

# Real-time monitoring of the garbage vehicle for a smart waste management system

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Submitted: 10-06-2021

Revised: 20-06-2021

Accepted: 23-06-2021

**ABSTRACT** -The rate of urbanisation has accelerated in recent years. At the same time, trash generation rises, making waste management a more critical issue, particularly when it comes to waste collection at the household level. The Indian government is making a concerted effort to promote cleanliness throughout the country. To demonstrate this, government agencies launched a door-to-door rubbish pickup programme employing garbage vans at the household level. However, because garbage trucks arrive at inconvenient times, this endeavour does not work as well as it could. As a result, despite public awareness initiatives, individuals do not gather waste and wait for the garbage truck; instead, they throw waste anywhere in the vicinity. It could result in pollution, which could lead to sanitary problems and infections.

This paper presented a mobile application called "Garbage Truck Tracker" that tracks and warns citizens and authorities about garbage collection vehicle schedules. This application supported Swachh Bharat for cleanliness and ensured a greener environment.

**Keywords** - Garbage management, GSM module, wifi module, alert system, Garbage truck, fuel efficiency.

## I. INTRODUCTION

Garbage monitoring has become a serious concern in most cities and around the world due to a lack of efficient trash management, which is a major contributor to environmental pollution and a variety of health issues. The organisation or firm is

in charge of rubbish removal according to a schedule specified by the authority or a timetable set by the citizens. People must collect all rubbish, either in plastic or in a trash can, and place it outside their homes for collection by the authority or agency. If a particular agency or authority does not collect rubbish on a regular basis, it will pollute the environment and have major health consequences. It is critical to strengthen the Urban Local Body and people in order to encourage or effectively monitor door-to-door waste collection and service delivery in order to accomplish the goal of clean cities free of all types of garbage. An authorised person maintains track of whether a vehicle has skipped collecting up rubbish from some households or bins, changed its route without warning, or is driving erratically. With this in mind, the "Garbage Truck Tracker" was developed for effective monitoring.

This programme was created to help citizens and government agencies solve waste management issues. This idea aims to notify individuals who are moving throughout their neighbourhood about the current time and position of garbage trucks. The garbage car monitoring software provides quick access to the monitoring system, allowing the user to monitor the progress of the waste vehicle in real time. If citizens have any civic-related difficulties, they merely need to take a photograph of the problem and submit it through the app. If the garbage truck does not arrive or the schedule changes, the programme will tell you. The tracking system uses the Global Positioning System Services Technique to find the

garbage truck's location and display it interactively on a smart phone via Google Maps. Android Studio was used to code and interface with the editor. All of the information is recorded in a MYSQL database and may be accessed online. This programme serves as a link between city governments and citizens. The primary goal of this application is to actively engage individuals in the clean India movement.

## II. LITERATURE SURVEY

1] Muhammad Alif Asyraf Ghazali, proposed the mobile application on garbage collector tracker using google map. The main purpose of this application is to help to achieve the issues of late garbage collection and it decreased problems of waste garbage collection and alerts surrounding the community. A quality of service for garbage system management to residents has been taken care with a handful of mobile and GPS services for garbage truck services and benefits of authority.

2] R. Sureshkumar, S.u. Prabha, proposed (Sureshkumar & Prabha). The main purpose of this application is that corporations all over the nation and in states face major problems in waste collection by using the current system introducing automation and embedded systems to waste collection methodology to the current system to the next level.

3] J. kokila, K.gayathri Devi, Dhivya and C. Haritha Jose, (Kokila, Devi, Dhivya, & Jose, 2017) . The main purpose of this application is the necessity for the web based waste management application is increasing day by day due to the population and maintenance in the disposal of waste. The novelty of this proposed work is to develop an intelligent alerting system integrated with RFID and IOT for proper management of garbage.

4] Sonalchokole, Priya khadse , proposed (Chakole, et al., 2017)the main purpose of this application is in the coming few years the cities would become developed and smart one. But, the smart city is incomplete without a smart garbage management system, so we have designed a system for proper management of garbage. In this project we have studied and implemented the concept of smart city with the help of GPS and GSM.

