

# RFID and GSM-based Garbage Collection System

Sandip J. Dawada<sup>1</sup> Bhaumil P. Patel<sup>2</sup> Dharmeshkumar M. Agrawal<sup>3</sup> Neel R. Harshe<sup>4</sup>

Mayank P. Gupta<sup>5</sup>

<sup>1</sup>asst. Professor <sup>2,3,4,5</sup> Final Year B.E (Ece)

<sup>1, 2, 3, 4, 5</sup> Electronics & Communication Department

<sup>1, 2, 3, 4, 5</sup> GEC (GTU), Bharuch, Gujarat

**Abstract**---A RFID & GSM Based Vehicle Tracking System combine the installation of an electronic device in a vehicle, with purpose-designed computer software to track the vehicle's location. In vehicle tracking systems we use Global System for Mobile communication (GSM) technology for locating the vehicle. Vehicle information can be viewed on electronic maps which are positioned at control room. The control circuit is placed inside the garbage vehicle. Whenever the vehicle will reach in front of the respective trash bin the RFID reader will read the address from the respective trash bin, the microcontroller matches the RFID no. with the existing record and sends the vehicle position details to the control room via GSM module. The module will receive the message through GSM in the control room. This message will then be transferred to the LCD placed in control room through the serial port. In addition to the details of vehicle position, this system will also take care of whether the municipal staff has faithfully collected the garbage or not after reaching there. For this process we will make use of different type of sensors like IR PHOTO and ULTRASONIC sensors.

**Keywords:** Global System for Mobile (GSM) SIM300, Radio-Frequency Identification (RFID Reader)-EM18, IR Photosensors and Ultrasonicsensor.

## I. INTRODUCTION

In today's world, government has many responsibilities to fulfill for society's welfare. One of those responsibilities includes the proper management of garbage collection from society's streets and directly from citizens home. But there are some loopholes in the management system because of unfaithful working of municipal garbage collection staffs. Even though the municipal corporation takes every possible step for proper functioning of this system but somehow these garbage collection staffs can't be trusted for proper garbage collection. They simply skip some of these allocated areas for garbage collection. Thus the citizens are bound to dispose their trash in the nearby areas. These causes pollution in the city and as a result creates many health problems for the citizens. Thus in view of society's health, proper management of this system is our first priority. But these all can be avoided if we find a way to monitor the activities carried out by the government employees and to make sure that they do it faithfully.

The project describes a way to track the trash vans to ensure that they cover their routes on a daily basis. Also there are sensors placed in the carriage of the vans to keep an account on the minimum average trash collected on daily basis. The RF ID is attached on the trash bin. The RF reader is kept in the van. When the van passes through the trash bin the RF ID reader placed in the van reads the RF ID tag attached on the trash bin. After the detection the data

containing the position of the van is sent to the control room via GSM module in the van. After receiving the information regarding vehicle's position, the LCD representing that particular location on map will turn on indicating that van has reached that place. Thus by these method one can keep a track on the trash van.

The IR photo sensors and ultrasonic sensors are placed in the carriage to keep a track on the amount of the trash collected in it. The ultrasonic sensors will determine the level up to which the trash is filled in the van.

## II. OVERVIEW OF THE SYSTEM

This system is designed in two major sections; first control room and second van system.

### A. Control room

The whole process of detection and monitoring starts when the van arrives at its allocated collecting point. The RF reader placed in the van will read the RF ID tag on the trash bin. These will display the corresponding address of the location of the trash bin on the LCD in the van. The weight sensors will account for the total weight collected in the container of the van. The IR photo sensors will determine the height level of trash collected in the container. The data from the sensors is displayed on the LCD of the van via micro controller. Also the baseband signal containing the information of the location of the van, the quantity of trash collected and the level of the trash in the container of the van is modulated and transmitted to the control room via GSM module.

### B. Vehicle Unit System

The data received from the van is received at the control room with the help of GSM module. It contains information of the positional coordinates of the van. The decoder will perform the function of demodulation and thus extracting information from the baseband signal. This information is displayed on the LCD. The viewer can thus get the required data and take appropriate actions required. The control room also has a map of the predetermined routes of the van. We have placed LEDs on the map at the trash collecting points. Thus the LED will be turned on when the van passes through the collection point. This is done on the basis of the data received at the control room. We also have made use of GSM SIM 300 module in the control room. These will perform the function of sending messages to the cell phones of the responsible government officers. The message will contain the information of the average quantity of the trash collected and the number of collection points covered during the day.

