 today). With such kind of inflation in population number, the responsibilities towards waste

management also increase accordingly. Our waste administration frameworks and our economic situations make us unequipped for taking care of the developing measures of waste.

So unless a new paradigm of global cooperation and governance is adopted, a tidal wave of uncontrolled dumpsites will be the sole waste management method, especially in our country, which as seen is not the best way to go.

2. LITERATURE SURVEY

The rise in population has increased waste generation manifoldly, therefore, it is necessary to have in cities, a waste management system implemented effectively and efficiently. There were various methodologies put forward for implementation, of which some were successfully implemented and some were not. So a survey regarding different proposals was done to know about the existing systems.

The main objective is to collect information regarding solid waste collection and transportation in Ipoh and recommend a proper optimization plan which emphasizes on recycling of generated solid waste. The new optimized plan involves deciding a systematic route. Time, crew and vehicles for collection of recyclables were suggested via the application of Geographical Information System (GIS). This route will be nothing but a well-defined pathway for the system to be executed and accomplish smoothly and on time.

The paper proposed method in which ultrasonic sensors (as primary sensors) are used to sense the extent of scrap in bin and load cell is used as a secondary sensor. If the level sensors for some reason break down then load cell can be used as a reference. When the bin is reaching its limit GSM send a notification to the server room. This notification contains the coordinate of the bin which is supplied by the GPS module. The microcontroller receives the input from GSM and performs signal processing. The microcontroller communicates to GSM by using UART. The use of weight sensor for detection of the amount of garbage in dustbin will only detect the weight of waste, not how much level it is of. So sometimes this information may not be helpful, depending upon different scenarios.

In this paper [3] garbage management was done in the following way. A dustbin is coherent with a microcontroller based system (such as Raspberry Pi development board), connected to an IR wireless system along with the main system showing the current status of garbage, on a mobile application or a web browser by transmitting data over Wi-Fi. Hence the status will be updated on to the page. Therefore reducing human resources and their efforts and also serving the purpose of making smart cities. Considering the need for modern technology, the smart garbage bin can expensive, also considering the amount of dustbin needed in big cities it might not be feasible for the government body to opt for smart dustbins. The message can be sent directly to the cleaning vehicle instead of the respective authority's office. In such a way garbage bins are managed.

In paper [7] Infrared sensor (IR sensor) is used which is a versatile sensor widely used in various applications, these can detect the level of garbage. The IR sensors emit the light, such type of light is impalpable to the bare eye but the respective components are capable of detecting the rays. The two main components required are an IR transmitter and an IR receiver. On the working principle of IR sensors, we are able to get the levels of waste in the bins. The graphical representation to access the output of the sensor was shown. It gives the output of what amount of garbage is filled. If scrap level in a bin extends the threshold limit, then LED placed at the place of the bin begin to blink. When the blinking LED is clicked, a window opens showing the pinpoint location of the bin and its status along with some data and time when the bin got filled, mobile number and the text to send to the concerned person is made known. But this system does not ensure whether garbage is cleaned or not and transportation cost was one other issue.

In one of the proposed methods RFID technology were used for the collection of information regarding garbage container. The RFID tag has a specific frequency range in which it can be detected by the sensors. When any tag comes under the range of RFID reader, it automatically reads data from the tag, after collecting and the data is processed to obtain a report. The required information is sent via SMS for the worker. The data is sent to a central server, where a database of reports is kept. The system sent the information to the web server as well as the authorized person's mobile phone. RFID has a short range for interception of signals, thus it was not the best way for implementing smart dustbins.

3. PROPOSED SYSTEM

In the proposed system there are numerous dustbins situated across the city, these dustbins are fixated with a low-cost embedded device which actually assists in keeping track of the quantity of the waste material in the dustbins and a unique alphanumeric identification will be provided for each dustbin in the city so that the task for the concerned worker to identify and know about the whereabouts is simpler.

When the level of waste reaches the predefined threshold limit, the embedded kit which contains an LCD display will show the level of waste, right there on the dustbin and through the GSM or Wi-Fi module, this information will be transmitted to the web server, along with the unique ID provided to each dustbin. These details can be accessed by the concern authorities from their place through the Internet and an immediate notification can be sent to the employee hired for the work to take the necessary action. Due to timely alerts received by both the bodies in charge they can quickly take up the required work. This will help in monitoring the collection of garbage quite efficiently.

