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Smart Garbage Management System for Hygienic and Healthy Environment

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Abstract

In metropolitan cities, garbage management is serious problem. It is not possible to check each place where the garbage dump yard is full or not. In many places, even though dustbins are filled, authorities are not cleaning them due to lack of information. As a result, harmful gases are evolved causing illness to human beings and animals. To avoid these problems, a system for monitoring Garbage is designed. Sensors are placed in dustbins, if dustbin is filled completely, then a message is sent to municipal authorities indicating that dust bin status and the location of bin with the help of GSM. Ultrasonic sensors attached to the dustbins intimates the extent to which the bin is filled. It detects the garbage levels and updates information accordingly. Gas sensors senses the presence of harmful gases. If any gas is present it gives information to municipal authorities. Using the concept of Inter of Things (IOT) the data is available in the internet, giving the status information of garbage and gas levels to the municipal authorities.

Keywords: *garbage, hazardous gases, IOT, municipal authorities*

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INTRODUCTION

With the power of IOT, fusing of tasks and systems together to quickly execute jobs have a more efficient system of working. The Internet of Things (IOT) shall be able to incorporate transparently and seamlessly an enormous number of different systems, while providing data for millions of people to use and capitalize.

Solid waste management is the prime concern for our environment that will impact the health and environment of our society. The primary problem is detection, monitoring and management of wastes. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies.

A solution for automated waste management is discussed in this paper. To keep the cities hygienic and healthy, an IoT Garbage Monitoring system is developed.

The block diagram (Figure 1) illustrates garbage dustbin monitoring system and reporting to municipal authorities over IOT. The ESP32-WROOM-32 and ultrasonic sensor are the major prerequisites for the system construction.

Advantages

It reduces infrastructure, operating and maintenance costs by upto 30%, keeps our surroundings clean and green and free from bad odour of wastes, emphasizes on healthy environment and keep cities more beautiful.

LITERATURE SURVEY

System that provides prior data of the filling of the bin that alerts the municipality and propose a “Smart Garbage Bin”, which is able to alarm and inform the approved person once when the garbage bin is on the top of fill. NIR spectroscopy analysis is employed for separation of perishable waste. The system is an android based application wherever the user himself will contribute to clean his town, apprize volunteer to come back forward or will inform town corporation**.**

