

# AUTOMATED TRASH COLLECTOR WITH SMS ALERT

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**Abstract**—The Automated trash collector is a normal dustbin modified with the help of an embedded system which collects trash and traces its path back to the starting point. Also, it monitors the garbage level all the time and gives information. If the threshold level is reached, a warning message is sent to the concerned authority via SMS. The trash collector finds its path to the desired location using the Infrared sensor and the whole setup is connected to RF transceiver. The ultimate aim is that people need not carry the trash and search for bins. Instead, the bin comes to the user's location. A switch and IR sensor are fitted in a cabin. When the user presses the switch, a signal is transmitted via the RF transmitter to a receiver placed in the bin. This signal triggers the motor to start and the robot moves towards the desired cabin along the line. When the robot moves towards the cabin, the IR sensor in the cabin detects the robot and sends a Stop signal to the robot through PAN. Now the robot checks if the switch is ON or OFF. If the switch is ON, it stops else it passes through and goes to the next cabin. After collecting the garbage it goes to the starting point and stops. The above-depicted model of smart trash is cost effective and can be implemented in malls, airports, schools and colleges.

**Keywords**- Arduino Uno, IR sensor, Ultrasonic sensor, Battery, Gsm, RF transceiver, Switch, Motor driver.

## I. INTRODUCTION

The ultimate aim of the project is that the elderly and sick people need not carry the trash and search for bins. Instead, the bin comes to the user's location, collects the waste and returns to its home point. A large number of dust bins are required for an office for waste management. These bins are replaced by a single automated bin installed in each floor of an office. Also, it monitors the garbage level all the time and gives information. If the threshold level is reached, a warning message is sent to the concerned authority via SMS. In many offices, the location of bins may not be known to the workers and some are too lazy to go to the bin and throw their waste. So they drop it under their cabin or onto the floor. This leads to uncleanliness and unfriendly environment. Smart bins are used only to monitor the trash level in the bin and send an SMS to authority. In this proposed project, an effective model that arrives at the user's location to collect the trash has been illustrated.

## II. WASTE MANAGEMENT

Municipal Solid Waste Management (MSWM) is a challenging problem for developing countries. Municipal Solid Waste (MSW) generation in Chennai, the fourth

largest metropolitan city in India, has increased from 600 to 3500 tons per day within 20 years. The highest per capita solid waste generation rate in India is in Chennai (0.6 kg/d). Trash bins are quite common in roads, buildings, and industries. Therefore it is our duty to throw garbage in its desired location, thereby reducing the segregation time. According to a recent survey by the Chennai Corporation, about 40% of the total garbage is removed in the ecologically unsustainable manner by open dumping or burning leading to pollution of our natural resources. An imperative feature of soil is that it influences the efficiency of the environment through harbouring and nurturing various forms of life resulting in the creation of outstanding and energetic biodiversity. Total cost for street sweeping, collection and transportation per Metric ton of waste by Corporation of Chennai is approximately USD 33 which is not a good sign. Thus from the results of the survey, it is clearly evident that most of the population are unaware of the types of waste and its disposal methods.

### III. AVAILABLE TECHNOLOGY

#### A. *A Survey On Garbage Collection And Monitoring System For Smart Cities Using IoT*

There needs to be a system that gives prior information of the filling of the bin that alerts the municipality so that they can clean the bin on time and safeguard the environment. To avoid all such situations we intend to propose a solution for this problem "Smart Bin", which will alarm and inform the authorized person when the bin is about to be filled. Then a message will be sent to the authorized person to collect the garbage from the particular area.

#### B. *Smart Dustbin Management System*

A project has been developed to control the overfilling of the dustbin by making the dustbin smart enough to notify itself for its cleaning. In this project the smart dustbin management system is built on the microcontroller based system having ultrasonic sensors on each of the four dustbins that will show the current status of garbage on the LCD screen as well as on the mobile.

#### C. *Line Following Robot*

The Following Robot Carrier is a small, wheeled robot and ALT, which will follow the user, and will have a surface on which to conveniently place heavy objects. A working, full-scale version of the product was expected to be constructed for the purposes of this project, but budget and time constraints led to a small prototype being made instead. This will be used to demonstrate the functions of the proposed product, the feasibility of the project and to gain insight into its technical aspects.

#### D. *Smart Wi-Fi Dustbin System*

Garbage causes affect local ecosystems and act as a threat to plant and human life. To avoid all such situations we are going to implement a project called IoT Based Smart Garbage. "When somebody dumps trash into a dustbin the bin asks for a unique code, which can be used to gain access to free Wi-Fi". Sensor checks if the garbage is filled or not and Router provides Wi-Fi to the user. A major part of our project depends upon the working of the Wi-Fi module. The main aim of this project is to enhance the vision of the smart city.