The data collected can be useful for any government to know about the waste generation in a particular area, so they can keep track of the type of waste, may derive some pattern, amount of waste etc. Thus measures can be taken to stricken the rules for local people if the waste management is going way out a hand.

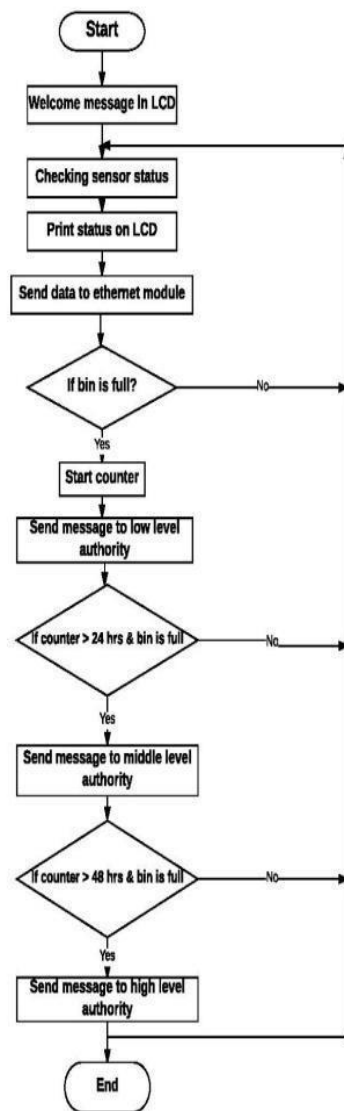


Fig. 1: The workflow of the proposed system

4. COMPONENTS OF THE SYSTEM

4.1 LCD display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in a 5x8 pixel matrix. This LCD has two registers, namely, Command and Data.

4.2 Ultrasonic sensors

Ultrasonic sound waves are used to measure the distance of an object from the ultrasonic sensors.

An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

4.3 Arduino Uno

The Arduino Uno is a microcontroller board grounded on the ATmega328 (datasheet). It comprises of 14 digital input/output pins (out of which 6 can be utilized as PWM outputs), 6 analogue inputs, a 16 MHz resonator, facilitation for USB connectivity, a power jack, an ICSP header, and a reset button. Its designs comprise of assistance that supports the microcontroller in every possible way. One has to connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery in order to work with it.

4.4 Wi-Fi module

To send a message or to establish a connection with the web server a Wi-Fi module is used, which along with the information gives the location of the dustbin. The Arduino Uno Wi-Fi is an Arduino Uno with an integrated Wi-Fi module. The board is based on the ATmega328P with an ESP8266 Wi-Fi Module integrated.

4.5 Web Server

An android application is used by the user to access the information like latitude, longitude, volume and weight of the bin. This information is also represented on the web server and is stored in the database.

The design of the dustbin will be such that it is of 1m-1.4m in length, dustbin will have a front opening for the people to throw in the waste. The embedded kit containing the components is placed under the lid.

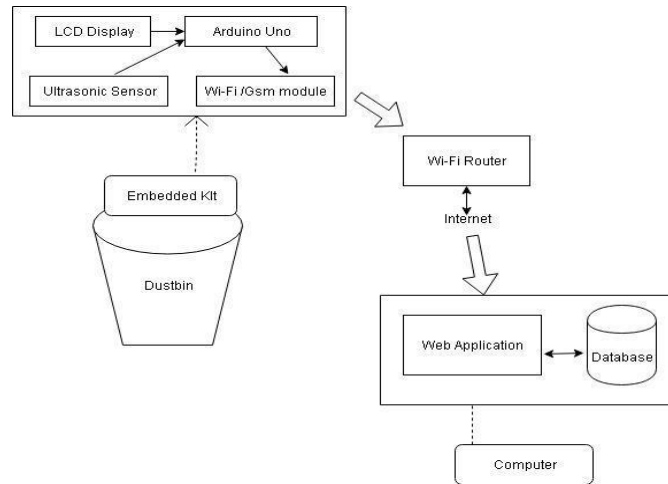


Fig. 2: Components of garbage monitoring system with the data flow

5. RESULT

The following are the results obtained from this work.

- Waste level detection inside the dustbin.
- Transmit the information wirelessly to the concerned person.
- The data can be accessed at any time and from anywhere.
- The real-time data transmission and access.
- Avoids the overflow of the dustbin.