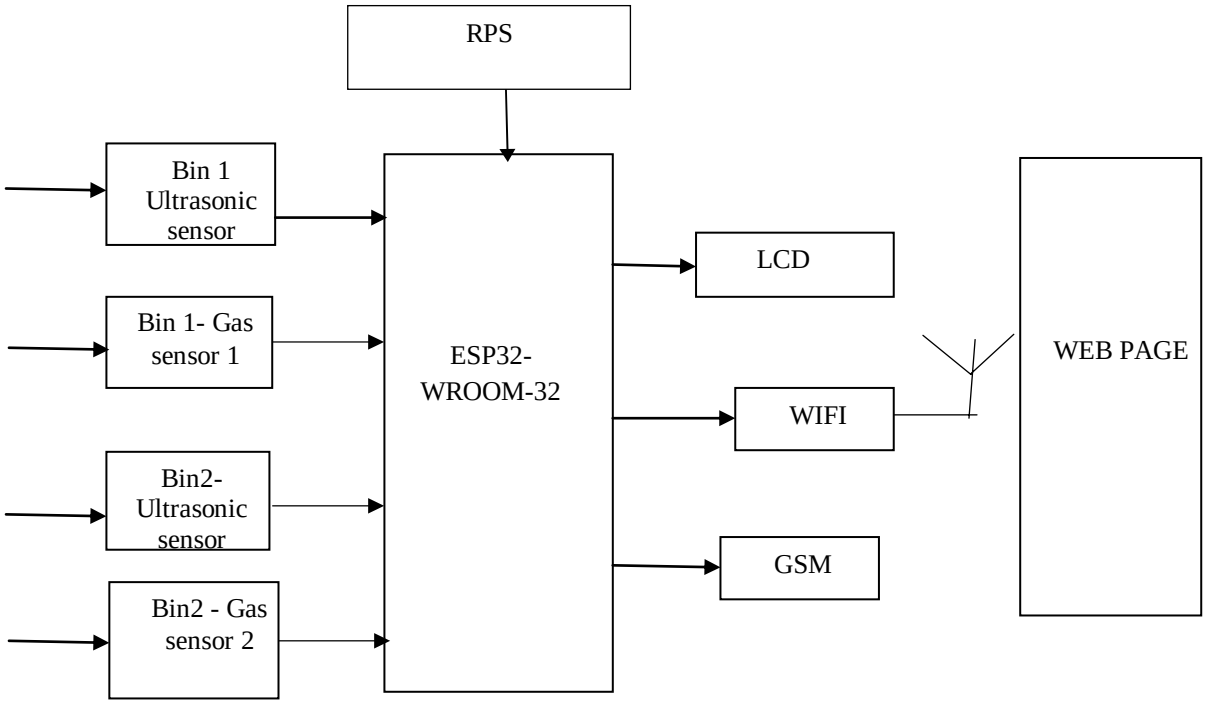

Fig. 1: *Block Diagram*

The system architecture is based on sensor nodes and makes use of Data Transfer Nodes (DTN) in order to provide to a remote server, the retrieved data measurements from the garbage bins filling. A remote monitoring solution has been enforced, providing user the chance to move with the system by employing a browser.

The bin was interfaced with a system supported microcontroller that had IR wireless systems with a central system that showed the current status of the garbage in the bin. The status was seen on a mobile based web browser with a html page by using Wi-Fi. To scale down the cost, they solely used weight-based sensors and on the sender's aspect they only used a Wi-Fi module to send and receive the information. In the end the sensor could only detect the weight of waste present in the bin but not the extent of waste.

In a system of integration of Radio Frequency Identification (RFID) and communication technologies for solid waste bin and truck monitoring system. RFID, GPS, GPRS and GIS along with camera technologies have been integrated and developed the bin and truck intelligent monitoring system. The experimental results showed that the performance of the developed system was stable and satisfied the monitoring system with high practicability and validity**.**

Arduino Uno micro controller based smart garbage monitoring system to ascertain the level of waste in the garbage bin in real-time and before there is overflow in garbage bin the system sense out and alert through SMS municipality for the bin to be emptied an garbage to be collected immediately[1-4].

The data is collected and transmitted via a wireless mesh network. Moreover, to reduce the amount of power consumed and maximize the time efficiency of the operations, the system employee's duty cycle technique. However, the technology employed uses short range connection for the system such as WIFI and Ethernet internet connections [5].

With this type of system, an enhancement would be employing a web server with effective graphic user interface and controlling actions. All bins will be mounted with GPRS enabled embedded system. Central servers receive information from bins and store all necessary information such as bin level history, number of dispatched wastes collecting vehicles etc. Thus, based on the

prediction of collected data on bin level, it enables the optimization of number of vehicles to be used. An application for smartphone will be developed, through which people can report to the appropriate authority with fill level, photos, comment, etc. With the integration of all the technologies, a new way of waste management system will emerge. Thus, this could lead to a significant reduction in the amount of garbage in the city, the cost of transportation and the realization of clean and convenient environment [6-11].

METHODOLOGY

The system is used for monitoring the level of bins and composition of waste using IoT and updated in the webpage. Our main goal of proposing this system is to remotely monitor the system and send quick notification to official which can reduce the overflow of bins. The level of bin is identified using ultrasonic sensor and its captured data are stored in webpage. If the bin level is filled it sends the notification to the official with the help of GSM. If the bin is not filled, its available space is viewed and updated in webpage. Then the waste is dumped in the main storage where it is decomposed. In the main storage, its levels are analyzed using ultrasonic sensor and the sensed data are captured in webpage. The gas sensor is used to sense the gas level in the main storage if the gas level is high then the waste can be used has a fertilizer and the notification is send to official or it should be decomposed. All the data are sensed and send to webpage. The device in the bin uses Wi-Fi for sending the sensed parameters of bin level and presence of gas to the webpage. The ESP32-WROOM-32 is used as the microcontroller. The complete system is well designed and meets the industrial and international waste management standards.

