

Project Synopsis
on
IOT based Smart Waste Management System

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in
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DECLARATION

We hereby declare that this submission is our work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

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CERTIFICATE

This is to certify that Project Report entitled “**IOT based Smart Waste Management System**” which is submitted by Karan Agarwal ,Harsh Yadav ,Karnik Gautam in partial fulfilment of the requirement for the award of degree B. Tech. in Department of Computer Science of Dr A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Date: 17/11/2022

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Last but not the least, we acknowledge our friends for their contribution to the completion of the project.

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ABSTRACT

Multiple mobile or online technologies are combined in smart cities to create a comfortable environment for people to live.

Offering a waste management system that is efficient, effective, and ecologically beneficial is one of these alternatives.

The existing garbage collection system involves routine garbage trucks making daily or weekly rounds, which is not only a grossly wasteful use of public resources but also doesn't reach every part of the city. The suggested approach, in which the admin operates the web app for complete online-based monitoring and system analysis.

Bins, the driver, user complaints, and job updates from the driver are managed by her admin. The government can use the resources at its disposal to effectively manage the enormous volumes of rubbish that are picked up every day, and this paper offers a cost-effective mobile or web-based solution that will do both of these tasks.

A more effective remedy for the inconvenience caused to the population by garbage disposal.

A driver handles this an app will offer recommended and supervised routes for garbage trucks. Then after, the driver will change the status of the task that has now been completed. For the workforce and residents, an android or web app that mainly provides the user the ability to create complaints is provided in a smart bin.

Chapter 1 Introduction

Introduction

- Smart waste management is a cutting-edge method of processing and collecting garbage. Smart waste management, which is based on Internet of Things (IoT) technology, offers information on the behaviour and trends of trash creation. Municipalities, communities, and garbage collectors are now better equipped to streamline waste operations, improve sustainability, and make wiser economic decisions.
- For the workforce and the general public, an android or web app has been created. This software primarily sends pop-up messages to all municipal employees informing them that the trash bin is full and must be emptied.

Problem statement

- Nowadays, as we seen that dustbins are being overflowed and they are not being monitored properly.
- This will result in serious health issues and also affecting the surrounding environment.
- The Collectors are also unable to find out the overflowed dustbins and hence it hampers their work.
- As a result, people tend to throw garbage in nearby surroundings and it will create a pollution in the environment.

Objectives

A garbage management system is a concept where we can handle many issues that bother society in terms of pollution and illnesses. The management of the rubbish must be done immediately; otherwise, irregular management results, which would harm the environment.

The following are the key goals of our suggested system:

- Keeping an eye on waste disposal. supplying a smart waste system with technology.
- Providing intelligent garbage system technologies.
- Producing a clean and waste-free environment by reducing human time and effort.
- To protect the health and well being of people by providing a affordable waste management service

Scope

Scope of our project:

- We can Use our project to efficiently track the Fill level of dustbin.
- It will further help us in efficient management of waste.
- We can use these smart bins in various places such as corporate offices, Cafes or anywhere we desire.

CHAPTER 2: LITERATURE REVIEW

RESEARCH PAPER 1 - Internet of things (IoT) based Smart Garbage monitoring system

In this research paper we have that because of the harmful consequences for the environment, garbage waste monitoring, collection, and management is one of the main issues of the modern day. The usual approach of manually examining and collecting trash is a tedious procedure that increases prices since it needs a large amount of time and human labour. In this work, an open IoT platform and an IoT-based waste monitoring system are proposed. An Arduino microcontroller, an ultrasonic sensor, a load cell, and a Wi-Fi module comprise up the system.

Periodically throughout each day, live updates of the garbage bin status are provided via the social network website Twitter. A tweet reporting the status of a garbage can that is full or overcrowded allows authorized individuals to take the necessary action.

Public awareness of management of waste and waste pollution may grow as a result of information sharing. With this system, the admin can properly plan and keep a record of garbage pickup. This technology would improve environmental hygiene, contribute to intelligent waste management, and help make cities cleaner.

