

# SMART GARBAGE MONITORING SYSTEM USING INTERNET OF THINGS

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**Abstract** - Urbanization and growth in population has increased tremendously. Waste management is one of the main problems that India is facing irrespective of the case of under development states or developed states. At the same phase there is an increase in waste generation also. Waste management is an important issue to be considered.

Many of the cities are still lacking a proper waste management system particularly the waste collection within the cities. Time to time collection of waste from apartments and housing societies is an important factor in order to avoid pollution, piling of garbage in certain areas which may lead to an unhealthy environment and deadly diseases. This project proposes smart garbage collection system using IOT in order to collect the garbage from the apartments and housing societies so as to avoid irresponsible dumping of garbage on the roadside or nearby areas. In the current scenario there is no proper schedule of garbage collection. The garbage collecting vehicle does not arrive or follow a specific schedule, because of which people dump garbage anywhere.

In this project using GPS and ESP module, the concerned person (the waste analyzer) shall be informed through SMS that the garbage collecting vehicle will be arriving within sometime at their place, so to be prepared with the garbage that they want to dump. By this waste can be managed efficiently as it avoids unnecessary dumping of the waste on the roadside.

**Key Words:** GPS, ESP module, IOT, Arduino Uno, Android, Database.

## 1. INTRODUCTION

Waste is being produced at a higher rate as population is increasing at a fast pace which makes waste management more crucial. Collection of waste from apartments, housing societies is of particular importance. If time to time collection of waste is not done, people tend to dump the garbage near the roadside or some isolated area in order to get rid of the garbage. As time lapses, pile of garbage is formed, polluting the nearby area. This piled up waste can cause air and land pollution, sometimes can cause water pollution also. Rotting garbage is also known to produce harmful gases that mix with the air and can cause foul smell and can lead to many air borne and water borne diseases. Keeping all these factors in mind, proper waste collection system is implemented.

### 1.1 Objective

To design a system for proper waste management using IOT which will be able to efficiently collect the waste and reduce

various types of pollution caused by roadside dumping of waste. To protect the health, well-being of people and environment by providing a proper waste collection system. The system (garbage collecting vehicle) will update the status using ESP module and GPS to the database. The concerned person will be informed before that the vehicle is going to arrive at their place in sometime so accumulate all the waste at one place which they want to dump.

## 2. LITERATURE SURVEY

In the current system, when the garbage collecting vehicle arrives to a particular area, it plays some specific music to inform the residents that the vehicle has arrived. This system is not proper as the time when the residents collect all the waste from their house, pack it and comes to dump it in the vehicle, the vehicle would have left already. The vehicle waits for some specific time only. Very less work is done in the field of garbage collection.

The following research papers describe the earlier work done in the design and development of smart waste management system.

[1] NamakamboMuyunda, Muhammad Ibrahim, "Arduino – based Smart Garbage Monitoring System". The proposed system monitors the state i.e. level of the dustbin using various sensors and stores it in the central database. It alerts the authorities about the status of the bin in a given area. Then the system provides the route planning to collect all the filled bins.

[2] Narayan Sharma, Nirman Singha, Tanmoy Dutta, "Smart Bin Implementation for Smart Cities". The proposed smart bin will be sending data about the levels of the garbage bin. When the level reaches the threshold i.e. the bin gets full, SMS is sent to the authority about the status of the bin. Then the garbage collecting vehicle is sent to that location to collect the garbage & empty the bin.

## 3. HARDWARE REQUIRED

Sr. No.	Parameter	Minimum Requirement	Justification
1	Arduino Uno	1 Piece	As Microcontroller
2	ESP Module	1 Piece	For Communication
3	GPS	1 Piece	For Live Location

#### 4. PROJECT IDEA

In the proposed system, the residents or waste analyzer of a particular area will be informed before the arrival of the garbage collecting vehicle. They can dump the garbage in that particular vehicle. They do not have to dump it anywhere on the roadside in order to get rid of it. The system comprises of micro-controller, ESP module and GPS. All these are connected and implemented using the concepts of IOT. ESP module is a miniature Wi-Fi module present in the market and is used for establishing a wireless network connection for microcontroller or processor. It will be mounted on the garbage collecting vehicle. When the garbage collecting vehicle is about to reach (at a specified distance) a particular area, an automated SMS will be sent to the concerned people of that area. It will send SMS to them only, who have registered with the waste collection system. It sends the SMS saying the vehicle will arrive at their place in sometime. The vehicle reaches that area and garbage is collected from that area. At the same time, the apartments, housing societies which are located in next specified distance will be sent SMS that the garbage collecting vehicle will arrive soon. Within the time, the waste analyzers or the residents can accumulate all the waste at the gate so that when the vehicle arrives, the garbage collection task is completed easily and less time is consumed by the vehicle waiting for the waste analyzers to gather garbage at the gate. The Admin can continuously monitor the status and location of the vehicle on an android app and will receive a notification when the vehicle is fully filled.