### III. PROPOSED SYSTEM

The entire system is divided into two parts. Control room unit, Vehicle unit.

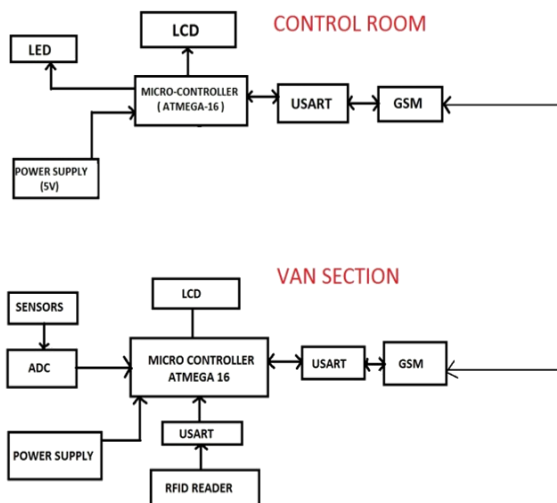


Fig.1: shows block diagram of System.

#### A. LCD

1. LCD in the van is used to display sensors status and the detection of the trash bin.
2. LCD in the control room will display the location of the van and level of trash in the van.

#### B. RFID Tag

RFID cards are also known as "proximity", "proxy" or "contact less cards and come in three general varieties: passive, semi-passive (also known as semi-active), or active.

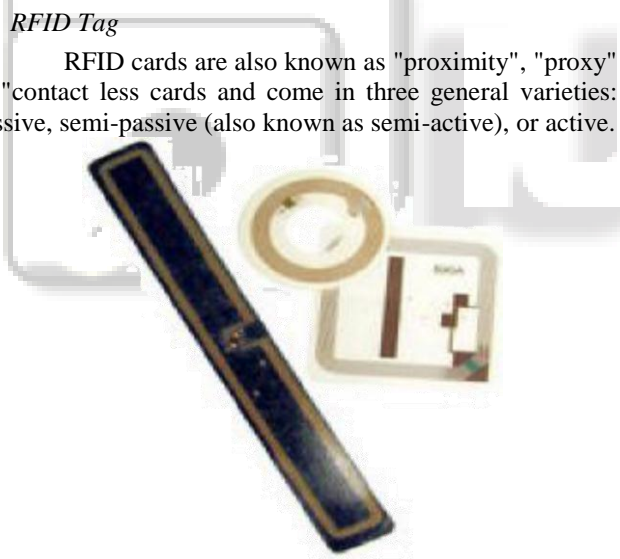


Fig. 2: Visual System of RFID Tags

**Passive Tag:** A passive tag is placed on the trash bin. Passive RFID tags have no internal power supply. The minute electrical current induced in the antenna by the incoming radio frequency signal provides just enough power for the CMOS integrated circuit in the tag to power up and transmit a response. Most passive tags signal by backscattering the carrier signal from the reader. Also they have an advantage of being cheap in cost. They will help to detect the location of the van.

#### C. RF ID Reader

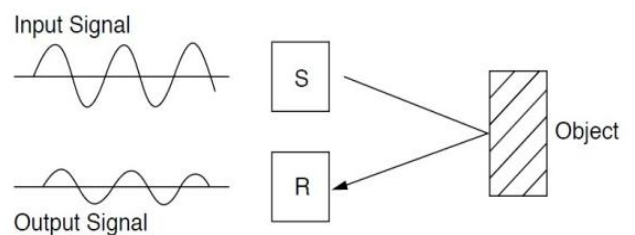
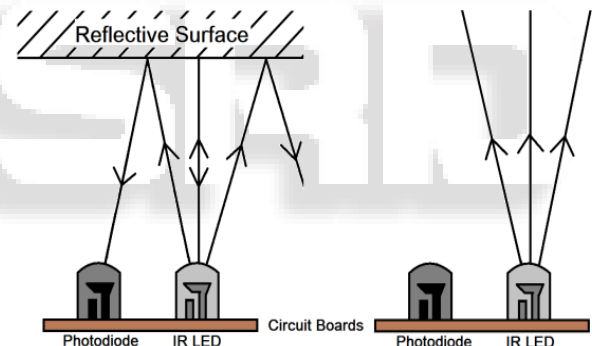
RF ID reader will be placed on the trash collecting van. Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. With the help of the

serial number the location of the trash bin will be detected. [1][2][3][4]



