

EFFICIENT WASTE MANAGEMENT SYSTEM USING IOT

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ABSTRACT

The term waste management usually relates to all kinds of waste, whether generated during the extraction of raw materials. It includes over flow of garbage which results in land pollution, spread of diseases, also it creates unhygienic conditions for people, and ugliness to that place for processing, There needs to be system that gives prior information of the filling of the bin that alerts the municipality so that they can clean the bin on time and safeguard the environment. To avoid all such situations we intend to propose a solution for this problem Smart Garbage Bin, which will inform the authorized person when the garbage bin is about to fill, and will send the location of bin to the server. The idea is simple and is driven by the fact that dustbins require very frequent cleaning, which is not always possible. This leads to unhealthy environment and spread of diseases. The aim is to accommodate more and get the dustbin cleaned timely using alert services.

Keywords: ESP8266, Microcontroller, Ultrasonic Sensor, IOT, Waste Management.

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I. INTRODUCTION

In efficient waste collection systems lead to environmental pollution, which in turn results in breeding of insects, animal scavengers and rodents, and giving rise to range of diseases. The traditional method includes burning of the waste if not collected in time. Burning of waste causes air pollution to great extent. Normally, the municipal/corporation authorities maintain dust bins at specific places in the domestic areas where the residents are instructed to dispose their household wastage. Though the authorities are instructed to clear away the wastage within a specific time period, they end up clearing them after few days by the time, the dustbins start over overflowing and smelling. Therefore, degradation of the waste also causes bacterial & viruses to grow, thereby affecting the public health. The garbage collector is going to check a individual places and cleaned it. It will take much time to reach another garbage bin if it is overflowed. The purpose of this paper is to suggest a schedule for collection of waste and dumping them to the existing disposal sites. Currently we find the trucks landing at our doorstep irregularly. These trucks discard their further path if they get filled at some point. Eventually delaying collection of waste in some regions. This leads to waste

accumulation in such regions. In order to avoid this, we have come up with the new system "smart garbage bin". In Particular area there might be multiple garbage bin it will be mentioned id in the sensor. If the garbage bin is about to be fill. Suddenly it will search database in the list. Who is the authorized person. Then A person will got notification message from sensor by using a GSM modem. Along with the address of bin which helps garbage collector to find out the bin for collection of waste the garbage bin. Here there is no need to check the individual garbage bins. Also with the use of this scheme, system finds out the shortest path to collect the waste so that waste collection can be maximized with less fuel consumption. Human health issues related to the overloaded waste bins and harmful gas levels in the atmosphere can be reduced by the use of proposed system, as it focuses on collecting the waste efficiently and in time. Database maintained at the central server can be used to generate the monthly or yearly reports regarding amount of waste collected in a month or year, quantity of fuel consumed. This data can be used to predict the amount of waste that might be generated next year. Also, in case if bin is full the system will displays the address of next empty bin on LCD display. use of LCD displays helps residents to find next empty bin for disposal of their household waste. In

this system we send the notification will do the work of this project is to send a message to authorized.

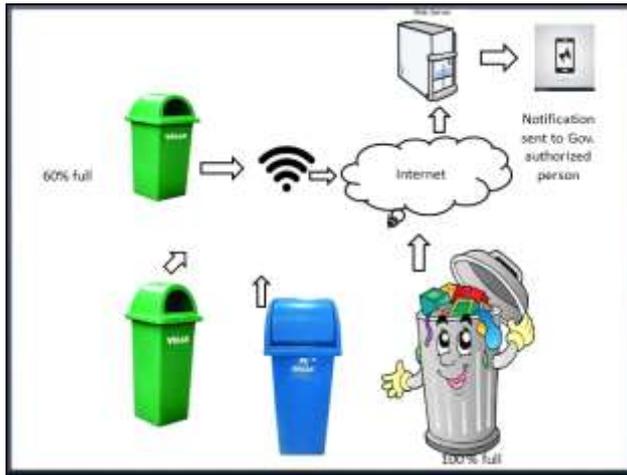


Fig 1. System overview

II. LITERATURE SURVEY

The main problems of the existing solid waste collection process is :

i) Lack of the information about the collecting time and area.

ii) Lack of the proper system for monitoring, tracking the trucks and trash bins that have been collected in real time

• **Sensor based monitoring of bin fullness status:** The liquid and gases takes the proper layers of filling so it is comparatively easier task to sense the level than to sense a level of solid materials [4]. Two sensors which are weight and filling sensors are placed sensed data from these two sensors will give status regarding with bin fullness. The weight sensor is at the bottom of dustbin whereas filling sensor is at the top of the dustbin. Wireless networks will play role of conveying this status of respective dustbin.

• **Software applications involving people for waste management:** The software mobile application is developed to involve citizens in a process of managing a solid waste. Android mobile application is developed where people can come forward as volunteer or they may inform a corporation about the bin fullness so that they can collect it. This will avoid the overflow condition of a dustbin and ultimately its side effects like spreading number of diseases. Detailed provisions related to the opinion from citizens about the status of city with reference to cleanliness, categories of taking snaps and uploading it to server application, segregation of dust status based on waste class, distance, time is given so as to assigning preference etc, are given which makes software applications even more helpful to actively contribute in a process of waste management.

• **Optimal Vehicle routing algorithm:** Smart dustbins are designed whose fullness status will be displayed on a database for the respective person responsible for collection of garbage [1]. The map will show the location of that particular bin as well as the shortest path to follow so as to reach that dust bin in optimal way. Various models for shortest path algorithm has been implemented that will help ultimately to manage routing cost etc. [2] [3] [5]. It can be

said that the researches carried out for the solid waste management are majorly concerned with vehicle routing.

