

SMART WASTE MANAGEMENT SYSTEM

ABSTRACT:

Urban India generates tonnes of wastes annually. Our country faces major challenges associated with waste management. Conventional garbage collection is not efficient since the authorities are not notified until the waste bin is full, and this leads to overflow of waste material. Efficient way of waste disposal and collection of disposed garbage is essential for a sustainable and clean India. This paper presents smart waste management using IoT based waste bin for collection and monitoring the level of waste inside bin. The system is implemented using two ultrasonic sensors which is being controlled by Node MCU. One of the ultrasonic sensor detects the level of the waste in the bin and other detects the person approaching the bin to dispose the waste. This detection helps in automatic opening and closing of the lid. Servo motor is connected to the lid which serves the action of closing and opening of the lid. In this system, level of waste in the bin will be sent to concerned authorities. The IoT data is stored and monitored using Blynk app. The proposed system is reliable, cost effective and can be easily implemented.

LITERATURE SURVEY :

This is not an original idea, IOT based dustbin was implemented and effectuated much before. Some authors presented systems where the sensors in the bin checked if the bin are filled up to the brim or not. If it was filled an automated message was sent to the server end of the system, through the Arduino SIM module, which used the application of the Arduino board. Once the server received the message it forwarded the message to the worker in charge, if the worker was available, he would notify his/her presence by accepting the work and would reach the required destination. If the worker was not available, the work would be transferred to another worker.

Some authors also implemented real time waste management system by using smart dustbins to check the filled level of dustbins whether they were filled. In this system the information of all smart dustbins can be accessed from anywhere and anytime by the concern person and he/she can

take a decision accordingly. By implementing this proposed system, the cost reduction, resource optimization, effective usage of smart dustbins was carried out. This system indirectly reduced traffic in the city. In major cities the garbage collection vehicle visited the area's everyday twice or thrice depending on the population of the particular area. The System informed the status of each and every dust bin in real time so that the concerned authority can send the garbage collection vehicle only when the dustbin is full.

Some proposed smart garbage management system using IR sensor, microcontroller and Wi-Fi module. This system assured the cleaning of dustbins soon when the garbage level reached its maximum. If the dustbin was not cleaned in specific time, then the records were sent to the higher authority who took appropriate action against the concerned contractor. This system also helped to monitor the fake reports and hence helped to reduce the corruption in the overall management system. It ultimately helped to keep cleanliness in the society

Progressively the Dustbin with Wi-Fi Router attached in it was also introduced. The Dustbin had a Passive Infrared Sensor. The Wi-Fi router was programmed to display the temporary connecting code. When the user threw trash in the dustbin, the PIR sensor detected the trash and sent signals to the microcontroller. The microcontroller detected the signals and forwarded it to the router device. The router verified the signals and generated random codes and then forwarded it again to the microcontroller. The microcontroller scanned the signals and forwarded it to the LCD Display. The LCD Display displayed it. The user entered the random code generated by the router on the PHP interface which was hosted on the server. The server then responded to the request and displayed the Master Wi-Fi password to the user. The user then used the Master Wi-Fi password to connect to the internet. The user got the internet access for 10 minutes and automatically got disconnected.

III. FLAWS IN THE EXISTING SYSTEM:

The main problems of the existing solid waste collection

process and management system are as follows:

- **More complications in the processing.**
- **many controlling units linked with each other**
- **higher implementation cost**

IV. PROPOSED SYSTEM:

Smart netbin a normal dustbin elevated using a microcontroller-based platform Arduino Uno board interfaced with Load sensor and Wi-Fi module.it consists of 2 main modules the mechanical designed components and the electric components. The mechanical components consist of shredder and the load sensing plate while the electric components consist of various components that are the Arduino

Loadcell, LCD Display screen, IR Sensor, Amplifier, Relay module, Wi-Fi Router.

When the user dumps the trash into the dustbin the trash will be first crashed within the shredder and the shredded trash will the get collected onto the load sensing plate present in the dustbin.

