PROJECT REPORT

ON

SMART GARBAGE MONITORING SYSTEM

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INTRODUCTION

WHAT IS SMART GARBAGE MONITORING?

Waste management or **waste** disposal is all the activities and actions required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment, and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling.

Technology is expanding reach across all industries to simplify and optimize performance. A very important face to the development of smart cities is waste management.

The crossing of waste management and smart city development births "Smart Waste Management". Smart cities are leveraging the Internet of Things (IoT) to create an efficient system to save cities money and save the environment.

Waste management companies rely on technology to reduce their time and resources allocated to managing waste. Sensor-based technologies are key to developing smarter solutions for solid waste management.

GOALS OF SMART GARBAGE MONITORING

1. The prime goals of our smart garbage monitoring system are to cover the concept of smart garbage monitoring system over the span of our college hostel premises.
2. The main goal is to maintain a clean hostel premises applying the concept of smart garbage system to our hostel dustbins so that on required time the dustbins get cleaned and there is a clean surrounding.
3. The smart garbage monitoring aims that all the dustbins at each floors of hostel be numbered according to their floor numbers and as it gets filled up the cleaning authorities are alerted by forms of communications.
4. The project aims at detecting garbage at a distance from the sensor which needs to be checked time to time for perfect working.

MOTIVATION

The most important thing that motivated us to do this project and select the topic of “smart garbage monitoring system” is that we have seen in out hostel that in spite of the better performance of the housekeeping people sometimes they forget to check the dustbins or due their continuing work load they are not able to fulfill the cleanliness promises and clean the dustbins.

If we can build a system such that there is numbering of dustbins floor wise in hostels so that once a dustbin is full in a particular floor than the message goes immediately to the caretaker where the message depicts to clean the dustbin of particular floor containing dustbin number. The caretaker than can call the housekeeping stuffs or some other person to clean the dustbin.

This system can prove to be an efficient one and there can be a regular maintenance of cleanliness in hostels in any college.

OBJECTIVES

The main objective of our project is to build an Iot based smart garbage monitoring system to monitor the cleaning of garbage bins in hostel premises.

- Our project aims at detecting the garbage level at each dustbin in floors of hostel and sending a message to the caretakers to clean the bins.
- To be very specific about which bin in which floor has filled up we have used numbering in our dustbins where the first digit is the floor number and the next trailing digits the dustbin number.
- Our project aims at using protocols and connectivity that are easily available that makes our device to be cost effective and easily accessible.

SMART GARBAGE MONITORING SYSTEM

This project introduces the design and development of smart Green environment of garbage monitoring system by measuring the garbage level in real time and to alert the caretaker of hostels where never the bin is full based on types of garbage.

This project mainly aims to focus on to detect garbage level at each dustbin corresponding to each floor of hostel. The dustbin number in each dustbin has its first digit corresponding to each floor of each hostel and the next trailing digits corresponding to dustbin numbers in that respective floors.

Our project works in the manner:

A. The garbage is accumulated in dustbin and according to its level the distance is calculated from the sensor to the garbage at regular intervals.
B. Whenever any dustbins garbage level crosses the threshold declared in our device program than the data is passed to the IFTTT platform which is further posted to the phone number registered in IFTTT.
C. The message is posted to the registered phone number as to clean the particular dustbin number which has the floor number as its first digit and trailing digits as the dustbin number.

ENTITIES INVLOVED

The entities involved our project is:

1) Hardware-raspberry pi, ultrasonic sensor
2) Protocols – HTTPs (Through IFTTT)3) Communication - Wi-Fi4) Network backbone - TCP5) Software - Raspbian

SHORT INTRODUCTION ON ENTITIES

Raspberry Pi 3 Model B+

a) Raspberry pi-The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote teaching of basic computer science in schools and in developing countries.

Raspberry Pi 3 Model B+ was launched with a faster 1.4 GHz processor and a three-times faster gigabit Ethernet (throughput limited to ca. 300 Mbit/s by the internal USB 2.0 connection) or 2.4 / 5 GHz dual-band Wi-Fi (100 Mbit/s).

HTTP (through IFTTT)

If This Then That, also known as IFTTT is a free web-based service to create chains of simple conditional statements, called applets. In addition to the web-based application, the service runs on iOS and Android. You can turn on or off an applet using IFTTT's website or mobile apps (and/or the mobile apps' IFTTT widgets). You can also create your own applets or make variations of existing ones via IFTTT's user-friendly, straightforward interface.

ULTRASONIC SENSOR

We have used HC-s04 ultrasonic sensor to sense distance in our project.