5] IoT-predicated solid waste management system is proposed in. In this system, a DHT22 temperature sensor, MQ-135 gas sensor, IR sensor, passive infrared, PIR sensor, and load cell are acclimated to monitor the temperature and sultriness, presence of deleterious gas, quantity of garbage, presence of utilizer, and weight of garbage respectively. LoRa communication is utilized to transmit data to a gateway, and the data are sent to a cloud for cloud monitoring.

## III. METHODOLOGY



Fig. 1 System Architecture

Above figure shows an overall view of system connection design in which personal computer or laptop act as control panel to build the mobile application, troubleshoot and debugging the programming by using android studio. The database activities are controlled by control panel. MYSQL database can store the data where the user can get the data in real time. The database is synchronized with the location of garbage truck

through GPS service & with the help of Smartphone; user's can get the location of garbage truck by displaying it onto the Google map.

When compared to the previously proposed waste systems employing GPS modules put in garbage collection vehicles, this proposal provides a unique solution to handle the issue of waste collecting and tracking. This application was created with the Android Studio software and the

Java programming language. Three basic Modules were offered in this application.

- Admin Module
- User Module
- Driver Module

**Admin Module:** Here, We give a web link for the administrator, where all garbage truck tracking and database storage operations are carried out. Fig(a) displays how many users have signed up for this. Here, the administrator can receive customer complaints about garbage collection, truck allocation services, or any other complaint, as well as monitor how many complaints have been resolved by a certain driver and how many are still waiting.

The administrator will then identify a truck near the spot and assign it to pick up the rubbish. This is accomplished by a direct communication channel between truck drivers and administrative personnel.

Admin can track garbage truck collectors' locations in real time all throughout the area and communicate directly with drivers and users. If the waste collection truck's schedule is changed or rescheduled, the programme allows the administrator to send a notification to the driver and user..

**User Module:** Where users can see the running status of garbage trucks, complaining, notification and feedback modules. Fig(d) shown, If user have any kind of civic related issue, then user can send their complaints to admin and driver directly through the message, with their proper details like full name, ward no, area, mobile no. as well as they can upload the real time picture of the complaint; If garbage truck will not coming, then they will get notification also which is shown in fig(b). fig (e) shows the feedback page where users can give their feedback regarding the garbage collector truck and regular cleanliness of their society, with the help of that admin will know everything about how the work is going on in his area. So that authority can provide better services to them.

**Driver Module:** Here, Driver work is assigned by the admin, where the driver can see all user complaints and then he will resolve those

complaints directly, as well as he will be able to see the notification which is sent by the admin. The system would automatically generate an efficient route to the available garbage truck enabled with smart GPS monitoring system.

#### IV. PRE-REQUISITES

**Arduino UNO :**The Arduino Uno is a microcontroller board based on the ATmega328P microcontroller (datasheet). It contains 14 digital input/output pins, 6 analogue inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a potency jack, an ICSP header, and a reset button.

**GPS module:** GPS modules have small computers and antennas that receive data directly from satellites via specific radio channels. It will then receive a timestamp from each visible satellite, as well as other pieces of information.

**GSM Module:** The SIM900A is a GSM/GPRS module that can be found in a variety of mobile phones and PDAs. The module can be used to create Internet of Things (IoT) and Embedded Applications.

**ESP8266 wifi module:**The ESP8266 microcontroller module allows microcontrollers to connect to a Wi-Fi network and establish basic TCP/IP communications using Hayes-style commands.

**Android Studio:** Based on IntelliJ IDEA, Android Studio is the official Integrated Development Environment (IDE) for Android app development. A unified development environment for all Android devices.

**Arduino Software:**Arduino is an open-source electronics platform that uses simple hardware and software to make it easy to use. Arduino boards can detect inputs such as light on a sensor, a finger on a button, or a Twitter post and convert them to outputs such as turning on an LED, triggering a motor, or publishing anything online.

**Xampp Server:** XAMPP stands for cross-platform, Apache, MySQL, PHP, and Perl, and it allows you to create WordPress sites on your computer's local web server. The "cross-platform" component refers to the fact that this simple and lightweight solution works on Windows, Linux, and Mac.