The measure of junk, at the end of the day suppose if your bin is half full you don't generally need to exhaust it. Our sift, or most extreme sum that we license of trash, is 75% of the container. On the off chance that assuming a specific bin tops off 20% and, at that point for seven days doesn't transform, it comes into our second criteria, time. With time even the little sum will begin spoiling prompting a foul encompassing. To evade that our resistance level is 2 days, so if a bin is under 75% yet it is two days old it at that point will likewise should be purged.

The connections are made to ESP32-WROOM-32. The ESP32-WROOM-32 pins are connected to power supply, ultrasonic sensor, gas sensor, GSM. We can program ESP32 using Arduino. The ultrasonic sensor and gas sensor give the status of the dustbin to ESP32 which is used to update it in the webpage.

The G12, G14 pins are connected to ultrasonic sensor-1 and the pins G26, G27 pins are connected to ultrasonic sensor-2. The ultrasonic sensor gives the level of the garbage by measuring the distance. The G34 pin is connected to gas sensor-1 and G35 pin is connected to gas sensor-2. The EPS32 updates the status of gas and level of garbage to the webpage when it gets the data from the ultrasonic sensor and gas sensor. The pins G16 and G17 are connected to GSM. The GSM module becomes active when the input from EPS32 is given to GSM. The G0, G2, G4, G5, G15, G18 pins are connected to LCD to display the status of the garbage level and the traces any harmful gases present in the dustbin.

The input for GSM is given from ESP32-WROOM-32. The Rx pin of GSM is connected to G17 pin of ESP32 and Tx pin is connected to G18 pin of ESP32. If the dustbin is full, then GSM is made active with the help of ESP32 and used to send the message along with the address of the dustbin. If the harmful gases present in the dustbin, then an alert message is sent to the municipal authorities.

The power to the circuit is 12V, which is given from the adapter. The above circuit is used give to power supply to all the components. The input for ESP32 is given from laptop with the help of USB cable. The GND pin of GSM is given to power supply. The VCC and GND pins of ESP32 are connected to the power supply.

The status of garbage level and gas content are uploaded in the web page. The URL of webpage created by us for knowing the status of garbage is projection xyz/ IoT Projects/ Garbage System/ view php. The level of garbage is first updated in the webpage and then message is sent to the authorities, when the garbage level is full.

The complete setup of the project is known in the above figure. The ultrasonic sensor is fixed at the top of the dustbin, as it measures the distance. The dustbin is full if the dust is 5m away from the ultrasonic sensor. Here, we are using two dustbins to differentiate the address of the dustbins by providing different addresses to the bins.

IMPLEMENTATION

The ESP32 is a development board featuring the popular WiFi chip. Arduino IDE is an official software introduced by Arduino.cc. The Arduino Integrated Development Environment (IDE) is the main text editing program used for Arduino programming.

Initially, both the dustbins are empty. Ultrasonic sensors and gas sensors are attached to dustbins. Gas sensors are used to sense the harmful gases if present. Ultrasonic sensors are used to give information about garbage levels by measuring distance from the dustbin lid.

If level of garbage is less than 5cm then ultrasonic sensor sends information to microcontroller indicating that dustbin is filled. With the help of microcontroller and Wi-Fi module webpage is updated and using GSM which is interfaced to microcontroller a message is sent to municipal authorities including the address of the dustbin.