Below we are briefly describing the features of the sensor-

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle

Of work:
(1) Using IO trigger for at least 10us high level signal,
(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
(3) IF the signal back, through high level, time of high output IO duration is
the time from sending ultrasonic to returning.
Test distance = (high level time×velocity of sound (340M/S) / 2,

RASPBIAN

Raspbian is the main and basic software for RPi devices, officially supported by the Raspberry Pi Foundation. In fact, it is an operating system, based on Debian and optimized for Raspberry Pi hardware. It comes with lots of pre-installed pieces of software appropriate for most of ARM users and developers.
Raspbian is an official operating system for Raspberry Pi devices, supported by Raspberry Pi Foundation. There are three most popular versions of Raspbian, widely spread among users now: Wheezy, Jessie and Stretch. All of them are based on Debian: Debian 7 Wheezy, Debian 8 Jessie and Debian 9 Stretch respectively. The Stretch is the latest one. It contains a lot of useful stuff: Chromium browser, Sonic Pi, Real NC, Node RED, Blue and Green foot Java IDE, Geany, Python, Scratch, and Wolfram.

PURPOSE AND REQUIREMENT SPECIFICATION MODEL

The first step in iot design system is to specify the purpose and requirement specification of the device. In this step, the purpose requirement and behavior of the device specified.
Applying to our iot device we have:

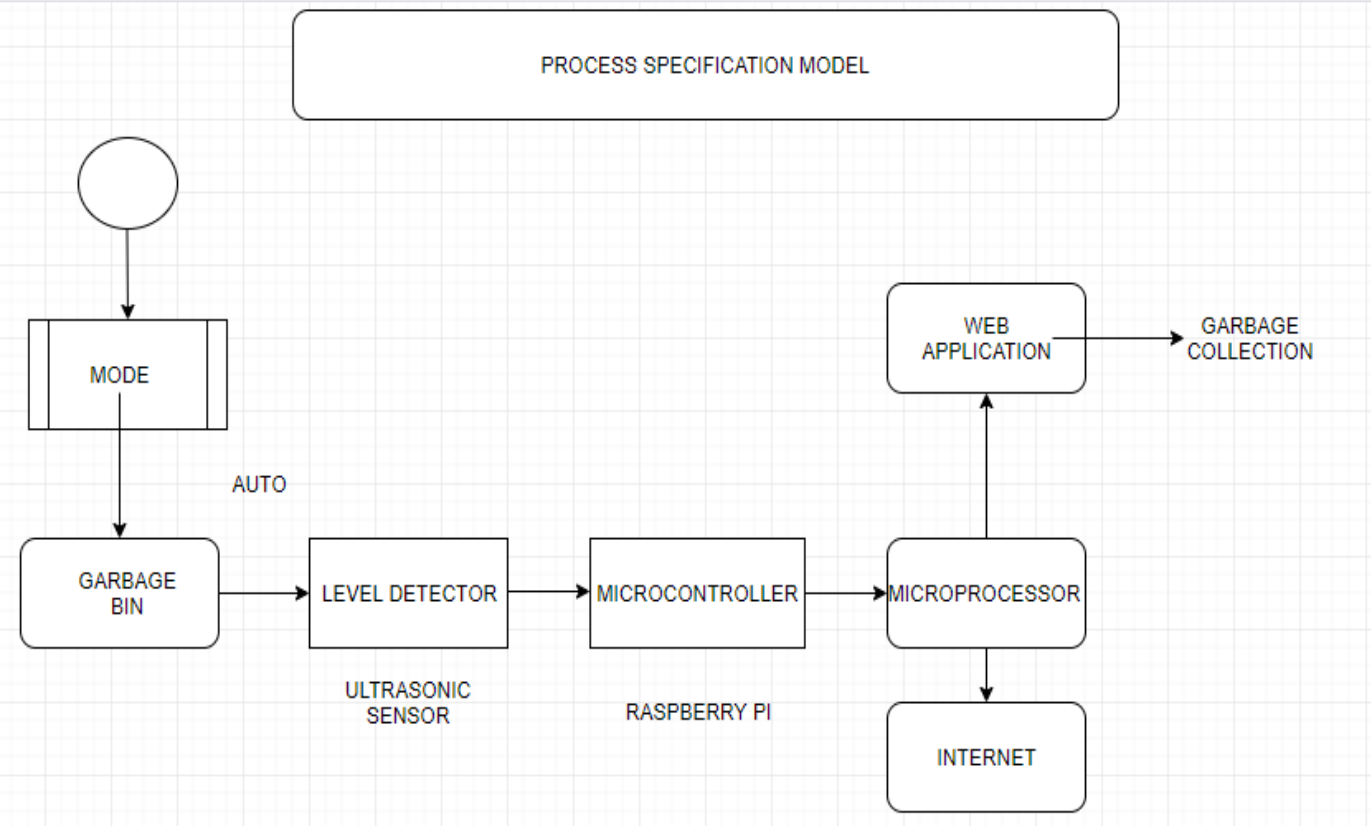
a) ***Purpose***:-smart garbage monitoring system that facilitates the collection of garbage on basis of web application.

b) ***Behavior***:-the device operates in auto mode.

c) ***System Management Requirement***: - the system provides control functions.

