

Garbage Level Monitoring System using Raspberry Pi

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ABSTRACT: The current system for waste management includes numerous stages with tremendous man-power. Every time labourers have to visit the garbage bins in the city area to check whether they are filled or not. And if they are filled, garbage bins are collected and disposed at closest landfill. If garbage bins are not filled, then the man-power invested goes in vain. As the population increases, the waste generated will in turn increase. This leads to filling of garbage bins more frequently and garbage remains unattended for a longer period due to lack of management. We can automate the whole process by monitoring levels of these garbage bins and send the notification once the garbage bin is about to fill. This will drastically reduce the wastage of man-power and would enable us to collect garbage only from those places that are about to overflow. Also, proposed system along with real-time fill level information collected through monitoring platform substantially reduces the overflow of the garbage by informing operators of such instances before they occur.

KEYWORDS: Raspberry Pi, Ultrasonic sensor, Internet of Things

I. INTRODUCTION

Waste management is one of the primary problem that the world faces irrespective of the case of developing or developed countries. The main issue in the waste management is that the garbage bins at public places get overflowed well in advance before the commencement of the next cleaning process. Problem: The current system for waste management includes numerous stages with tremendous man-power. Every time labours have to visit the garbage bins in the city area to check whether they are filled or not. And if they are filled, garbage bins are collected and disposed at closest landfill. If garbage bins are not filled, then the man-power invested goes in vain. A city like Pune has population of 31.15 lakhs (2012) is projected to grow up to 44.30 lakhs by 2027. And as the population increases, the waste generated by them will proportionally increase. Currently, about 1,600 to 1,700 tonnes of waste is produced daily in Pune city. This is growing on daily basis which is leading to various problems such as waste lying unprocessed in the city, protests by surrounding civilians. Swachh Bharat Abhiyan is a campaign by the Government of India to keep the streets, roads and infrastructure of the country's 4,041 statutory cities and town and its rural areas clean. The mission is bifurcated into sub-missions as Swachh Bharat Abhiyan (Garmin), under Ministry of Drinking Water and Sanitation, and Swachh Bharat Abhiyan (Urban), under Ministry of Housing and Urban Affairs. It includes ambassadors and activities such as a run, national real-time monitoring and updates from NGOs. Also, proposed system along with real-time fill level information collected through monitoring platform substantially reduces the overflow of the garbage by informing operators of such instances before they occur. From areas not covered by door to door collection, markets and other public places waste is collected from container bins and brought to the ramps. There are an estimated 350 locations where container bins are kept and an estimated 500 plus bins are placed in these locations.

II. LITERATURE SURVEY

[1] Parkash, Prabu Proposed system contains garbage bins with embedded device and unique ID. When the level reaches the threshold limit, the device will transmit the level along with the unique ID provided.

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[2] P. R. Naregalkar, Krishna Kishore Thanvi, Rajat Srivastava published the paper which aims to describe the implementation of a project called IoT Based Smart Garbage Monitoring System. The proposed system contains dustbins which are interfaced with microcontroller based system having Ultra sonic sensors with wireless systems along with central system showing current status of garbage

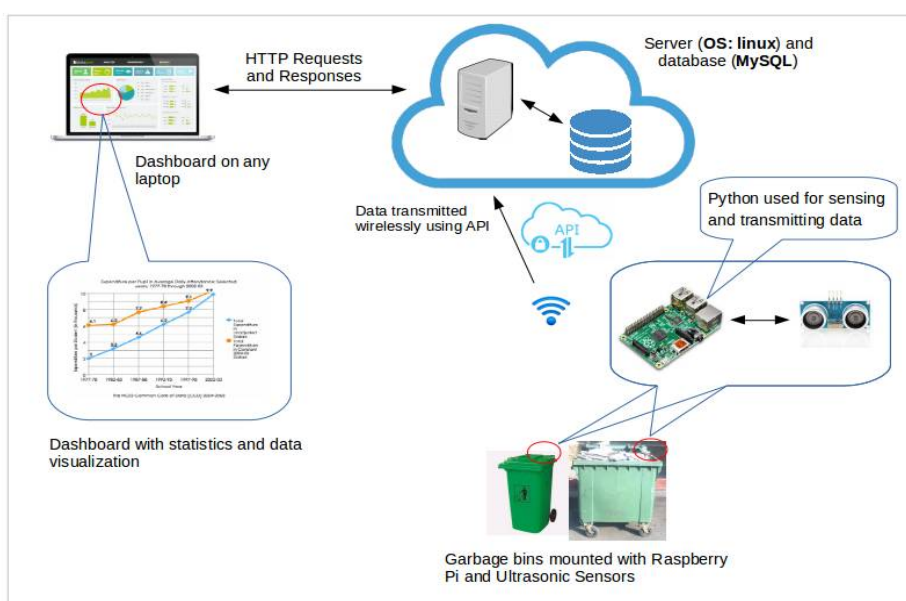
[3] Sneha Patil, Snehal Mohite, Aishwarya Patil, Dr. S.D.Joshi proposed system which consists a "Smart Garbage Bin", which will alarm and inform the authorized person when the garbage bin is about to overflow. The message then will be send to the authorized person to collect the garbage from the particular area.

