IOT Based Smart Garbage Management System

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Abstract - The waste collection process is a critical aspect for the service providers. The traditional way of manually monitoring the wastes in waste bins is a complex, cumbersome process and utilizes more human effort, time and cost which is not compatible with the present day technologies. Irregular management of waste typically domestic waste, industrial waste and environmental waste is a root cause for many of the human problems such as pollution, diseases and has adverse effects on the hygiene of living beings. In order to overcome all these problems, we are proposing the idea of smart waste management system which helps in auto-management of waste without human interaction in order to maintain a clean environment. The concept of smart waste management is implementable in cities where waste production is domestically high but the effort put to control it is relatively very low. This idea is compatible mainly with the concept of smart cities. The smart waste management mainly avoids the congested collection of waste generated domestically which creates difficulty to manage its disposal. All cities, regardless their size, their geographical location or their economic level, spend huge amount of money every year for waste collection. The number of bins located in the streets and the number of vehicles used to empty them are generally estimated based on the number of citizens, but the resulting estimation is sometimes either too high or too low.

Keywords- Dustbins, Ultrasonic sensors, Arduino board, GSM Module, Bread board, Jump wires.

I. INTRODUCTION

Many times, in cities we see that the garbage bins or dustbins positioned at public places are overloaded. Earlier when there was no scope for IOT, the waste was once gathered periodically by using trash collectors and was once dumped in the dump yards. But, in this method there was no intervening of internet. Hence this is a hectic process which is time consuming. To make cities cleaner and beautiful, greener and protected from a number of ailments the IoT can play a very fundamental role. By using exceptional devices, hardware's and various technologies properly high-quality of existence and enhancement in protection can be achieved. In smart cities satisfactory technological solution can be achieved. Unhygienic conditions are created through the overflowing of dustbins. It may reason serious illnesses and it degrades the valuation of that area. Waste management is all the activities and actions required to manage waste from its inception to its final disposal. This includes collection, transportation, treatment and disposal of waste together with monitoring and regulation. Waste collection methods vary widely among different countries and regions. Domestic waste collection services are often provided by local government authorities. Curb side collection is the most common method of disposal in most countries, in which waste is collected at regular intervals by specialised trucks. Waste collected is then Transported to an appropriate disposal area. Now days, cities with developing economies experience exhausted waste collection services, inadequately managed and uncontrolled dumpsites and the problems are worsening. Waste collection method in such countries is an on-going challenge and many struggle due to weak institutions and rapid urbanization. This survey paper presents, a waste series management answer based totally on IoT prototype to waste packing containers with sensors and logics. The proposed system makes use of the technology which can manipulate the trash containers technically.

II. LITERATURE SURVEY

According to literature survey after studying different IEEE paper, collected some related papers and documents some of the point discussed here:

1. Internet of Things Based Garbage Monitoring System

Authors: Sagnik Kantai, Srinjoy jash, Himadri Nath Saha

Description: Garbage consists of the unwanted materials left over from city, Urban areas, Educational Institutions, Business organizations, home etc. This project will help to understand the developments of research on IoT to eradicate or minimize the garbage disposal problem. IoT is a recent communication Technology, in which the objects of everyday life will be equipped with Arduino family microcontrollers, transceivers for digital communication and suitable protocol stacks, that will make them able to communicate with one another and with the users.

2. IoT Based Garbage Management (Monitor and Acknowledgment) System: A Review

Authors: Sudharani Ashok Ghadage, Dr. Mrs. Neeta Anilkumar Doshi.

Description: The environment should be clean and hygienic for life leads in India. In the present scenario, many times it is seen that the garbage bins or dust bin are placed at public places in the cities are overflowing due to increase

in the waste every day. These overflowed garbage bins can create an obnoxious smell and make an unhygienic environment. This leads to the rapid growth of bacteria and viruses which can cause different types of diseases. The proposed system shall overcome such problems by alerting the status of garbage bins as well as helps to keep dry and wet garbage separately so that different processes-composting, recycling, incineration shall be applied to different kinds of garbage. By intimating the notification of garbage filled, the number of trips of the garbage collecting vehicle shall be also reduced.

3. Smart Waste Management using Internet of things

Authors: Pallavi K N, Dr. Ravi Kumar V, Chaithra B M

Description: As the population is increasing the solid waste is also increasing in urban and rural areas and waste management has become a global concern. We need to take right decision in order to manage this overflowing garbage. Mainly there are three types of sources where garbage is generated viz. residential, commercial and industrial. The garbage produced in the residential area can be collected directly from home or by making an arrangement for mass collection in that area and can be lifted using vehicles. In case of restaurants, malls and other commercial establishment garbage can be collected directly from the unit using vehicles. Industrial garbage which includes waste produced in construction sites, various industries can also be disposed using different ways. For effective handling of these wastes like collection

and disposal, Internet of Things (IOT) concept is being used, which mainly deals with sensing, actuating, data gathering, storing and processing by connecting physical and virtual devices to the Internet.

4. Towards an Analysis of Garbage Collection Techniques for Embedded Real-Time Java Systems.

Description: From a real-time perspective, the Garbage Collector (GC) introduces unpredictable pauses that are not tolerated by real-time tasks. Real-time collectors eliminate this problem but introduce a high overhead. Another approach is to use Memory Regions (MR) within which allocation and DE allocation are customized. This facility is supported by the memory model of the Real-Time Specification for Java (RTSJ). This paper provides an in-depth analytical investigation of the problems and solutions of Java garbage collection techniques regarding it use in embedded real-time systems. keywords: Java, embedded, real-time, write barriers, memory management, garbage collection.