#### E. *A Survey On Smart Waste Management Systems*

The municipal solid waste generation levels are increasing significantly with the ever-increasing population, urbanization, migration issues and change in lifestyle. Waste management becomes a challenge not only for the developing nations but also to the developed and advanced countries. The efficient management of waste has a significant impact on the quality of life of citizens. The reason is that waste disposal has a clear connection with negative impacts on the environment and thus on the citizens' health. Also, the quantity of waste near the streets causes bad smell and unhygienic condition. It also provides a negative impact on tourism. The smart waste management system helps us to remove the waste in appropriate time without overflowing and also provides better waste management.

### IV. PROPOSED TECHNOLOGY

In this work, we present an automated trash collector that not only comes to the user's location but also alerts the concerned authority via the GSM. This module includes IR Sensor, Ultrasonic Sensor, ZigBee module, GSM module, Arduino UNO, 12V Battery. The sensors interfaced to the microcontroller monitors the position of the moving bin and works accordingly. When the switch in the cabin is pressed, the RF transmitter signals the RF receiver to switch on the motor, which allows the robot to follow the black path. As the robot reaches the cabin, the ultrasonic sensor senses the robot and signals the robot to switch off the motor, thereby maintaining a stationary position in the cabin. Once the switch is released, the robot starts moving again until it reaches the home position where it provides the values which determine the amount of trash filled. This information is communicated to the caretakers using GSM technology.

### V. COMPONENTS USED

#### A. *Arduino Uno*

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

#### B. *Ultrasonic Sensor*

Ultrasonic transducers or ultrasonic sensors are a type of acoustic sensor divided into three broad categories: transmitters, receivers, and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound.

#### C. *Infrared Sensor*

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually, this radiation isn't visible to the human eye because it radiates at infrared wavelengths,

but it can be detected by electronic devices designed for such a purpose.

**D. Zigbee Transceiver Module**

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need a wireless connection. Hence, ZigBee is a low-power, low data rate, and close proximity (i.e., personal area) wireless ad hoc network.

**E. Battery**

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smartphones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.

**F. Switch**

An electrical switch is any device used to interrupt the flow of electrons in a circuit. Switches are essentially binary devices: they are either completely on (“closed”) or completely off (“open”).

**G. Gsm**

GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and code-division multiple access (CDMA).

**H. Motor Driver**

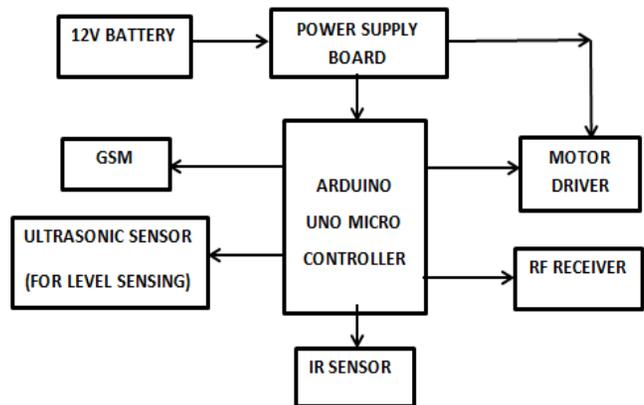
L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction.

**VI. WORKING PRINCIPLE**

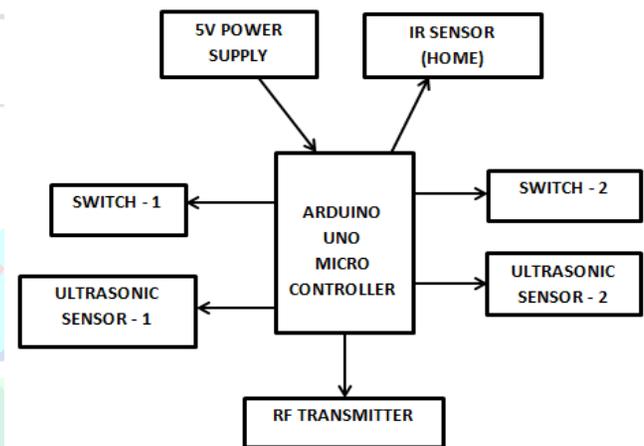
The cabin part consists of Arduino Uno, RF transmitter, switch, and ultrasonic sensor. The microcontroller is mainly used so as to interface the ultrasonic sensor with the RF module. When the user presses the switch, a signal is transmitted via an RF transmitter to the RF receiver placed in the bin. This signal triggers the motor to start and the robot moves towards the desired cabin along the line. When the robot moves towards the cabin, the ultrasonic sensor in the cabin detects the robot and sends a Stop signal to the robot through PAN. Now the robot checks if the switch is ON or OFF. If the switch is ON, it stops and collects the trash, else it passes through and goes to the next cabin. When the switch is released the trash collector goes to the starting point and stops. For the collector to stop at the Home position, an IR sensor is placed. When the IR senses the robot, the controller again sends a stop signal to the robot. If another switch in the other cabin is pressed the above procedure is followed. An ultrasonic sensor is installed in the bin which continuously monitors the garbage level and sends an SMS alert to the authority using GSM board. This will help to manage the garbage collection efficiently.

