

Smart trash can using internet of things

D.BALAJI
Assistant Professor
balajiece21@gmail.com

S MEERA
Assistant Professor
meeravasanth05@gmail.com

F Arshya Banu³
Student¹
arshya4ul@gmail.com

M.Priya⁴
Student²
Priyatulips03@gmail.com

C. ShinySherlin⁵
Student³
shinyclowton@gmail.com

K Sathyapriya⁶
Student⁴
sathiyapriya17796@gmail.com

Department of Electronics and Communication Engineering
Mahendra College of Engineering, Salem.

Abstract- The aim of the project is to control the waste management system of Municipal by using Internet. Internet of Things (IoT) is the concept of basically connecting any device with an, on and off switch to the internet. This project connects the trashcan to the internet. It will update the status of the trashcan to the Municipal so that the garbage will be cleaned earlier to the overflow stage. This smart trashcan has three Infrared sensors which are used to find the level of the garbage in the trashcan. If the level reaches the threshold value, Raspberry pi model will send message to a mobile application as well as to an IoT cloud. In addition, the trashcan will have separate section for degradable and non-degradable wastes. The wastes which are thrown to the trashcan will fall on a plate. A capacitive is used to detect the degradable and non-degradable wastes. Initially the trashcan for non-degradable wastes is placed under the plate. If the public put the degradable wastes, a motor will rotate the trashcan for degradable waste under the plate. Then the waste will fall on the correct section. This project will help to improve the waste

management system and it will help to change the city as smart city.

I.INTRODUCTION

Nowadays, people are using smart phone to pay their electricity bills, buy vegetables, book transport tickets, order Accessories. But those are all done for an individual's need. This project will use that smartphone for the welfare of the society. Overflowing garbage bins is a cause of concern for residents in developing countries. With the existence of many diseases in our Nation, the open containers are proving to be a breeding place for germs. Traditionally, municipalities operate on weekly routes to pick up wastes in the garbage bin on designated days but regardless of whether the containers are full or not. This project aims to optimize waste collection and to maintain the cleanliness of the area.

Internet of Things is becoming an increasingly growing concept both in workplace and outside of it. Internet of Things extends internet connectivity beyond

laptop computers, smartphone to a diverse range of devices that utilize embedded technology to communicate with the external environment, all via internet.

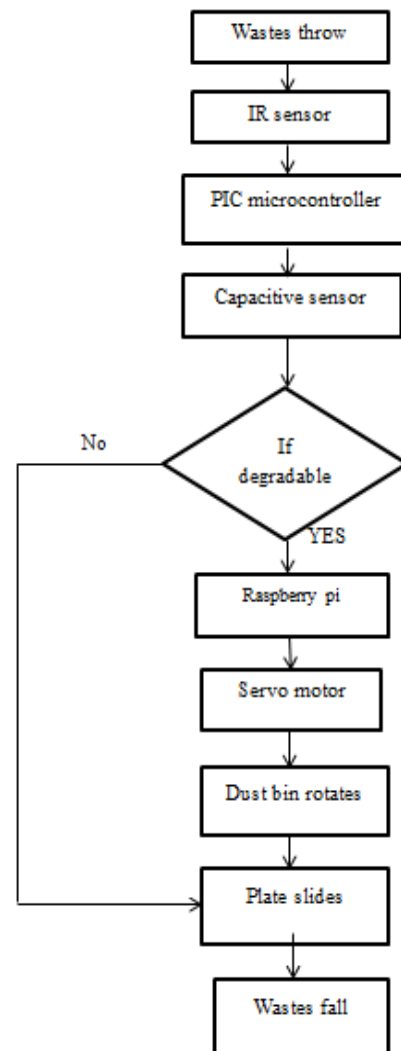
This project aims to design an IoT enabled trashcan which will automatically and frequently intimate the status of the trashcan to the Municipality. This will produce an immediate response among the workers of the Municipality. They are providing separate garbage bins for degradable and non- degradable wastes. But the people are not having awareness about that, they are putting the wastes in anyone of the garbage bins without separating it. This project automatically separates the wastes and drops it in the right bin. This will help to avoid the manual separation of wastes for further recycling processes. Garbage bin overflowed with wastes will cause Odor pollution and spread diseases like Malaria, dengue, etc. This project will give a better solution to those problems and will help for cleanliness of the society.