The load sensor us been attached to the load sensing plate this

sensor will measure the weight of the trash been dumped in the bin. once the set limit of weight is been satisfied the password of the router will get displayed on the LCD screen, although the router is still off .after the password has been displayed the user have to pull this plate outside so that the trash which has been collected on the plate falls down in the dustbin. This motion of the falling trash is captured by the IR sensor and once the IR sensor sense the falling motion

Advantages of proposed system over the existing:

- Low implementation cost
- Simple module
- Easy functionality

V. SYSTEM ARCHITECTURE:

A. The system is composed of following components:

1. The dustbin:

A normal dustbin made of plastic or metal which can hold up all the components installed in it the mechanical shredder installed on the top side and the load sensing plate at the

mediocre level all the IOT components will be installed at the bottom side. Thus, it should be of average size (height_600-700 mm dia_)

2. Sensors:

The sensing unit will mainly consist of 2 sensors i.e. the load sensor and the IR sensor the load sensor used for measuring the weight of trash being dumped into the dustbin and this is attached to the bottom side of load sensing plate, the IR sensor will detect the downward motion of trash once the load sensing plate s pulled out and the trash falls down in the bin

3. Load cell:

During a measurement, weight acts on the load cell's metal spring element and causes elastic deformation. This strain (positive or negative) is converted into an electrical signal by a strain gauge (SG) that is installed on the spring element.

Product Name: Load Cell

Load: 10Kg /22lb

Rated Output: $1 \pm 0.15 \text{ mV/V}$

Recommend Excitation Voltage: DC 5V; Max Excitation

Voltage: DC 10V

4. IR sensor:

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings. It does this by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

Operating Voltage Range

3.6~5 VDC

Average Current Consumption (mA)

0.06

Detection Angle

35 °

Distance Measuring Range

2 ~ 30cm

5. Wi-Fi module

It consists of the router which will provide the internet facilities to the user for dumping the trash into the bin

6. Microcontroller:

Arduino will be the processing unit for the embedded system at the bins. This will be used for controlling sensors and send information.

The other components include:

7. HX711 amplifier:

Differential input voltage: $\pm 40\text{mV}$ (Full-scale differential input voltage is $\pm 40\text{mV}$)

Operating Voltage: 2.7V to 5VDC

Operating current: $<10\text{ mA}$

8. LCD display:

Operating Voltage is 4.7V to 5.3V

Current consumption is 1mA without backlight

9. Power supply

The Power supply will provide electrical power for the

microcontroller, the shredder, and the router which are the most important part of the system.

10. Shredder:

A mechanical horizontal two shaft shredder is a machine used for reducing the size of all kind of material.it consist of shredding blade, loading box, box bracket, power system, the blade used is of steel. The specifications:

Voltage 200-300V

Power 4-15 kw

Capacity 80-800

11. Load sensing plate

The load sensing plate is a specifically designed plate according to the dustbin dimensions.it can be made of plastic wood metal it is used to collect the waste dumped into the bin and as the load sensor is attached to its bottom it measures the weight of the trash dumped in. it consist of holes so that the sand soil mud flows down through this holes and their weight is not been considered also the holes reduces the overall weight of the

plate.it is installed at the 1/4th height from the top of the dustbin

SOLUTIONS:

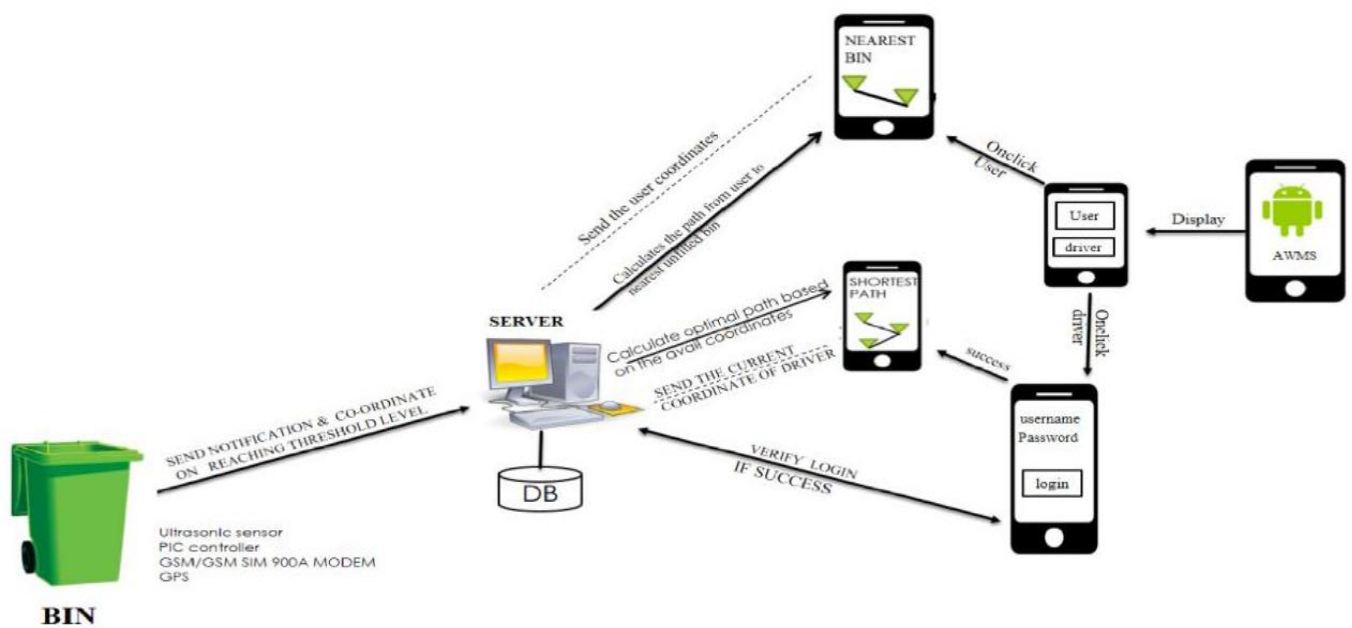
Design a smart waste collection system that allows citizens to segregate the various types of solid waste they want to dispose and the municipal authorities to efficiently collect the same. The system should be mobile app (Android) based.