RESEARCH PAPER 2 - An Internet of Things Based Smart Waste Management System Using LoRa and Tensorflow Deep Learning Model

Waste management is an expensive endeavor as it necessitates a great deal of time and resources. The development of the recyclable bin and the launch of the 3Rs campaign are instances of measures the authorities have taken to boost waste management systems (recycle, reuse and reduce). The present waste management system has been enhanced thanks to advancements in IoT.

Real-time monitoring, which was not feasible with the current waste management system, is made possible by the use of sensors in the trash can and IoT connectivity. The sensors may be used to collect data such as fill levels, temperature, humidity, and any other critical information. The storage and processing of these data can therefore be handled on the cloud.

The data that have been examined could be used to research and uncover the flaws of the current waste management system.

The recyclables container is further divided into various types of waste, including paper, metal, and plastic. As many as four specific types of bins have been positioned at a garbage collection location as a result of this practice. The overall operating expense for managing the bin inevitably goes up as a consequence of this.

Public awareness of waste management and waste pollution can be increased via disseminating information. To keep records of how full each of the bin's trash storage containers include a section for plastic, metal, paper, and general waste—is, an ultrasonic sensor is connected to an Arduino Uno board.

RESEARCH PAPER 3- Smart Waste Management System using IoT

The difficulties with sanitation and trash management are becoming progressively worse. It causes unhygienic conditions for the local populations, which accelerates the spread of infectious diseases and illnesses. IoT-based "Smart Waste Management" is the most effective and popular alternative to address this issue. The proposed system will equip public garbage cans with embedded equipment that allows for real-time monitoring of the level of garbage within the garbage cans.

The integration of moisture sensors and load sensors will enhance the accuracy of data relevant to garbage level and waste segregation in a dust bin, correspondingly. The information on which dumpster should be placed in which location by their corresponding ids will be maintained in a database.

The dustbin incorporates a humidity sensor to differentiate among wet and dry garbage, along with UV and load sensors for level determination.

Employing analysis tools like Hadoop or Storm, the cloud-collected data will be analyzed to derive relevant facts on waste management. The proposed methodology guarantees that garbage will be collected as soon as it reaches its maximum level. As a consequence, the will produce accurate reports, improving system efficiency. The total number of trips that the GCV must make will be minimized due to the real-time monitoring of the garbage level made possible by sensors and wireless connectivity, which will also reduce the overall cost of garbage collection.

RESEARCH PAPER 4:- IoT-Based Smart Waste Bin Monitoring and Municipal Solid Waste Management System for Smart Cities

Due to incredibly large population growth and globalization, increasing waste generation has become a major problem in developing nations. Several problems have been examined from the literature that suggest a significant correlation between the surge in waste production and challenges involved to handle it in a smart city. Inadequate waste material collection and disposal techniques, rising migratory patterns to urban areas, and a lack of sophisticated equipment supporting the municipal solid waste management system are the roots of these problems. As a consequence of the large amount of waste that is left lying around, management of waste has become challenging.

The system's key benefit is its ability to promptly collect trash in order to prevent bin overflow, which would protect the environment from contamination.

This study offers a clever approach to waste collection in a smart city. The system's architecture is based on an IoT sensing prototype that measures bin waste levels and transmits that data to a server via online services. For additional processing and analysis, the data stored on the server and in the cloud is used.

Based on this information, the collected area is separated into four regions, and four additional routes are constructed, which are then supplied to the dump truck and used to successfully hit the loaded bins during the simulation. The effectiveness and operational costs of the system are the major concerns of this essay. To limit both financial and human life losses, the system's proposed prototype also has fire detection capabilities . The system is intended to support MSWM of the Saudi Arabian city of Najran.

RESEARCH PAPER 5- A Proposed IoT Based Smart Waste Bin Management System with An Optimized Route: A Case Study of Ghana

A technique is put forward that utilizes a number of adjustments to deal with spillage and unsuccessful collection techniques. By issuing orders for the garbage collectors that may be accessed via a mobile application system, the system gives the waste management institution a monitoring platform to handle the alert records. The proposed solution includes a smart trash can that is integrated with a microcontroller-based system that is integrated inside and attached to the top of the bins to detect bin level status and communicate with drivers and the management department via SMS and application system.