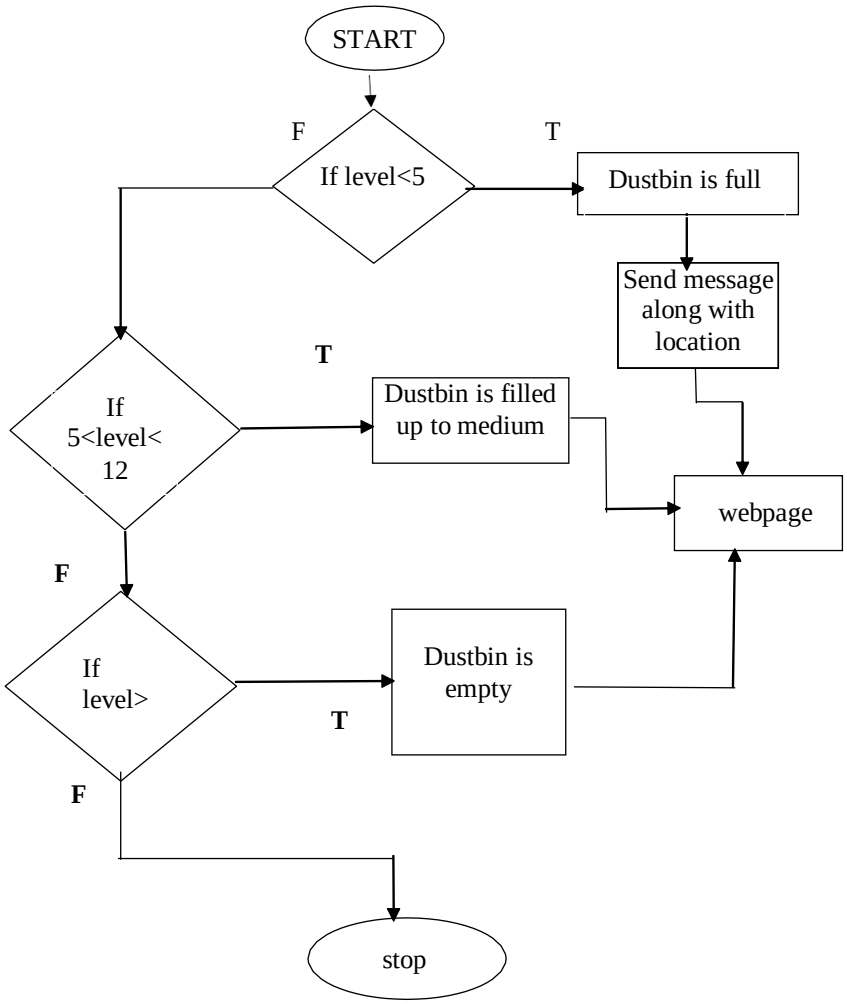

Fig. 2: *Flow chart*

If level of garbage is greater than 5 cm and less than 12 cm then ultrasonic sensor sends information that dustbin is filled up to medium, automatically it is updated in webpage.

If level of garbage is greater than 12 cm then ultrasonic sensor sends information that dustbin is empty, automatically it is updated in webpage.

Similarly, if any harmful gas is present in any dustbin then gas sensor identifies and gives information to microcontroller. Webpage is updated as gas is high dustbin. Using GSM, a message is sent to authorities indicating that gas levels are high.

If gas levels are low, then webpage is updated as gas is low in particular dustbin.
The above operations are shown in Figure 2.

RESULT

Initially, both the bins are empty with low gas levels as shown in the figure 3 & 4.

In this case, bin 1 is empty and bin 2 is filled up to medium level with low gas levels as shown in above figure 5

Status of garbage levels and gas levels of bins is displayed on webpage using IoT (Internet of things). In the above Fig 6, as bin 2 is filled up to medium level it is displayed on webpage.

In this case, bin 1 is empty and bin 2 is filled with low gas levels as shown in figure7.