Smart waste management is about using technology and data to create a more efficient waste collection methods. Based on IoT (Internet of Things) technology, smart waste management aims to optimize resource allocation, reduce running costs, and increase the sustainability of waste services.

WORKING OF THE MODEL :

The bin with ultrasonic sensor, PIC controller, GSM and GPS will notify the coordinate and bin status to the database. Here GSM is user to communicate with the server, which will contain the SIM with the basic speed internet. The ultrasonic sensor which uses ultrasonic waves will check the bin status. The server will maintain the details of the unfilled bins, filled bins and authority registration. The information to the normal user is about the nearest unfilled bin and authorised person will be given the coordinated of the filled bins. The user end will contain the android app which works on android compatible phone. The user will notify the unfilled nearest bin with path and authorised person will be notified by the filled bins with path. The working is as follows, User inserts trash into the bin, Bin checks for threshold level, Bin sends the status and coordinates to the Control centre on reaching the appropriate level, Control centre uses the coordinates sent by multiple Bins and provides an optimal path to the garbage vehicle, The bin if emptied by the vehicle, a notification is sent by it to Control centre. This helps in easy monitoring.



Smart waste management is a idea where we can control lots of problems which disturbs the society in pollution and diseases. The Smart waste management is compatible mainly with concept of smart cities. The main objectives of our proposed system are as follows:

1. Monitoring the waste management.
2. Providing a smart technology for waste system.
3. Avoiding human intervention.
4. Reducing human time and effort

5. Resulting in healthy and waste ridden environment. This project falls under the category of embedded systems and android applications.

VIII. FUTURE WORKS:

The moisture sensor can be implemented hand in hand with the other sensors and the compartments for segregating the dry and wet waste can be created which will solve the issues related to waste segregation.

IX. CONCLUSION:

Improper disposal and improper maintainance of domestic waste create issues in public health and environment pollution thus this paper attempts to provide practical solution towards managing the waste collaborating it with the use of IOT i.e. providing free internet facilities for a specific time once the trash is dumped into the bin. the proposed system will definitely help to overcome all the serious issues related to waste and keep the environment clean

X. REFERENCES:

[1] P. Suresh, Vijay. Daniel, R.H. Aswathy, Dr. V. Parthasarathy, “A State-of-the-Art review on Internet of Things” International Conference on Science Engineering and Management Research (ICSEMR), IEEE, DOI: 10.1109/ICSEMR.2014.7043637 19 February 2015.

[2] Parkash, Prabu V “IoT Based Waste Management for Smart City” International Journal of Innovative Research in Computer and Communication Engineering, Vol. 4, Issue 2, DOI: 10.15680/IJIRCCE.2016. 0402029, February 2016.

[3] Evaluation on the Performance of Urban Domestic Sewage Treatment Plants in China - 2011 Dongmei Han; Guojun Song

[4] Teemu Nuortioa, Jari Kyto ¨ jokib, Harri Niskaa, Olli Bra ¨ ysyb “Improved route planning and scheduling of waste collection and transport” , Expert Systems with Applications 30 (2006) 223 – 232, Elsevier

[5] M. Arebey, M. Hannan, H. Basri, and H. Abdullah, "Solid waste

**monitoring and management using RFID, GIS and GSM", The
IEEE Student Conference on Research and Development
(SCOReD), 16-18 November 2009, UPM Serdang, Malaysia, 2009**