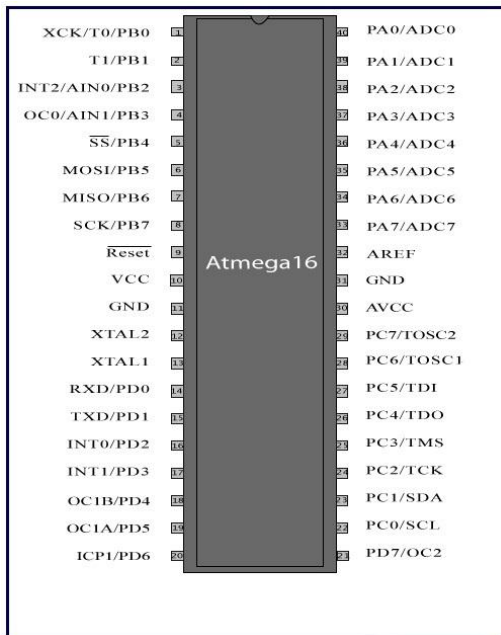
#### D. Sensors

1) **IR Photo sensor:** Infrared Emitting Diode (IR333C) is a high intensity diode, molded in a water clear plastic package. The device is spectrally matched with phototransistor, photodiode and infrared receiver module. They have high reliability and high radiant intensity. The panels of these sensors are placed at the required levels in the van. They will help to detect the level of garbage in the van. [5]



2) **Ultrasonic Sensor:** These sensors are placed in the van container. They are used to detect the accurate level of the garbage in the trash bin. The sensor will send ultrasonic wave which will be reflected by the trash it interfaces in its path. After reflection from the object the waves will be received by the receiver of the sensor. From the time delay occurred to get back the reflected signal the distance from the trash from the sensor will be detected. [6][7]

### E. Microcontroller



It is heart of the system. All the controlling actions are implemented by microcontroller ATMEGA16 with the help of software program. It will help to interface between sensors, RF ID system, LCD and GSM System.

### F. GSM Module

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack. SMS based Remote Control & Alerts can also be made from these module. The same is used here. The GSM module interfaces between the trash van and the control room. The data of the location of the van and the level of the trash in the container will be sent to the control room.

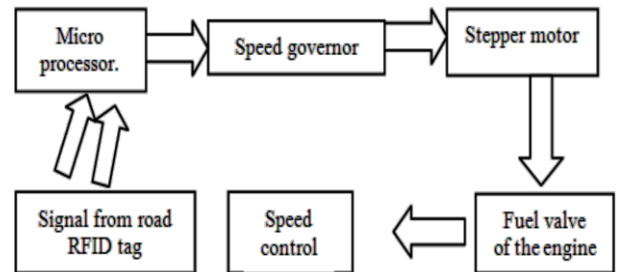


### IV. APPLICATIONS

- The tracking of government service providing vehicles can be provided to ensure faithful completion of service.
- The system can be used for controlling traffic by obtaining the information of location multiple vehicles in a given area.
- These can be done by allocating unique RF ID tag to the vehicles. The transportation and delivery of the goods by different sources can be monitored.

### V. CONCLUSION

With the help of this system we will be able to keep a track on almost all the government service vehicles to ensure that they carry out their services faithfully. These will help in proper functioning of the service sectors of the government that will contribute for a healthy environment to the citizens of the nation.



### VI. FUTURE ENHANCEMENTS

In future using the same RFID network, the analysis of traffic, selecting the signal and time allocation for the signals can be done by an artificial intelligent network. And by embedding a controlling system on the vehicle's engine, it can be controlled automatically and zero accident rates can be obtained.

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