



Smart Dustbin-An Efficient Garbage Monitoring System

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Abstract:

In the recent decades, Urbanization has increased tremendously. At the same phase there is an increase in waste production. Waste management has been a crucial issue to be considered. This paper is a way to achieve this good cause. In this paper, smart bin is built on a microcontroller based platform Aurdino Uno board which is interfaced with GSM modem and Ultrasonic sensor. Ultrasonic sensor is placed at the top of the dustbin which will measure the stature of the dustbin. The threshold stature is set as 10cm. Aurdino will be programmed in such a way that when the dustbin is being filled, the remaining height from the threshold height will be displayed. Once the garbage reaches the threshold level ultrasonic sensor will trigger the GSM modem which will continuously alert the required authority until the garbage in the dustbin is squashed. Once the dustbin is squashed, people can reuse the dustbin. At regular intervals dustbin will be squashed. Once these smart bins are implemented on a large scale, by replacing our traditional bins present today, waste can be managed efficiently as it avoids unnecessary lumping of wastes on roadside. Foul smell from these rotten wastes that remain untreated for a long time, due to negligence of authorities and carelessness of public may lead to long term problems. Breeding of insects and mosquitoes can create nuisance around promoting unclean environment. This may even cause dreadful diseases.

Keywords:

Aurdino Uno, GSM Modem, Ultrasonic sensor, microcontroller

1. INTRODUCTION

The idea struck us when we observed that the garbage truck

use to go around the town to collect solid waste twice a day. Although this system was thorough it was very inefficient. For example let's say street A is a busy street and we see that the garbage fills up really fast whereas maybe street B even after two days the bin isn't even half full. This example is something that actually happens thus it lead us to the "Eureka" moment!

What our system does is it gives a real time indicator of the garbage level in a trashcan at any given time. Using that data we can then optimize waste collection routes and ultimately reduce fuel consumption. It allows trash collectors to plan their daily/weekly pick up schedule.

Though the world is in a stage of up gradation, there is yet another problem [1] that has to be dealt with. Garbage! Pictures of garbage bins being overfull and the garbage being spilled out from the bins can be seen all around. This leads to various diseases as large number of insects and mosquitoes breed on it. A big challenge in the urban cities is solid waste management. Hence, smart dustbin is a system which can eradicate this problem or at least reduce it to the minimum level. Our present Prime Minister of India, Sri Narendra Modiji has introduced the concept of implementing 100 smart cities in India. "Swachh Bharat Abhiyan" was initiated to ensure a clean environment.

According to the UN, between now and 2025, the world population will increase by 20% to reach 8 billion inhabitants (from 6.5 today). With this increase in population, the responsibilities towards waste management also increases. Our waste administration frameworks and our economic situations, even taking care of business, are unequipped for taking care of the developing measures of waste universally. So unless a new paradigm of global cooperation and governance is adopted, a tidal wave of uncontrolled dumpsites will be the principal waste management method, especially in Asia. On the west coast of America, San Francisco leads the way with a landfill disposal diversion rate of 72% and the city has set itself a target of zero waste to landfill by 2020.



This paper gives us one of the most efficient ways to keep our environment clean and green. Dustbin is a common means and a basic need everywhere. It is observed that often the garbage get collected due to irregular removal of garbage present in the dustbin. In the proposed paper, a new model for the municipal dustbins which intimates the center of municipality for immediate cleaning of dustbin has been proposed [2].

2. LITERATURE SURVEY

The authors in [3] have made a quantitative analysis between existing dustbins and their serving population. The study first analyses the spatial distribution of dustbins in some areas of Dhaka city using average nearest neighbor functions of GIS. Remarkably, the spatial circulation of the current dustbins has appeared to be dominantly in clustered pattern. Next, an optimal number of additional dustbins were calculated. It is shown that the number of existing dustbins is insufficient in the study area. The authors in [4] have equipped the smart bins with ultrasonic sensors which measure the level of dustbin being filled up. The container is divided into three levels of garbage being collected in it. Every time the garbage crosses a level the sensors receives the data of the filled level. This data is further sent to the garbage analyzer as instant message using GSM module.