• Aeslina Abdul Kadi et.al (2015) New trend are used to improving technology to collect waste management by providing electronic system[7] in the bin. In that they are mentioned at level. To overcome this we are using a smart card recycle bin. Wastage will be calculated automatically in the smart card bin. It will be tracked by RFID-Based. Two methods First is garbage classification and second is rest back from the chain recycling.

• J. Teixeira et.al (2004) wastage was collected by recyclable waste and it will be collected by every day of month and minimizing the operation cost. In this they have a two main feature of this problem long period of time to clean and separate three types of waste. Here the heuristic technique [1] used to develop three types vehicles, routes, and preliminary result.

• KanchanMahajan et.al (2014)In this paper the garbage bin level detected the sensor. Once if the garbage is filled and they send information like, ARM 7 using in this paper. To induction and find the fill level of garbage.

• Zembedded et.al (2012) In this paper the GSM modem is interfaced with controller for SMS communication. The sending SMS through GSM modem when interfaced with microcontroller . They are many application of the project based on communication 8051 and GSM interfacing.

• Jose M. Gutierrez(2015) The Optimization algorithm and AI .The paper proposed waste collection system is based on waste level data from trashcans in a metropolitan area. but the garbage management in cities has to be effectively and efficiently not implemented.

• Monika K (2016) It consists of a GSM/GPRS modem with standard communication interfaces like RS-232 ,(Serial Port), USB But they require a more amount and labors.

• Meghana K C, Dr. K R Nataraj(2016) dynamic routing algorithm. But this system does not ensure whether garbage is cleaned or not and transportation cost is another issue.

III.PROBLEM STATEMENT

With rapid increase in population, the issues related to sanitation with respect to garbage management are degrading immensely. It creates unhygienic conditions for the citizens in the nearby surrounding, leading to the spread of infectious diseases and illness. To avoid this problem, IoT based “Smart Waste Management” is the best and trending solution.

IV.PROPOSED SYSTEM

We propose a smart waste collection system. The data obtained through sensors is transmitted over the Internet to a server for storage and processing mechanisms.

It is used for monitoring the daily selection of wastebins, based on which the routes to pick several of the wastebins from different locations are decided.

Every day, the workers receive the updated optimized routes in their navigational devices. The significant feature of this system is that it is designed to update from the previous experience and decide not only on the daily waste level status.

Also predict future state with respect to factors like traffic congestion in an area where the wastebins are placed, cost-efficiency balance, and other factors that is difficult for humans to observe and analyze.

As a result, it can be predicted before the overflow of wastes occurs in the wastebins that are placed in a specific location. Depending on economic requirements specified at early stages, the optimized selection of wastebins to be collected is expected to improve collection efficiency. Fig. 1 shows the block diagram.

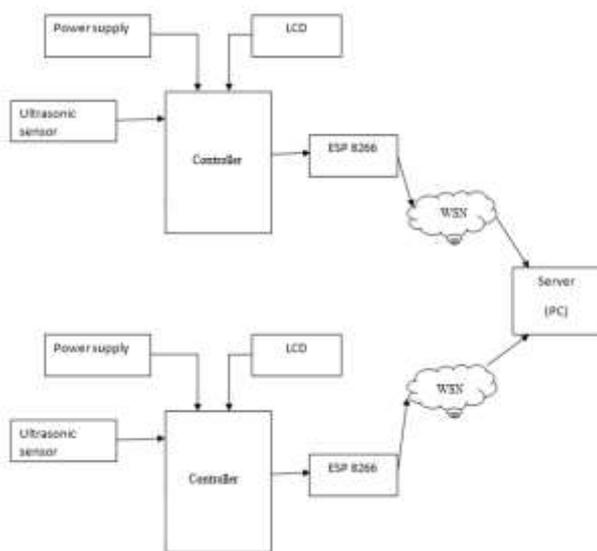


Fig 2. Block diagram

V. MATHEMATICAL MODEL

According to set Theory the relevant mathematical model for this project is designed below.

Let, System as S set

$$S = \{I, U, S, D\} \quad (1)$$

Where,

{I} is set of all given input set.

{U} is set of all processes in System.

{S} is dustbin level that detect from sensor.

{O} is set of output expected from system.

Module 1:

$$\text{Set } U = \{u_1, u_2, u_3, u_4\}$$

u_1 = Available waste systems.

u_2 = Hardware resources required

u_3 = Detection waste location.

u_4 = Level of dustbin.

Module 2:

$$\text{Set } S = \{s_1, s_2, s_3, s_4\}$$

S_1 = get dustbin location.

S_2 = activate dustbin for live services.

S_3 = check the dustbin level.

S_4 = Allocate Resources for Execution.

Module 3:

$$\text{Set } D = \{d_1, d_2, d_3, d_4, d_5\}$$

d_1 = Read location to be execute.

d_2 = Analysis of level of dustbin waste level

d_3 = Send notification to the server.

d_4 = Execution.

d_5 = Deployment.

VI. CONCLUSION

We presented an intelligent waste collection system. The system is based on IoT sensing prototype. It is responsible for measuring the waste level in the wastebins and later send this data (through Internet) to a server for storage and processing. This data helps to compute the optimized collection routes for the workers.

In future, we would like to enhance the system for different kind of wastes, namely solid and liquid wastes.

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