**VII. BLOCK DIAGRAM**

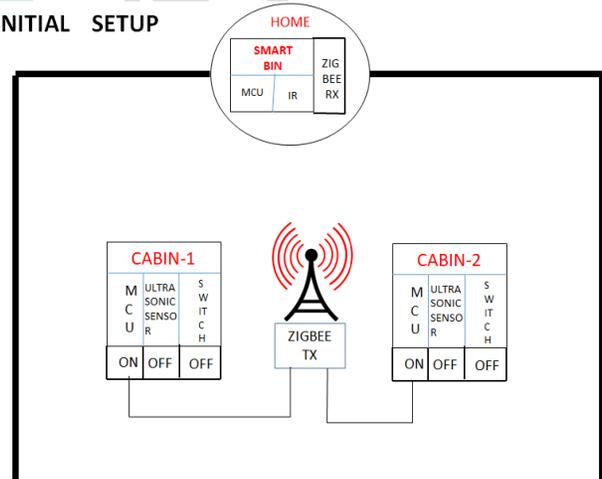
**A. Block Diagram of Line following trash collector**



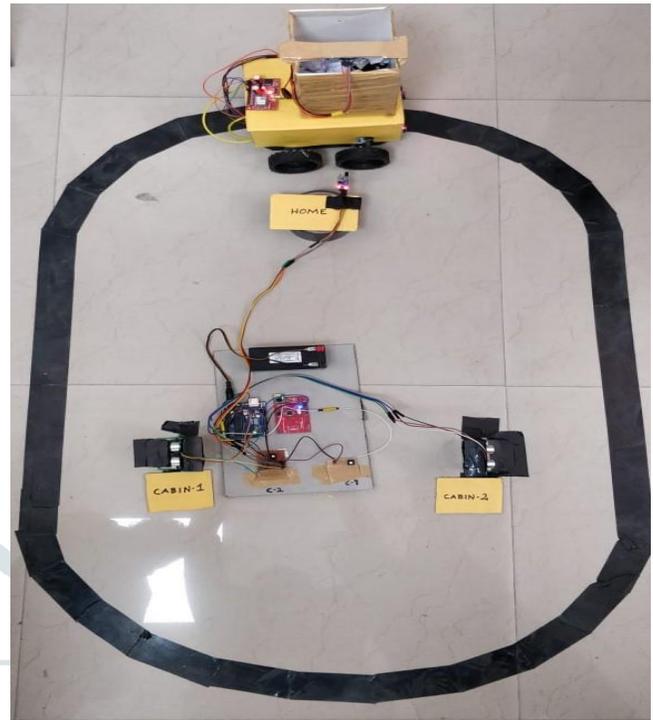
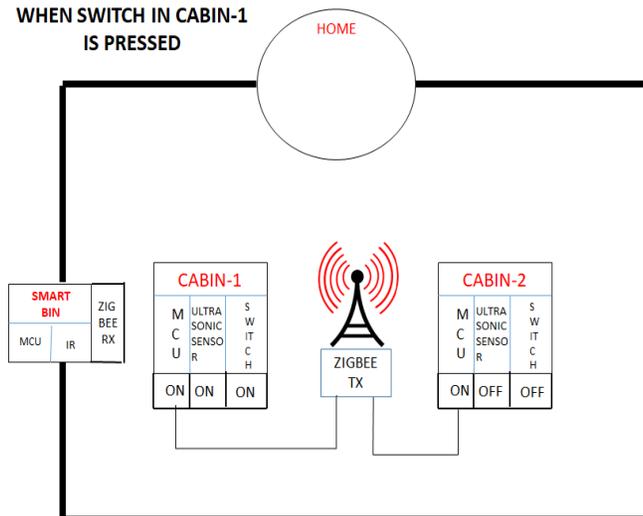
**B. Block Diagram of cabin setup**