The construction of a smart bin who used a microcontroller, a sensor for waste level detection, and an unit for network connectivity was displayed. A street cleaner should have access to the same information as just a garbage collector, be able to determine where full bins are located on a map, and be able to determine the most efficient routes for gathering bins.

The framework for waste management that have been proposed in this work consists an improved routing and an alternate SMS alert to garbage collectors. The methodology presented in this article for tackling a waste management concern that is gaining a lot of attention globally constitutes a contribution to the body of knowledge.

RESEARCH PAPER 6 - RFID-based Real-time Smart Waste Management System

Waste disposal and collection pose a serious threat to the environment, particularly in Australia's metropolitan areas today. Typically, waste collection vehicles collect trash from various residences and transport it to a landfill for disposal. Furthermore, landfills are much more expensive to run over time and have a tendency to fill up, demanding renovation.

The waste collection vehicle's PDA houses a Based separation RFID scanner that transforms the radio waves reflected back from the trash can into digital information. The measuring process helps to identify each bin's weigh when it has been carried onto the vehicle by the trash collector's robotic arms.

After emptying each bin, the information is used to determine the real costs of waste disposal for each household before being transferred to the PDA for short-term storage. In our waste management strategy, there is simply one route of interaction between waste tags, sensors, and back-ends. Our trash tags are cheap, inert, and have very little memory. For the creation of an RFID-based, sensor-based, real-time automated WIWSBIS, we have created a multi-layer wastewater treatment architecture of the system.

RESEARCH PAPER 7- IoT-based Intelligent Waste Bin

Humans are generating a rising quantity of trash, which cannot be stopped without aspects of different. Such developments will have a massive effect on waste management firms since they must provide resources for the collection of such trash with little or no revenue. The goal of this project is to create a knowledge and the development waste monitoring and management system that maximises efficiency and saves resources.

The system's development process is divided into two stages: hardware execution and system modelling. The modelling stage of something like the developing the system is presented in this essay. A smart trash can do it with remote monitoring and garbage collection monitoring is displayed. The trash can was created using open source software and embedded systems.

Data is transmitted using a GSM/GPRS module, and Thingspeak has been implemented as the IoT platform. The part of trash barrel monitoring for collection management that needs to be improved will be the focus of this design and development phase, that will also maximise distribution of resources and data analysis for users of decision-making systems.

RESEARCH PAPER 8:- Prototype Development of IoT Based Smart Waste Management System for Smart City.

Environmental pollution and excessive energy consumption are the consequences of the inefficient garbage management system. This is due to inefficient garbage collection methods that produce odour pollution, unpleasant views, the breeding of insects, scavenging animals, and rodents, as well as the growth of a number of diseases when certain waste bins are left piled high and unattended. Overall, it is an automated central monitoring system that enables accurate route planning for collections, shortens collection times, reduces expenses, and preserve fuel. It also gives timely bin status information.

Additionally, a mobile application will be created for real-time trash monitoring, alerting, and work assignment for drivers automatically. Air quality sensors will be utilised in addition to other presently in use sensors to detect different forms of gas and the smell of the bins.

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A decision will be made using machine learning.

reliable trash production forecasting. We anticipate that Malaysian cities will become smart after the successful commercialization of this low-cost prototype.

RESEARCH PAPER 9:- Implementation of spatial smart waste management system in Malaysia

Monitoring and managing the environment is one of the difficulties innovating and developing an IoT-enabled system. Using the Internet of Things (IoT) and the technology of smart wireless sensors, garbage collection will be able to collect fill-level data from garbage containers, resulting in a waste monitoring system that lowers the cost of waste collection. How to effectively and efficiently monitor the work of the contractor in waste management is one of the challenges facing the local government.

Monitoring and managing the environment is one of the challenges innovating and developing an IoT-enabled system. Using the Internet of Things (IoT) and the technology of smart wireless sensors, garbage pickup will be able to collect fill-level data from garbage containers, resulting in a waste monitoring system that lowers the cost of waste collection. How to effectively and efficiently monitor the work of the contractor in waste management is one of the challenges facing the local government.