[4] Prasad Kulkarni, Vivek Patil, Amey Chavan, Rajaram Powar, Vishal Dhaygude published the paper which aims to describe a GSM Based Waste Management for Smart Cities. In the proposed designed System there are multiple dustbins located throughout the city, these dustbins are provided with ultrasonic sensor which helps in level of the garbage bins and an so that it is easy to identify which garbage bin is full.

[5] P M. Palkar, T. Pathan, Ankita P. Hedaoo, Kalyani A. Harode, Nutan M. Petkule, Pranjali P. Kakade , Pranita D. Kolhe have proposed a Smart City Garbage Collection and Monitoring System, in which a smart bin is built on a microcontroller based platform Arduino Uno board which is interfaced with GSM module and ultrasonic sensor. GSM module is used to send message to garbage depot if the Garbage level exceeds threshold.

III.PROPOSED METHODOLOGY

The basic idea of the project is to monitor the level of garbage bins in the vicinity in real-time. Once the whole system is installed and power supply is given to the main processing unit i.e. Raspberry pi, it runs the program and activates Ultrasonic sensor. Sensor detects the garbage level in the bins and the result is provided to the server. This provides administrator a visual report of waste level in all the garbage bins on the server dashboard and he can monitor all garbage bin levels from a single location. Also, necessary actions can be taken on those bins whose garbage levels are above the threshold value. This helps in automating the process and reducing the wastage of man-power.



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IV. HARDWARE IMPLEMENTATION

This system consists of Raspberry pi, Ultrasonic sensor, ESP 8266 Wi-Fi Module and Power supply

A. Raspberry pi:

Raspberry Pi is a low cost (35 dollar), credit card sized, computer that performs various applications. Some of its main features include 1GB of RAM, 4 USB Ports, General Purpose Input Output pins, Linux support. These features gives programmers a wide range for diverse applications.

B. Ultrasonic sensor:

Ultrasonic sensors are used for distance measure using reflection mechanism. As soon as signal is given to the sensor through processing unit, it starts sending waves which reflects back from the waste in garbage bins and received back giving the resultant garbage level.

C. ESP 8266 Wi-Fi Module:

ESP 8266 is a Wi-Fi microchip having microcontroller compatibility. It has 64 KB of RAM and 16 GPIO pins.

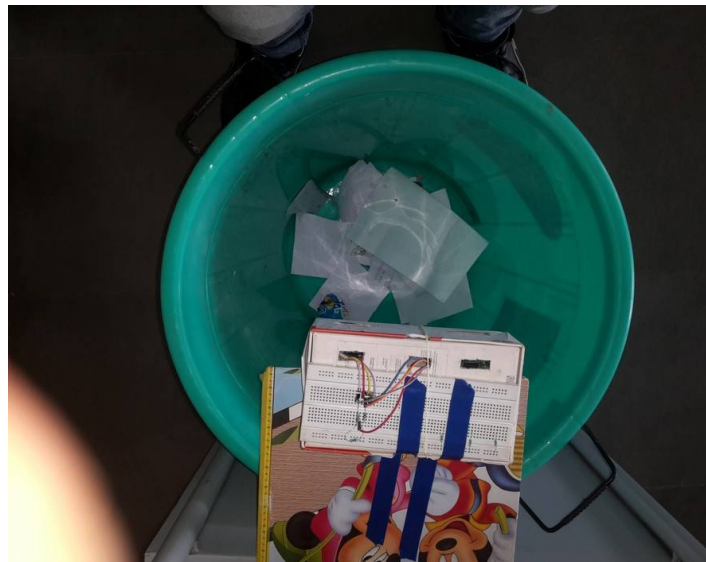


Fig 2. System Setup

V. SOFTWARE IMPLEMENTATION

A. Python:

Python programming language is used for the major part of the processing as well as for collecting data from sensors.