PROCESS SPECIFICATION MODEL

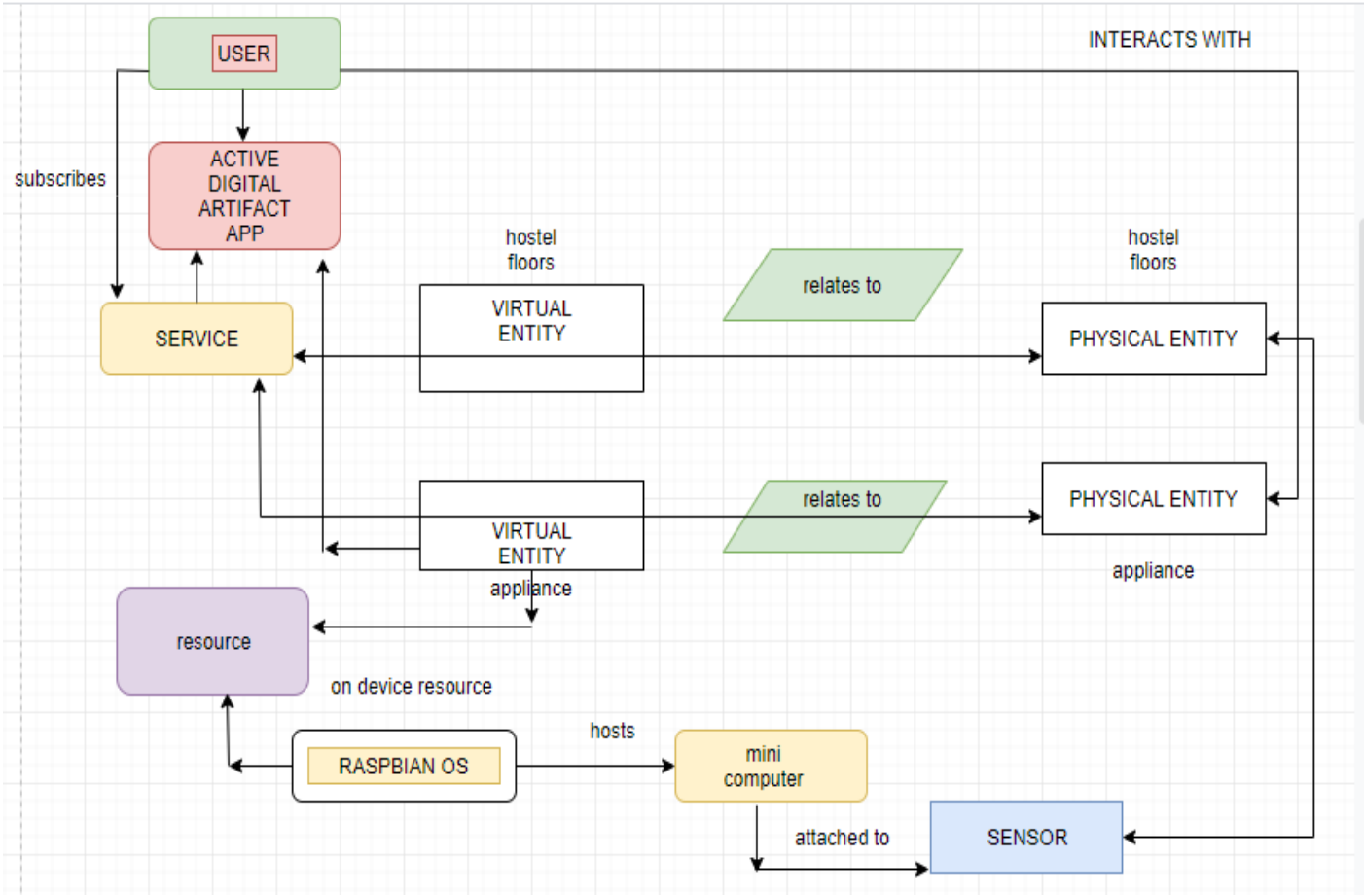
Process specifications are created for primitive processes and data flow diagram processes of a higher level. Process specifications are not created for processes requiring physical input or output, processes representing simple data validation or processes. Following represents our process specification of our iot device with the flow of data from one entity to other:-



DOMAIN SPECIFICATION MODEL

- The domain specification model specifies that the domains of the device with the detailed flow from the virtual entities to physical entities.
- Our device has the user that interacts with the physical entity that relates to the virtual entity of hostel floors than it is subscribes to services and then it interacts to raspbian OS resource and then the required push message is sent to the registered user based on the data collected by sensor of device.