In waste bin monitoring system using zig bee and Global mobile communication system (GSM). The sensors are place in the common garbage bins placed at the public place when the garbage reaches the level of the sensors. Then that indicated will give in indication to the driver by ARM7 they sending SMS using GSM technology. The technology use by Zig bee, Global mobile system (GSM), ARM 7 Controller. The range of communication of the zig bee is almost 50 meter. They use for range GSM Module, analysing the image we get an idea about level of garbage. The zig bee and GSM system would be able to monitor the solid waste collection process. This technique overcome some disadvantages which are use of minimum route, low cost, fuel use, clean environment. [5]

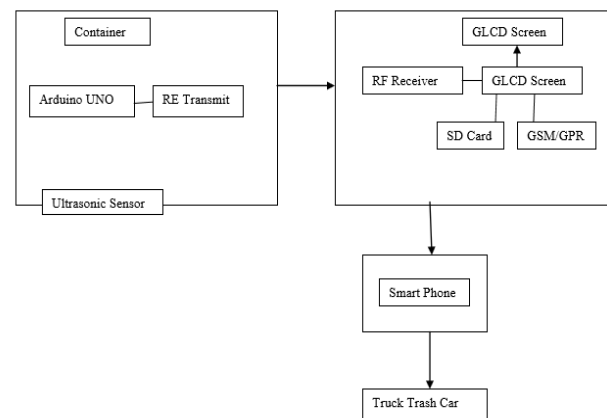
3. PROBLEM DEFINITION

Instead of using plenty of bins in an unordered fashion around the city, minimal number of smart bins can be used. Using only one sensor at the surface level instead of three not only makes it affordable but also achieves the same result. However, three sensors can be employed at various heights like $h/3$, $2h/3$ and h , where h is the height of the bin but to make it affordable and to achieve the same results, only one sensor is placed at surface level. Aurdino Uno board is used as microcontroller platform. Interfacing is done between GSM

modem and Aurdino board by connecting RX pin of modem to TX pin of board and viceversa. ECHO and TRIGGER pins of sensor is connected to digital pins 5 and 13 of Aurdino board. Aurdino board works at 5V power supply and GSM modem requires 2A to power on. Here in the above fig4.1, threshold height is set to 10cm. Threshold distance is the difference in height at which sensor is placed and the level of garbage fill. During the course of garbage accumulation, whenever the difference falls below threshold value, GSM modem is activated to send an alert signal to the concerned authority through an SMS. As soon as an SMS alert is received, concerned authority can place orders to the workers for cleaning the filled bins on time without allowing them to overflow.

4. SYSTEM ARCHITECTURE

The system is designed to decrease the improper use of valued human resources like human effort, time and cost and the need for smart waste collection and monitoring system. This study has been carried out in two parts. The first part was integrating the real system and developing smart services for smart waste collection and monitoring, and the second part was implementing the system for specific city to prove it. Fig illustrates the general block diagram of the system.



4.1. GSM Modem

A GSM modem is a specialized type wireless modem that works with a GSM wireless network. It accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. A GSM modem can be an external device or a PC Card / PCMCIA Card. An external GSM modem is connected to a computer through a serial cable or a USB cable



[6]. When a GSM modem is connected to a computer, this allows the computer to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS message. GSM Modem sends and receives data through radio waves.

4.2. Ultrasonic Sensor

The ultrasonic sensor has two pins: Trigger and Echo, which are used for calculating the distance of the object by generating sound waves and thus calculating the time duration of the echo that is generated.

4.3 Microcontroller

It get information from sensor and process on it. It compares the received data with the threshold level set and accordingly output is generated. The LPC2131/32/34//38 microcontrollers are based on a 16/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with 32 kB, 64 kB, 128 kB, 256 kB and 512 kB of embedded high-speed flash memory. A128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate.

4.4 Power Supply

We use 12v power supply in our project. It is mainly used to provide DC voltage to the components on board. 3.3V for lpc2138 and 4.2v for Wi-Fi module is apply from power supply. 5V is required for relay applied from power supply.

5. CONCLUSION

Various features such as durability, affordability, prevention against damage and maintenance issues are addressed when these smart dustbins are designed. This Smart Dustbin can contribute a lot towards clean and hygienic environment in building a smart city. But since the technology is new in India, 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 rough action of the users. By implementing this project we will avoid over flowing of garbage from the container in residential area which is previously either loaded manually or with the help of loaders in traditional trucks. It can automatically monitor the garbage level & send the information to collection truck. The technologies which are used in the proposed system are good enough to ensure the practical and perfect for solid garbage

collection process monitoring and management for green environment.

Advantages:

Monitors the garbage bins and informs about the level of garbage collected in the garbage bins. To keep our Environment clean & green. The cost & effort are less in this system.

Application:

This project can also be used in the "SMART CITY". This project is also helpful in the government project of "SWACHH BHARAT ABHIYAN".

6. FUTURE WORK

In this paper, implementation is done only for a single bin. Integration of many bins each with a unique ID can be done by implementing the principles of IOT and creating database for each bin which can be maintained by using SQL technology and a login webpage is created to ensure authorized entries. Apart from this, differentiation can be made between dry trash bin and wet trash bin collecting plastic dry waste and biodegradable waste respectively. To implement this methane and smell sensors can be used. This helps in distinguishing the waste at the source and hence reducing the requirement of manpower. To enhance it further, an automated system can be developed which is able to pick up waste in and around the bin, segregate them and put them in respective bins.

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