A Novel approach to design a Smart bin using through IoT

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ABSTRACT- India is the second largest population country, so collecting and disposal of waste plays a vital role in day today life. This work proposes a clean city concept using Smart bin and its application though a proper interaction and networking with one to many devices. The paper presents a novel waste collection technique and interaction through a Smart bin which is developed using ARM LPC 2148 with ultra-sonic sensors and pressure sensing resistor .The proposed system also provides the web page interactions to the terminal side with effective data base management and alert system according to the function of the bin. HTML web page is being created to show various levels of every bin located in each ward with various levels of trashes. A GSM transmits an alert to the terminal of the particular bin. RFID were incorporated for the authentication.

Keywords: Force sensing resistor, GSM, HTML, Smart bin, RFID, Ultrasonic sensor.

1. INTRODUCTION

ow a days waste management has become a sensational Nissue. To make SWACHBHARATH great success all the Indian citizens has to work together, it is quite challenging As the population increases the waste which is accumulated in the public bins are overfills and the waste will not carried to space land in time. It will spread diseases and effects the cleanness of the city. There are many solutions were proposed for the waste management concern these are not become successful due to many criteria, control unit has been placed in the dustbin in every public areas. But reality is everywhere the trash bins are overfilling and overflowing so the area is becoming untidy also area will be prone to diseases.

The manual method of tracking out the trash bins are tedious because sometimes a few bins will fill fast and some other are late. A Layman should be go to every bins and need to empty irrespective of the filling levels. It unnecessarily wastes human resource. Filling of waste depends upon not only the persons using the bin but also depends on the special occasions such as festivals, marriage etc. There is a survey carried out by Ranjith Kharvel Annepu, it cited that per data there is 130000 tons of Municipal Solid Waste (MSW) is produced in urban areas of India, which is capable of producing 1751 kcal/kg of energy [2] shows in Table 1. So, in this paper we have integrated analytics and electronics in order to create optimal changes in the conventional methodology of waste collection with the large amount of data that is being produced by the smart bin networks. The movement of waste across the whole city can be tracked and thus can be monitored by a single system efficiently and concretely. This system can prove to be a revolution for the whole urban waste management system of upcoming smart cities

Table 1: statics of MSW in India

Region/ city	MSW (TPD)	Compostable %	Recyclable %	Inerts %	Moisture %	Cal.value MU/Kg	Cal.value Kcal/kg
Metros	51400	50.89	16.28	32.82	46	6.4	1523
Other cities	2723	51.91	19.23	28.86	49	8.7	2084
East India	380	50.41	21.44	28.15	46	9.8	2341
North India	6823	52.38	16.78	30.85	49	6.8	1623
South India	2343	53.41	17.02	29.57	51	7.6	1827
West India	380	50.41	21.44	28.15	46	9.8	2341
Over all Urban India	130000	51.30	17.48	31.21	47	7.3	1751

2. EXISTING SYSTEMS

There are many steps being taken to avoid the overfilling of dustbins. Waste management becoming tougher and tougher these days. Large number of workforce are appointed for cleaning the metropolitan cities. Even though the task has not been reached to expected level.

A system [3] proposed which helps to show the nearby dustbin in a city. Users are voluntary need to log into the webpage to find out the bins. The System [5] introduces the user to put recycling material, users will be gets points by registering with their RFID. In advance to the existing system [5], this design [6] found little flexibilities which gives the high degree of scalability in terms of collecting the waste, each area is divided into polygon for every area a vehicle is provided the sensor data will go to vehicle where there is onboard computer. But this is failed to its cost and efficiency.

A few other system [2] which will alarm the system authority about the fullness they need to pick up waste in the

time scheduled manner but there is no controlling action is taken if they failed to pick up the trash bin in time.

2.1 Comparison of existing systems with the proposed system

By analyzing the Table 2, there are many systems had been developed to control and monitor the Municipal Solid Waste (MSW). The systems were successfully implemented with finding the nearest bin location, plastic sorting, recycling waste collection etc. But they are failed due to cost and precision of various sensors. In the proposed system it is mainly using the Internet of Things(IoT) also the GSM technology, Informing the various filling levels of the bin is become quite easy through the ultrasonic sensor and pressure sensor ,using the RFID identifying the location and authentication can be possible.

