

SMART DUSTBIN-GARBAGE MONITORING SYSTEM BY EFFICIENT ARDUINO BASED

M.R. Sundarakumar¹, Assistant Professor
Department of CSE
Selvam College of Technology
Namakkal, India
Sundar.infotech@gmail.com

S. Naveen³, UG Student,
Department of CSE
Selvam College of Technology
Namakkal, India
naveensnlbe@gmail.com

S. Arun kumar², UG Student,
Department of CSE
Selvam College of Technology
Namakkal, India
Comcomcomap.com@gmail.com

Kamal Kumar Ray⁴, UG Student,
Department of CSE
Selvam College of Technology
Namakkal, India
kamalsct@gmail.com

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 Arduino 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. Arduino 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—*IOT,GSM,NodeMCU,Arduino*

I. INTRODUCTION (HEADING 1)

Though the world is in a stage of up gradation, there is yet another problem 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 Modi ji has introduced the concept of implementing 100 smart cities in India. “Swachh Bharat Abhiyaan” was initiated to ensure a clean environment.

Majority of viruses and bacterial infections develop in polluted environment. Safeguarding the environment using technology sources is needed at present. Majority of the public environment seems to be polluted with the waste material. So, modernization of the restaurants is needed by imparting the smart technology. Amounts of waste are largely determined by two factors: first, the population in any given area, and second, its consumption patterns.

II. OBJECTIVES

- Ultrasonic sensors used to measure the garbage height.
- Arduino is used to connect all the modules for data transformation
- By the GSM module the message will send to the user when the dust bin will have filled.
- Bluetooth module used to display the garbage height to the user mobile.
- Instead of normal battery the lithium battery and solar panel will be used because it can rechargeable

III. METHODOLOGY

A. Reason & Analysis For Smart Dust Bin

The authors in 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 extent of pollution caused by the existing dustbins was calculated using spatial analyst functions of GIS. It is found that all the dustbins are burnt with wastes and causing pollution to the environment. The results thus obtained would help to understand the present situation of the waste management of Dhaka city and to optimally place the required number of dustbins to prevent further pollution to environment.

B. Working of Smart Dust Bin

The authors in 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. Placing three ultrasonic sensors at three different levels of the container may be a disadvantage as the cost of the dustbin increases due to the sensors and also the sensors can be damaged due to the rough action by the users.

The authors in has built a framework in which a Camera will be set at each garbage collection point alongside load cell sensor at base of the trash can. The camera will take continuous snapshots of the garbage can. A threshold level is set which compares the output of camera and load sensor. The comparison is done with help of microcontroller. After analyzing the image an idea about level of garbage in the can and from the load cell sensor, weight of garbage can be known. Accordingly, information is processed that is controller checks if the threshold level is exceeded or not. This is convenient to use but economically not reliable. 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.

IV. IMPLEMENTATION

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A. Method of implement

In this paper, GSM 900A modem is used to send the messages. It consists of a GSM/GPRS modem with standard

communication interfaces like RS-232 (Serial Port), USB, so that it can be easily connected to the other devices. The ultrasonic sensor is used to find the height of garbage filled at different intervals of time.



Fig 4.1 Smart Bin with ultrasonic sensor equipped at surface level.

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. Arduino Uno board is used as microcontroller platform. Interfacing is done between GSM modem and Arduino board by connecting RX pin of modem to TX pin of board and vice-versa.

ECHO and TRIGGER pins of sensor is connected to digital pins 5 and 13 of Arduino board. Arduino 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.

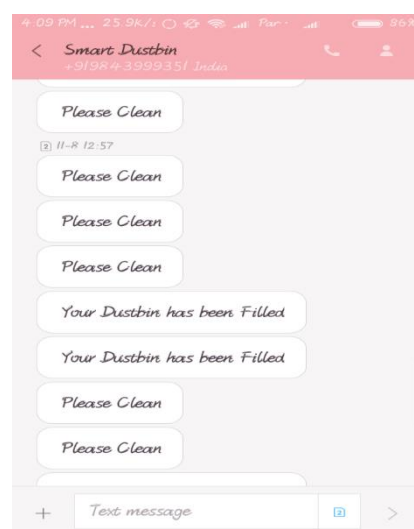


Fig 4.2
Display
alert
message
phone



Fig4.3 Height measurements of ultrasonic sensor by Bluetooth

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.

B. 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.

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To enhance it further, instead of battery we are using solar panel for charging and wi fi module(NodeMCU) will be added with 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.

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.

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