5. Smart Waste Management using Internet of Things.

Description: At present solid waste management is a major concern in the metropolitan cities of the developing and developed countries. As the population is growing, the garbage is also increasing. This huge unmanaged accumulation of garbage is polluting the environment, spoiling the beauty of the area and also leading to the health hazard. In this era of Internet, IOT (Internet of Things) can be used effectively to manage this solid waste. In this paper, we have discussed the definition of Internet of Things and its elements, testing and prototyping tool cooj simulator and finally the study of various literatures available on smart waste management system using IOT.

III. PROPOSED SYSTEM

- The garbage containers transmit signals to indicate that they are over 80% or 90%full and should be emptied. Via the mobile communications network, the signals are sent to a web based software application used by the waste management company.
- In the software, the capacity of the container is indicated, which is taken as a basis to plan the best route for waste collection garbage trucks travel only to those containers that actually need to be emptied.
- A robust ultrasonic sensor is installed in the garbage container and detects the fill level regardless of what has been deposited inside.

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- The whole system contains Ultrasonic Sensor, Arduino Board, Gsm Module, Bread Board, Power Supply (Battery).
- The sensor is fixed on to the bread board. the connection between the arduino board and sensor is made with the help of connecting wires. The working program is fed into the arduino board. The gsm module is also connected to the same arduino board with the help of wires. The power supply to the system is given with the help of a battery.

IV. EXISTING 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 waste bins, based on which the routes to pick several of the waste bins 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 waste bins 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 waste bins that are placed in a specific location. Depending on economic requirements specified at early stages, the optimized selection of waste bins to be collected is expected to improve collection efficiency.
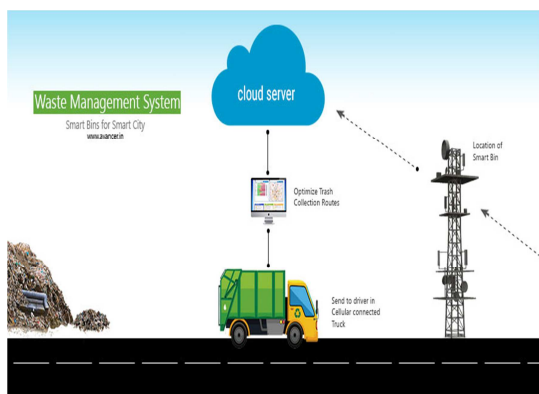
V: SYSTEM DESIGN

Fig1. System architecture

System Specification
Hardware and Software Requirements

Type	Name	Availability
Hardware	Computers Controller Ultrasonic Sensor Dustbin Box Wi-Fi Model	High
Software	Android studio Arduino software	High
Database	MySQL	Medium

VI: ADVANTAGES

- Less time and fuel consumption as the trucks go only to the filled containers.
- Decreased noise, traffic flow and air pollution as a result of less truck on the roads.
- Our smart operating system enables two ways communication between the dustbins deployed in the city and service operator. Therefore the focus is only on collection of route based fill level of the containers.
- The sensors installed in the containers provide real time information on the fill level. This information helps determine when and where to prioritise collection.
- In this way both service providers and citizens benefit from an optimized system which results in major cost savings and less urban pollution.
- Reduces the infrastructure (trucks, containers), operating (fuel) and maintenance costs of the service by up to 30%.
- Applying this technology to the city optimises management, resources and costs, and makes it a "SMART CITY".
- Historical information on collections helps adapt the deployment of containers to the actual needs of the city, therefore reducing the number of containers that clutter up the road and increasing public parking spaces.
  - It keeps the surroundings clean and green, free from bad odour of wastes, emphasizes on healthy environment and keep cities more beautiful.
  - Reducing manpower required to handle the garbage collection.

VII: ALGORITHM

Start

Step 1: Go to the target or garbage bin.

Step 2: Connect through ultrasonic sensors.

Step 3: Check the garbage level.

Is the bin empty? If YES Go to Step 8

Else Go to Step 4.

Step 4: Connect ultrasonic sensors through app.

Step 5: Show the graphical view of garbage level percentage via webpage.

If percentage<= 50% Then print message on led 50% trash is occupied.

Else if 51%<=percentage<=100% then message is send to worker and customers and connect the system through GSM to communicate with control station and load the truck.

Step 6: Disconnect from ultrasonic sensors.

STOP

VIII: CONCLUSION

Monitoring the fullness of bins through the use of sensors, it is possible to achieve a more efficient system than the current existing. Our idea of "Smart waste management system", mainly concentrates on Monitoring the waste management, providing a smart technology for waste system, avoiding human intervention, reducing human time and effort and which results in healthy and waste ridden environment.

The proposed idea can be implemented for smart cities where the residents would be busy enough with their hectic schedule and wouldn't have enough time for managing waste. The bins can be implemented in a city if desired where there would be a large bin that can have the capacity to accumulate the waste of solid type for a single apartment. The cost could be distributed among the residents leading to cheaper service provision.

Acknowledgements

Appendix A: Analysis Models

I) **Data Description**

a. Describing and documenting data is essential in ensuring that the researcher,and others who may need to use the data, can make sense of the data and understand the processes that have been followed in the collection,

b. processing, and analysis of the data.

c. Research data are any physical and/or digital materials that are collected, observed, or created in research activity for purposes of analysis to produce original research results or creative works.

II)

Data objects and Relationships

a. A data object is a part of the repository whose content can be addressed and interpreted by the program. All data objects must be declared in the ABAP program and are not persistent, meaning that they only exist

b. While the program is being executed. Before you can process persistent data (such as data from a database table or from a sequential file), you must read it into data objects first. Conversely, if you want to retain the

c. Contents of a data object beyond the end of the program, you must save it in a persistent form.

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