II.METHODOLOGY

The working of this project is based on sensors which are used in it. For level measurement, Infrared sensor is used and for waste separation, capacitive sensor is used. Raspberry pi is used as an open source for IoT platform .It is used to send the message to the IoT cloud. It receives digital signal only. But the output of the sensors will be analog signal. To convert the analog signal to digital signal PIC 16F876A microcontroller is used. All the inputs are connected to the PIC microcontroller and the outputs are connected to Raspberry pi. PIC

microcontroller will communicate with Raspberry pi by sending signal. Python language is used to control the Raspberry pi. The Python program is entered in an Editor window and it has been compiled and executed in a command window called “Python shell”. Raspberry pi will work in operating system called “Raspion”. The operating system is loaded in a SD card and that card is inserted in the SD card port of the Raspberry pi. The General Purpose Input Output Pins (GPIO) of the Raspberry pi are used for further connection with the motor and PIC microcontroller.

Flow chart:



III. WASTE DETECTION

In this section, a box is used to receive the wastes which are thrown to the trashcan. An IR sensor is fitted at that box. It is connected to PIN A0 of the PIC microcontroller. A plate is placed beneath the box where motor is fitted. The sensor continuously senses the box whether the waste is fallen or not. Once it detects the waste, PIN A0 will receive the value '1' then a message "waste detected" will be displayed in the LCD module. Then the Pic microcontroller sends signal to the Raspberry pi. The Raspberry pi rotates the motor which in turn slides the plate. The plate will slide out for 1000 milliseconds, then the plate slide in. The opening of the plate is shown in Figure 2.



Figure 2: Sliding out of the plate

IV. LEVEL DETECTION

Three IR sensors are placed in each trash can and each of them is controlled by PIC 16F876A microcontroller. Three IR sensors are placed vertically one above another. The sensors are given as input to the microcontroller and the output will be displayed in the LCD module. The 1st, 2nd and 3rd IR sensors of first trashcan are connected to the PIN C0, C1 and C2 of the Pic microcontroller respectively. Similarly the 1st, 2nd and 3rd IR sensors of second trashcan are connected to the PIN C3, C4 and C5 of the Pic microcontroller respectively. The sensor at the bottom first detects the wastes. If that sensor detects the wastes, the PIN C0 will receive the value '1' then a message "wastes low" will be displayed in the LCD. If the second IR sensor detects the wastes, a message "half loaded" will be displayed in the LCD. Likewise, if the third IR sensor detects the wastes, a message "fully loaded" will be displayed in the LCD.

Message transfer:

Wi-Fi module "AI THINKER" is connected to the Raspberry pi. Wi-Fi network is connected to the mobile phone which has the TermTCP application. Once the third IR sensor in the Trashcan senses the wastes, a signal will send to the Raspberry pi which in turn sends message to the mobile application "TermTCP". The application will receive the message only after the "LISTEN" button is pressed. The status of the trashcan will be uploaded in the IoT cloud called "Thingspeak". From that

cloud the data can be retrieved at any time.
Figure 3 shows the mobile application.