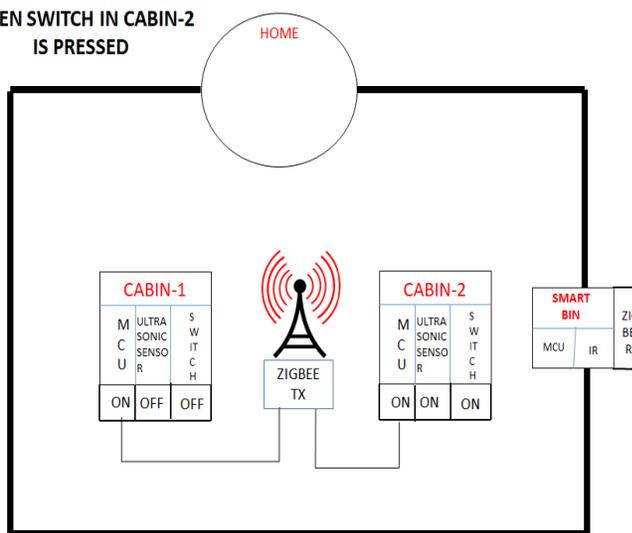
**INITIAL SETUP**



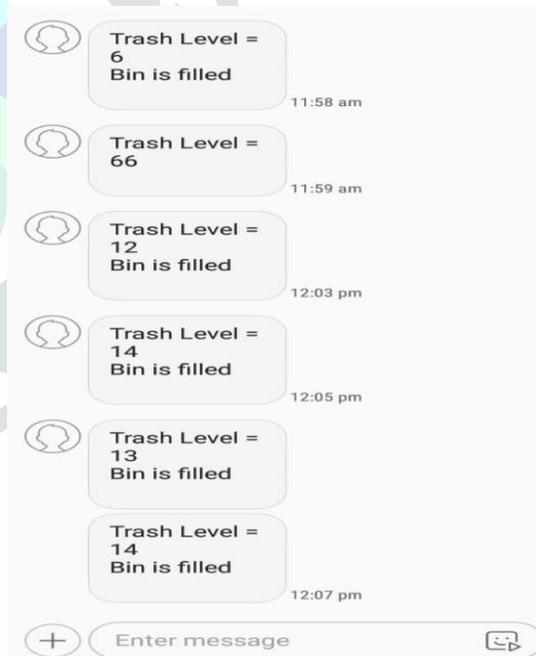
WHEN SWITCH IN CABIN-1 IS PRESSED



WHEN SWITCH IN CABIN-2 IS PRESSED



B. SMS Alert



VIII. RESULT

A. Prototype Of Automated Trash Collector

VII. ADVANTAGES

It is to be noted that while most of the recent findings only determine the amount of trash collected, the advantage of the existing system is that comes to the user's location, thereby reducing the burden of human beings. It is cost-effective in large offices since it reduces the number of bins required to be purchased. The segregation of waste can be done on time as the concerned authorities are alerted through SMS. By using Image processing technique, the waste can be distinguished which reduces the overall segregation time.

### VIII. PROJECT IMPLEMENTATION SUMMARY

The trash collector is designed in such a way that the robot comes to the user's location whenever the switch in the cabin is pressed. The main focus of the proposed system is that it saves time not only for the users but also for the concerned authorities, by servicing the user on demand and alerting them regarding the trash collected. Our idea has the potential to be implemented in schools, colleges, and offices. The use of cost-efficient components is of crucial importance to facilitate widespread adoption of such waste management systems. Therefore this method uses high accuracy models such as IR Sensors, Ultrasonic Sensors, ZigBee modules, GSM module, Arduino UNO and a 12V Battery which improves the reliability of the system.

### IX. RECOMMENDATIONS

Our project has the ability to be accepted globally as it is very simple to be implemented. This system is not meant only for office use but also suitable for hospitals, industries, households etc. The proposed work can be improved by integrating the system with the Internet of Things (IoT). By utilizing IoT, the rate of trash-filled in the particular location and the frequency of emptying the wastes can be modelled and the results can be sent to the management's web portal, thereby acting as a database. A robotic arm may be used in places such as offices and construction sites to collect the trash similar to a pick and place robot. The work can also be improvised by segregating degradable and non-biodegradable by using Image Processing techniques thereby enhancing the reliability and accuracy of the proposed system.

### X. CONCLUSION

In this work, we present an automated trash collector that not only comes to the user's location but also alerts the concerned authority via the GSM. When the switch in the cabin is pressed, the RF transmitter signals the RF receiver to switch on the motor, which allows the robot to follow the black path. As the robot reaches the cabin, the ultrasonic sensor senses the robot and signals the robot to switch off the motor, thereby maintaining a stationary position in the cabin. Once the switch is released, the robot starts moving again until it reaches the home position where it provides the values which determine the amount of trash

filled. This information is communicated to the caretakers using GSM technology. The ultimate aim is that people need not carry the trash and search for bins. Instead, the bin comes to the user's location and recorded audio will be played to the user. With the advent of technologies, all the things around us are getting smarter. The above-depicted model of smart trash is cost effective and can be implemented in malls, airports, hospitals, schools, and colleges. Thus it can be also improvised as a multifunctioning robot to perform tasks which reduces the burden of people.

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