B. Django:

Django framework is used for backend and frontend purposes.

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C. Google Charts:

For data visualization, Google Charts API is used. Reports are generated with the help of charts such as Pie Charts, Line Graphs and Bar Graphs.

D. SQLite:

For data collection and storage, SQLite database is used.

VI. EXPERIMENTAL RESULTS

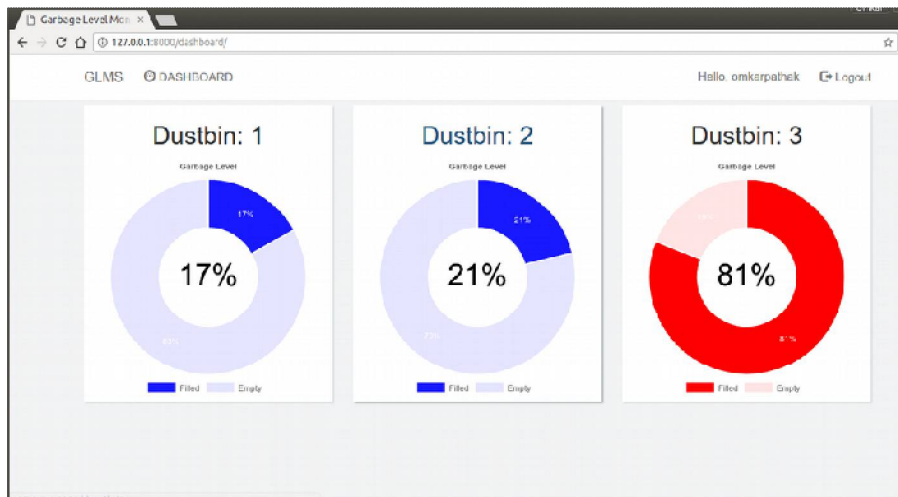


Fig 3. Real-time Dashboard

Figure 3 shows the real time dashboard that is being implemented to control and configure the garbage bins from a central location. The main advantage of this is that it eliminates the human intervention and automates the process to a great extent.

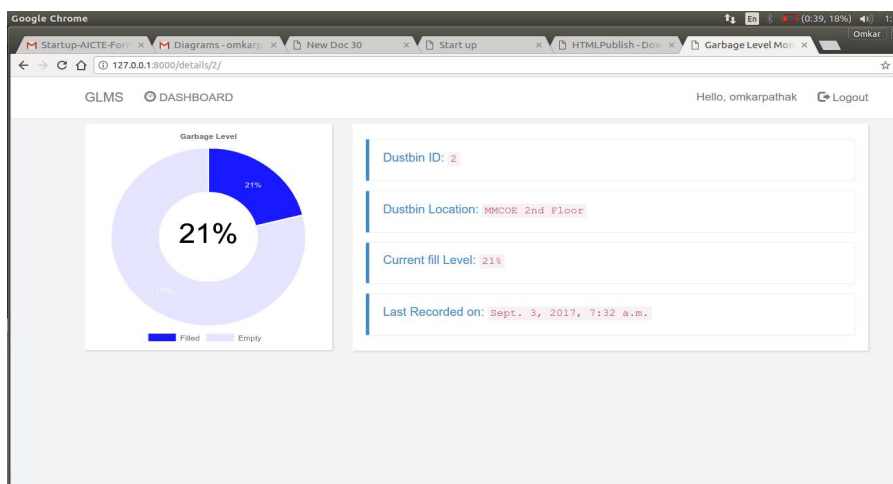


Fig 4 Real-time Dashboard of individual bin

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Figure 4 is the GUI provided to get the details of specific garbage bins. More information such as garbage bin location, the date of last garbage bin collection.

VII. CONCLUSION

The current system for waste management includes numerous stages with tremendous man-power. Every time labours must visit the garbage bins in the city area to check whether they are filled or not. And if they are filled, garbage bins are collected and disposed at closest landfill. If garbage bins are not filled, then the man-power invested goes in vain. The proposed system is an integration of a processing unit and sensors which help to detect garbage level and send corresponding data to centralized server. This helps to manage the overall garbage bins from a single location. Also, ultrasonic bin level sensors offer the means to have less trucks on the road for less time which means less fuel consumption and less greenhouse gas emission. Fewer truck cluttering up the roads also means less noise, less pollution and less road wear.

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