Fig. 3: *Complete setup of bins*

Fig. 4: *LCD displaying the status of bins*

Fig. 5: *Level of bin 2 is displayed medium*

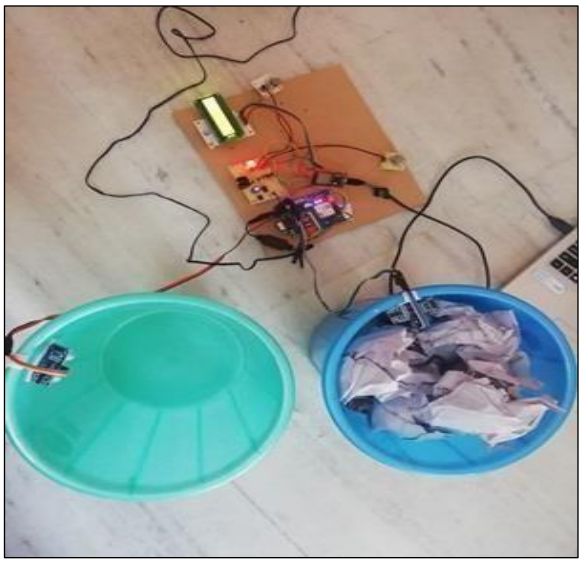

Fig. 6: *Setup with one bin filled completely*

Fig. 7: *Level of bin 2 is displayed high*

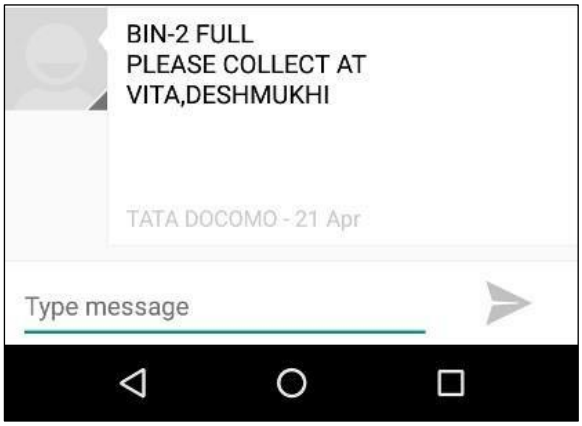

Fig. 8: *Message is sent through GSM when bin 2 is filled*

As bin 2 is completely is filled, it is displayed as FULL on webpage as shown in above figure. When any dustbin is filled completely, a message will be sent to authorities indicating that bin is full along with the location of the bin using GSM as shown in figure 8.

CONCLUSION

The multispecialty smart bin designed higher than will cause Associate in Nursing Eco-friendly, clean and healthy environment. This implementation can efficiently deal the problem of waste disposal which has been proved to be great threat to any developing country. The top Four developed countries spent most of their economy on effective waste management, recycling and disposal. Proper integrated work force can work collectively with distributed networks settled everywhere in the city for timely and quick decision making based on analytical data collected from sensors alarm alerts and, we provide message interfacing to know the condition of the bin. Thus, a proper waste management system is important to avoid spreading some vital diseases.

REFERENCES

1. Monika K A, Rao N, Prapulla S B and Shobha G, "Smart Dustbin-An Efficient Garbage Monitoring System", International Journal of Engineering Science and Computing, 2016, 7113-7116.
2. Prof. S.A Mahajan, Akshay kokanee, Apoorva shewale, Mrunaya shinde, Shivani Ingale," Smart waste management system using IoT" International Journal of Advanced Engineering Research and science (IJAERS), Vol 4, Issue 4, Apr 2017
3. Navghane S S, Killedar M S and Rohokale D V, "IoT Based Smart Garbage and Waste Collection Bin" International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Vol 5, Issue 5, May 2016
4. "Top–*k* Query based Dynamic Scheduling for IoT-enabled Smart City Waste Collection" 2015 16th IEEE International Conference on Mobile Data Management.
5. Kasliwal Manasi, Suryawanshi smitkumar, "A novel Approach to Garbage Management using Internet of Things for smart cities", International Journal of Current trends in Engineering and Research (IJCTER).
6. Andrea Zanella, Nicola But, Angelo Castellani,Lorenzo Vangelista,Michele Zorzi, "Internet of Things for Smart Cities", IEEE Internet of Things Journal, Volume: 1, Issue: 1, Feb. 2014
7. Kanchan Mahajan, Prof J.S. Chitode," Waste bin monitoring system using integrated technology", International Journal of Innovative Research in Science, Engineering and Technology.
8. Shivani Raina, Priya Gupta, Alice Kaw, Shruti Pandita, Shruti Parwana, " IoT Based Smart Garbage and Waste Collection Bin", International Journal of Engineering Science and Computing, Vol 7 issue 5, May 2017.
9. N Dinesh Kumar, S Pramod and Ch Sravani, " Intelligent Irrigation System", International Journal of Agricultural Science and Research, Vol 3, issue 3, pp no 23-30, Aug 2013.
10. N Dinesh Kumar, V Anand, B Bhavani, " Online Monitoring and Transfering of Geological Gases Data Through Zigbee", International Journal of Electronics, Communication & Instrumentation Engineering Research & Development, Vo 4, Issue 3, Jun 2014, pp no 135-142

11. N Dinesh Kumar, Chintam VB Aditya Kumar, VSK Reddy, P Raghu Ram, " Wireless transmission of bio-medical signals: Wireless doc ", 2011 Annual IEEE India Conference, pp no 1-5

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