#### 5. BLOCK DIAGRAMS

##### 5.1 Activity Diagram

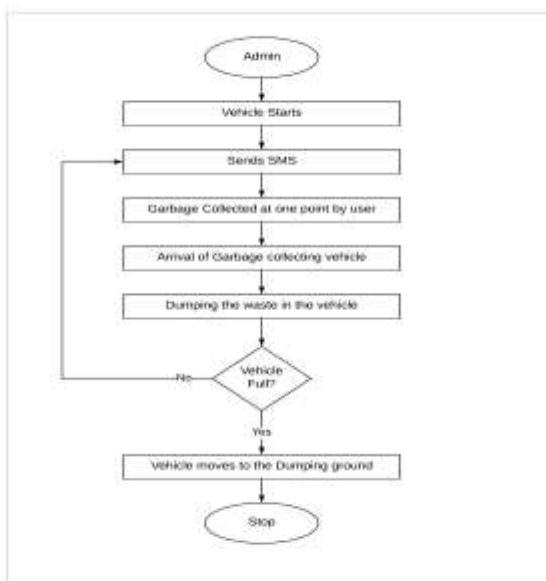


Figure 3: Activity Diagram

#### 5.2 Data Flow Diagram

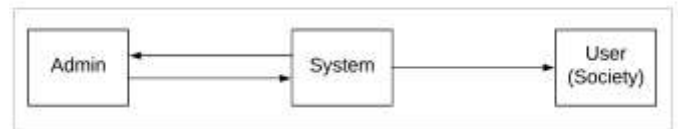


Figure 1: Level 0

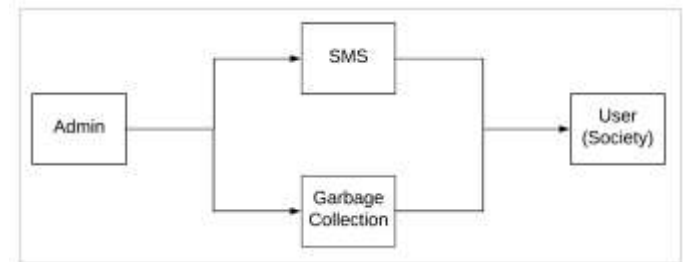


Figure 2: Level 1

#### 6. METHODOLOGY

The system comprises of micro-controller, ESP module and GPS. All these are connected and implemented using the concepts of IOT. ESP module is a miniature Wi-Fi module present in the market and is used for establishing a wireless network connection for microcontroller or processor. It will be mounted on the garbage collecting vehicle. The status of bin and location of vehicle will be updated in the database continuously. When the garbage collecting vehicle is about to reach (at a specified distance) a particular area, an automated SMS will be sent to the concerned people of that area. It will send SMS to them only, who have registered with the waste collection system. It sends the SMS saying the vehicle will arrive at their place in sometime. The vehicle reaches that area and garbage is collected from that area. At the same time, the apartments, housing societies which are located in next specified distance will be sent SMS that the garbage collecting vehicle will arrive soon. Within the time, the waste analyzers or the residents can accumulate all the waste at the gate so that when the vehicle arrives, the garbage collection task is completed easily and less time is consumed by the vehicle waiting for the waste analyzers to gather garbage at the gate. The Admin can continuously monitor the status and location of the vehicle on an android app and will receive a notification when the vehicle is fully filled.

#### 7. CONCLUSION

The developed system provides useful features for any city which wants to optimize its waste collection process as well as prevent people from dumping garbage anywhere. This gives the city's waste management authorities the ability to handle the system properly and also ability to predict and

plan their resources in a better way. In addition, the system will mitigate the risk of piling up of garbage and unsanitary conditions that are caused due to irresponsible dumping of garbage and irregular, improper collection process which is present currently.

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