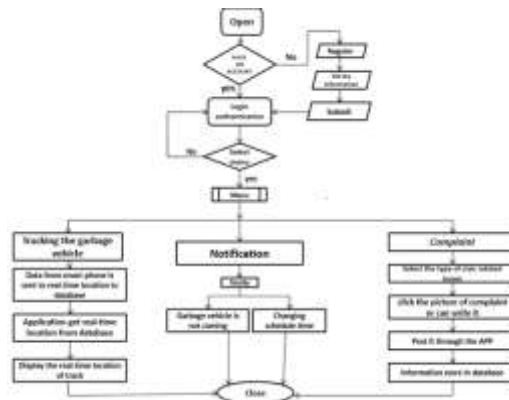


Fig. 2 Flow Diagram

### V. EXPERIMENTAL RESULTS AND DISCUSSION

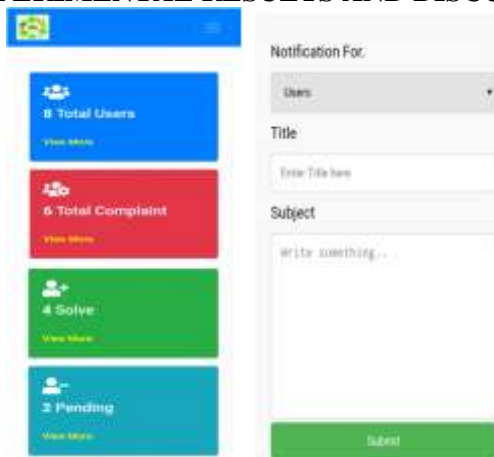


Fig. (a) Homepage of admin Fig. (b) notification panel of admin



Fig.(c) User registration Fig. (d) User complaint section



**Feedback**

1) Waste collector does visit at your area  
 YES  NO

2) Garbage collector is maintaining time  
 YES  NO

3) Garbage Collector is regularly come in your area  
 YES  NO

4) Garbage collector is not professional or being rude  
 YES  NO

5) After collection of garbage bin is placed properly  
 YES  NO

6) Is Garbage sweeper sweep your area daily  
 YES  NO

**Fig. (e) User feedback**

## VI. FINAL RESULT



**Fig. (f) Hardware Setup**

The microcontroller 8052 is used for interfacing the hardware peripherals. There is serial interfacing between the 8052 microcontroller and the GSM Modem and GPS receiver. The working of the system involves taking the input from the GPS. This input is then sent to the RS232. It is then sent to MAX232 where the data is formatted so that it could be sent to the receiver pin (Rx) of the microcontroller. After this, the data is stored in the microcontroller buffer and then sent to the MAX232 via the TX (Transmitter pin). The data is sent into GSM via the RS-232 protocol by MAX232. On demand that is by pressing the Track location button in the android app, it will send the location of the device to the registered mobile user. The location of the vehicle will be shown to the user on the designed android app. The code for the device is written and tested in Arduino IDE. The Arduino IDE is a cross- platform application where the code is written, debugged and tested. The android app is designed in android studio.

## VII. CONCLUSION

The construction of a smart garbage monitoring system based on an internet connection is detailed in this study. GPS is used to make rubbish collection more efficient and cost-effective.

The developed method creates a more accurate database for garbage pickup times and waste volume at each location.

By implementing this project, we will be able to prevent waste from overflowing from this container in residential neighbourhoods, which was previously filled manually or with the assistance of loaders in traditional trucks, and communicate the information to the collection truck.

The technologies which are used in the proposed system are good enough to ensure the practical and perfect for solid garbage collection processes monitoring and management for the green environment.

## VIII. ADVANTAGES

1. We will be able to examine all the routes that driver is taking along with his stoppages on the way.
2. Route planning and management help in reducing the fuel costs along with decreasing the travel time between each pick-up locations.
3. Real-time tracking will keep you updated about the vehicle locations and status report.
4. Real-time tracking will keep you updated about the vehicle locations and status report.

5. GPS tracking system can send SMS or E-mail Alerts on various matters, for instance when the waste collecting vehicle goes out of the assigned zone

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