This IoT beached waste management is very useful for smart cities in diverse aspects. We have seen that in cities, there are dissimilar dustbins located in different areas and dustbins become overflown many times and the concerned people do not get information about this on time. Our system is designed to crack this issue and will offer complete details of the dustbins located in different areas throughout the city. The Allocated authority can access the information from anywhere and anytime to get the details. Accordingly, they can revenue the decision on this immediately.

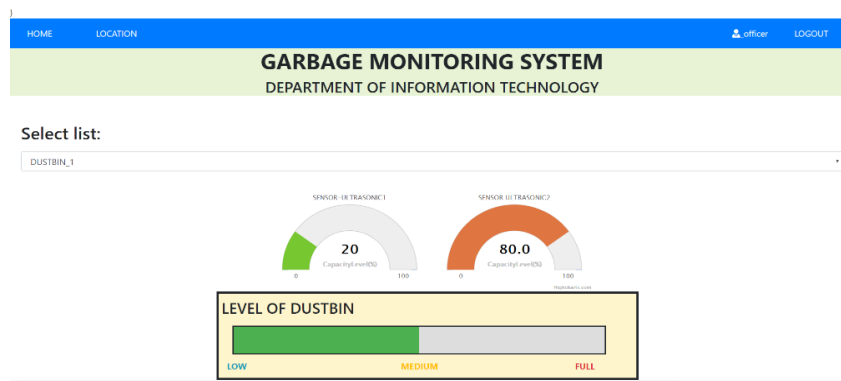


Fig. 3: Web View of the person in charge (Result)

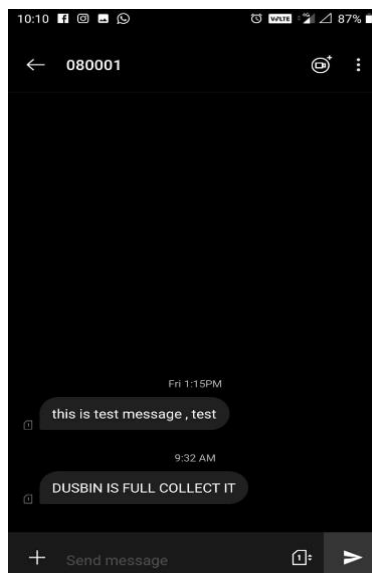


Fig 4: Message received by the worker

6. CONCLUSION

Various features such as durability, affordability *and* maintenance issues are addressed when these smart dustbins will be implemented. This Smart Dustbin can contribute a lot towards a clean and hygienic environment in a city.

Since the cost of our system is low it might be affordable for the people in charge to implement the framework provided. Human labour tasks also decrease. Proper awareness should be created among the public before it is implemented on a large scale. Otherwise, sensitive devices like sensors might be damaged due to the rough action of the users.

7. REFERENCES

- [1] Jia-Wei Lu, Ni-Bin Chang, Li Liao, and Meng-Ying Liao. Smart and green urban solid waste collection systems: Advances challenges. IEEE Systems Journal, Vol. 11, No. 4, December 2017
- [2] Dr.N.Satish Kumar, B.Vijayalakshmi, R. Jennifer Prathana, A.Shankar IOT based smart garbage alert system using Arduino UNO,6/16/2016 IEEE.
- [3] S.S. Navghane, M.S. Killedar, Dr.V.M. Rohokale, IoT based Garbage and waste Collection Binl, IJARECE vol 5, Issue. 5, pp. 1576-1578, May 2016.
- [4] Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, and Michele Zorzi. Internet of things for smart cities. IEEE Internet of Things Journal, 1(1), 2014.
- [5] Prakash Gavaskar, "IoT Based Smart Garbage System for Efficient Food waste management".The Scientific World Journal Volume 2014, Article ID646953.
- [6] Amirhossein Malakahmad and Noor Diana Khalil. A solid waste collection system in Ipoh city. In Business, Engineering and Industrial Applications (ICBEIA), 2011 International Conference on, pages 174–179. IEEE, 2011.
- [7] Meghana K C, Dr K R Nataraj, IOT based intelligent bin for smart cities.International Journal on recent trends in computing and communication.Vol 4 Issue 5.
- [8] <https://www.nmmc.gov.in/solid-waste-management-depstr>.