3. SYSTEM DESIGN

Taking the considerations of all the possible problems, proposed a smart bin which can sense the various levels of the bin using the ultrasonic sensors and also has the potential to measure the weight using pressure sensor.

The bin will be having various LED indication for various level. Namely for 20%,50%,70%, if the bin is 90% then filled the it will send a message to administer saying that the bin with this ID is about to fill please come and collect the waste. If the person delays it, the bin has been closed automatically and also there is an alarm to the user who dumps again the waste into the filled bins

The proposed bin will be fixed and the bin will be attached with the RFID. The layman with RFID reader only open the bin. So that can avoid the theft of the bin because the system is placed with sensors and controller. The Figure1 shows the basic block diagram of the proposed system.
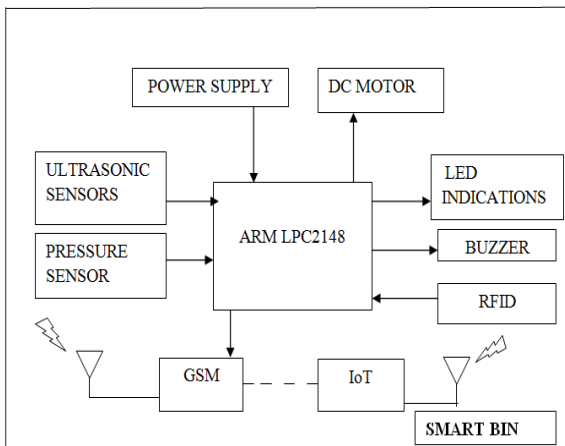

Fig 1: proposed system

Terminal Unit: The sensed data is sent to the terminal administrator where the data is stored in the database. The GUI is provided through the HTML where administer has

the graphical representation of each bin. Through the routine statistics one can make some essential observation like amount of thrash collected per daily, weekly, and monthly basis which helps to keep more trash bins for the required locations

4. SYSTEM SPECIFICATIONS

ARM LPC2148 :This controller is 32 bit, flash memory ranging from 32kb to 512kb, memory interface is 128bit it is a very tiny and low power device It is a full speed device with multiple UARTS, SPI, SSP, I2C and on chip SRAM memory ranges from 8kb to 40kb, various 32 bit timer, single or dual 10 bit ADC, PWM channels, also 45 fast GPIO lines with nine edge or level sensitive interrupt this will makes the system which suitable for the high end application[10]

Ultrasonic sensor: HC-SR04 is the sensor used, which will sense the various levels of the trash in and sends the data to the server HC-SR04 provides ranging between 2cm-300cm it has non-contact distance sensing capabilities, Ranging accuracy up to 3mm, module comprises an ultrasonic transmitter, a receiver and a control circuit[9]

4.3. Radio Frequency Identification (RFID): It being used to authenticate the user who is going to pick up the waste also the people who throws the waste to the bin. It Uniquely identifies an individual item beyond just its product type also it can identify items without direct line-of-sight, it has the potential to identify many items (up to 1,000s) simultaneously, items within a vicinity of between a few centimeters to several meters it can identify.

force sensing resistor (FSR): it helps to measure the weight, the weight being considered to measure its capacity. PSR are a Polymer Thick Film (PTF) device which exhibits a decrease in resistance with an increase in the force applied to the active surface. Its force sensitivity is optimized for use in human touch control of electronic devices. PSRs are not a load cell or strain gauge, though they have similar properties [9].

Global System for Mobile (GSM) sim900: GSM is used to send the message to the administrator, it is not necessary to have android based phone. It has RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz. It is well suited for SMS, Voice as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply [9].

4.6. *Hyper Text Markup Language (HTML)*: Hypertext markup language helps to give website where all can log in identify the filed bins. HTML is very dynamic and interactive, and it plays an important role in improving the user experience of the web. It provides more robust structure and organization.HTML helps us to define our own thoughts, layout, and definitions attractive hence creating the user friendly environment.

4.7 *Structured Query Language (SQL)*: is used as the database to store the sensor data it is possible to retrieve and manage data in relational data base.

5.CONCLUSION

This paper presents a new approach for the design of smart bin using LPC2148 and sensors. The work is proposed to provide an effective date base at the terminal side with user GUI interaction. The proposed bin are placed with various level indication for the fullness at the bin through ultrasonic sensors and pressure sensor for the statistics analysis. The system is also provided with a RFID tags for the authenticate and auto control for close and open the bin.

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