However, compared to the current system, the suggested SWMS demands additional maintenance expenses. It must be sustainable, meaning that the local government can implement it at an appropriate cost. The most crucial concern is how to provide local authorities with goods and services at a reasonable cost that require little upkeep.

A modest IoT device for waste monitoring may one day be created and installed inside the garbage chamber in front of every terrace home and house in order to expand implementation to the general public.

RESEARCH PAPER 10:- Smart City Application: Internet of Things (IoT) Technologies Based Smart Waste Collection Using Data Mining Approach and Ant Colony Optimization

Urban trash management is one of the major issues. The phenomenon of optimising garbage collection has grown to be crucial for smart cities.

We created a waste container with sensors that could measure the container's fill level, temperature, and carbon dioxide concentration. We transferred all data to our Internet of Things (IoT)-based waste management software.

The cost of oil, carbon emissions, traffic, truck wear, noise pollution, environmental pollution, and labour hours were all significantly reduced by smart waste management systems. The system offered immediate cost reductions in garbage collection of about 30%.

200 trash cans were being gathered by garbage trucks along a fixed route prior to the implementation of smart waste management system.

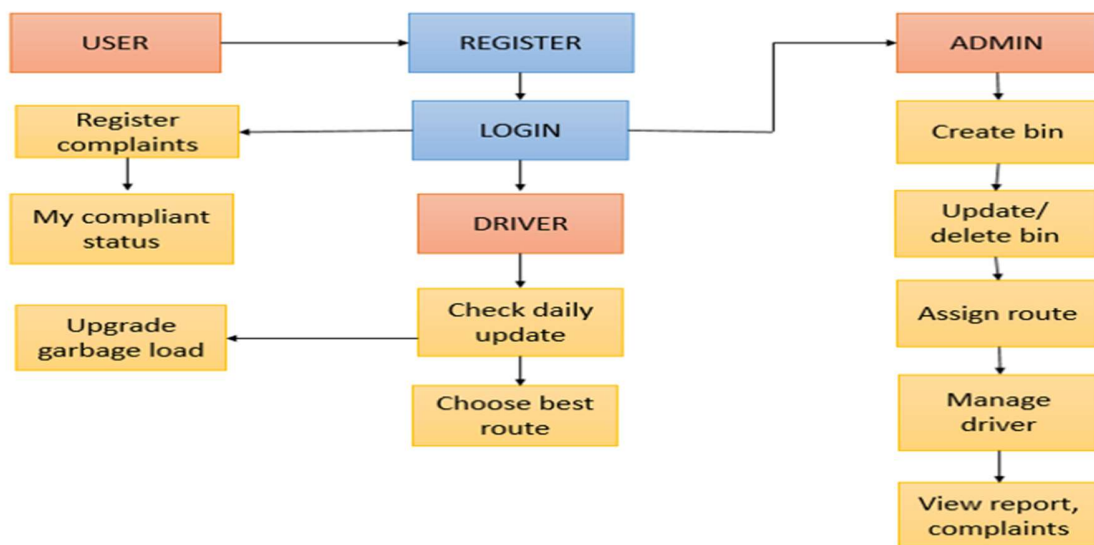
We have provided a method for creating smart cities that has practical application. The most effective waste collection route is sent to the garbage truck drivers' cellular-enabled smart tablet via the ant colony algorithm.

With the help of additional knowledge, such as the population of the garbage container region, an estimate of the amount of future garbage container fill, material categories, and so on, the study's intelligent waste management system may be improved.

Chapter 3 Proposed Methodology

Flowchart

Architecture Diagram:



(Fig 3.1)

Algorithm Proposed:

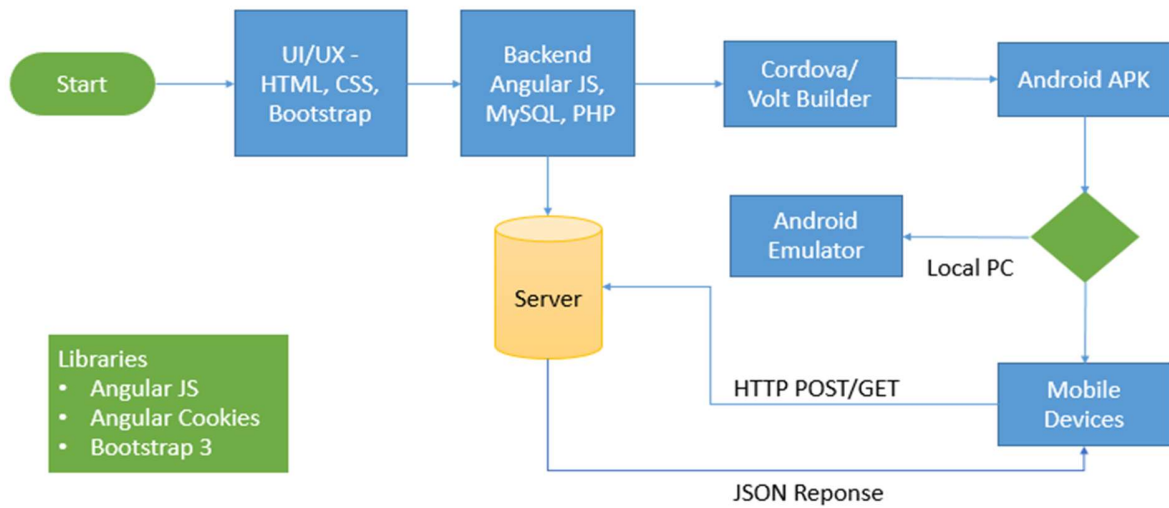
- Firstly, we will collect data using Ultrasonic sensor and then data is sent to admin.
- The collected data is further processed and the dustbins which are full are being filtered.
- The data of these filtered dustbin is further propagated to nearest garbage collector .
- The collector on receiving this dustbin data will empty the designated dustbin and sensor will automatically update the status of emptied dustbin on the app .

Chapter 4 Technology Used

- **FRONT END :** HTML , CSS, JAVASCRIPT
- **BACKEND :** REACT JS, PHP, MYSQL
- **TOOLS :** ANDROID STUDIO
- **IOT :** ULTRASONIC SENSOR, NODE MCU ESP8266 WIFI MODULE.

CHAPTER 5 DIAGRAMS

Workplay Diagram For android application:



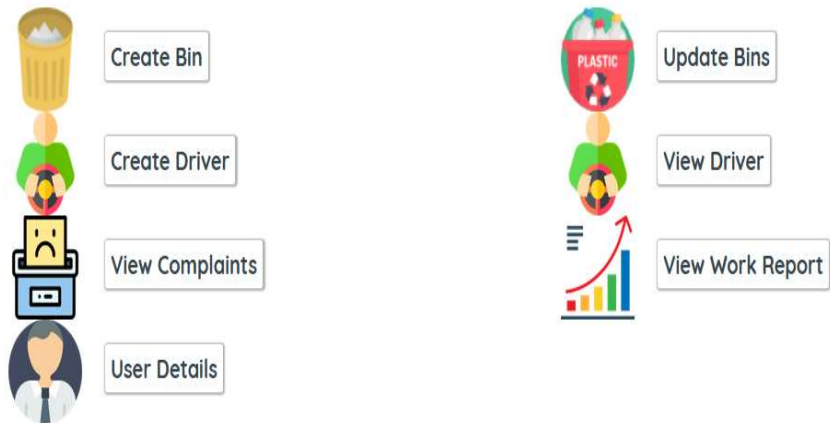
(fig 5.1)

Sample View Of Future Developed App:



(fig 5.2)

≡ Garbage Management



(fig 5.3)

CHAPTER 6 CONCLUSION

- After the successful completion of project we would have developed a waste management system which is quite cost effective and easy to use. This will help us make environment more healthier and toxicity free.
- It will also help us in significant reduce in the amount of fuel used by the garbage management trucks as garbage collectors can go to particular area to collect garbage when significant amount of garbage cans are full in that area. It will also help us to identify hotspot area where more number of garbage can are being filled daily and will help in easy deployment of garbage bins.
- Since the funds required by this project is quite low so, the authorities who are not willing to invest much money in this sector can also avail this facilities..