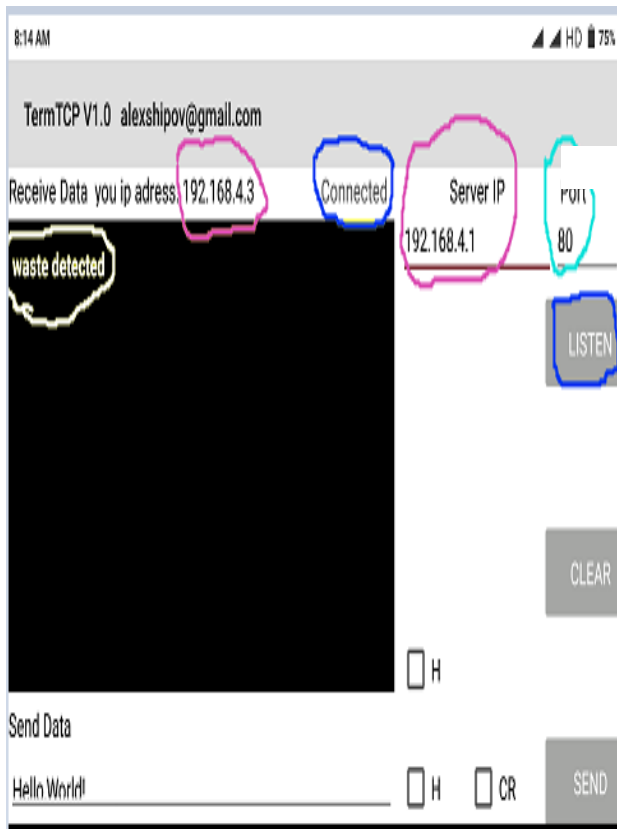


Figure 3: Mobile application “TermTCP”.

V. SEPARATION OF WASTES

Capacitive sensor is used to detect the degradable and non-degradable wastes. It is placed in the box which is receiving the wastes. The sensor is connected to the PIN A1 of the PIC microcontroller. A Servo motor is used to rotate the trashcans. Initially the trashcan for non-degradable waste is kept below the box. If the capacitive sensor detects degradable waste, the PIN A1 will receive the value ‘1’. Then the PIC microcontroller sends signal to the

Raspberry pi. The Raspberry pi rotates the servo motor so that the trashcan for degradable waste will come under the box. After that the plate will slide then wastes will fall on that trashcan.

VI .RESULT AND DISCUSSION

From this project the level of the garbage in the trashcan can be automatically intimated to the Municipality via the mobile application. The mobile application will be given to the Concern authority of the Municipality. The status of the trashcan can be continuously monitored by that Concern authority. This project uses only simple sensors for level detection and separation of the degradable and non-degradable wastes. It will be very useful to avoid manual separation of wastes for further Recycling process. The outputs are shown in Figure 4.



Figure 4.1: Fully-filled trashcan

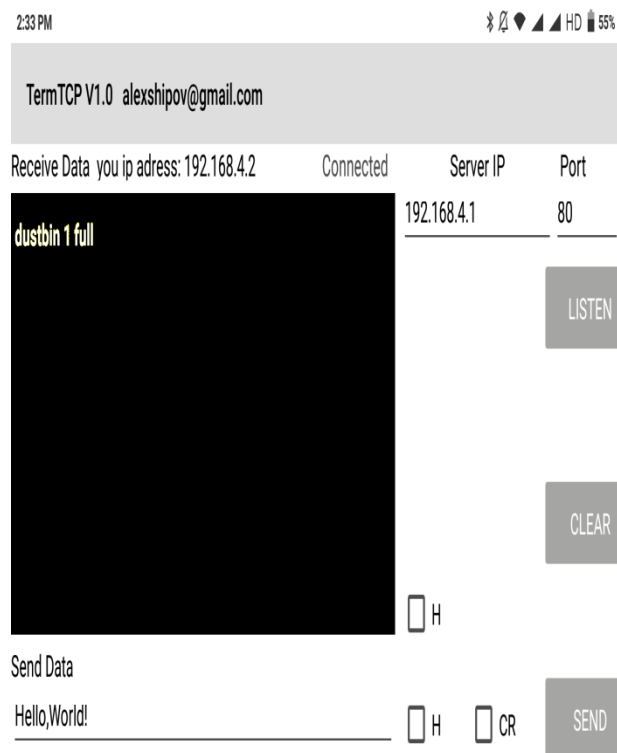


Figure 4.2: Message transferred in TermTCP

VII.CONCLUSION

Environmental cleanliness is the most important factor to be considered in the developing countries. This project helps to automate the waste management system. Using IoT, the status of the trash in each local area can be updated to the Municipality. The entire setup of the project is done to manage the wastes in the bus stand, classrooms, and it also can be implemented in the garbage bins which are kept in the streets of the residential areas. Thus this project will help to improve the waste management thereby environmental cleanliness can be maintained.

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