The domain specification model is as follow



MODULES INVOLVED IN RASPBERRY PI

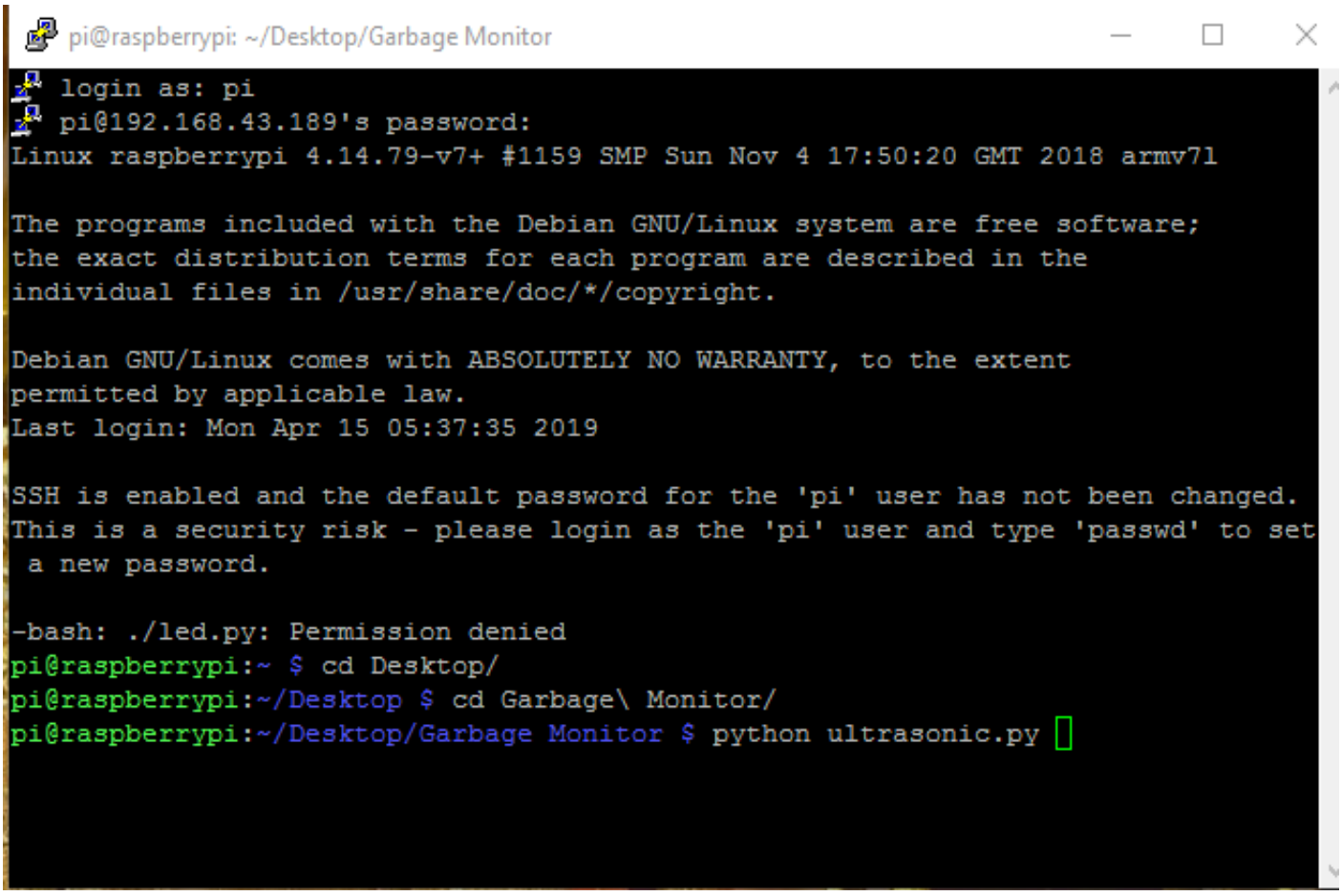
The modules involved in our Raspberry Pi 3 B+ device is-

a) 64-Bit quad core processor.
b) 1.4GHz, dual band 2.4GHz / 5.0GHz wireless Bluetooth 4.2/BLE.
c) Faster Ethernet (Gigabit Ethernet over USB 2.0, maximum throughput of 300Mbps).
d) Broadcom processor - BCM2837B0, Cortex 64-bit SoC @1.4GHz 2.4GHz
e) Improved thermal management.

The dual band wireless comes with modular compliance certification allowing the board to be designed into end product without the need for further wireless compliance testing, improving both cost and time to market.

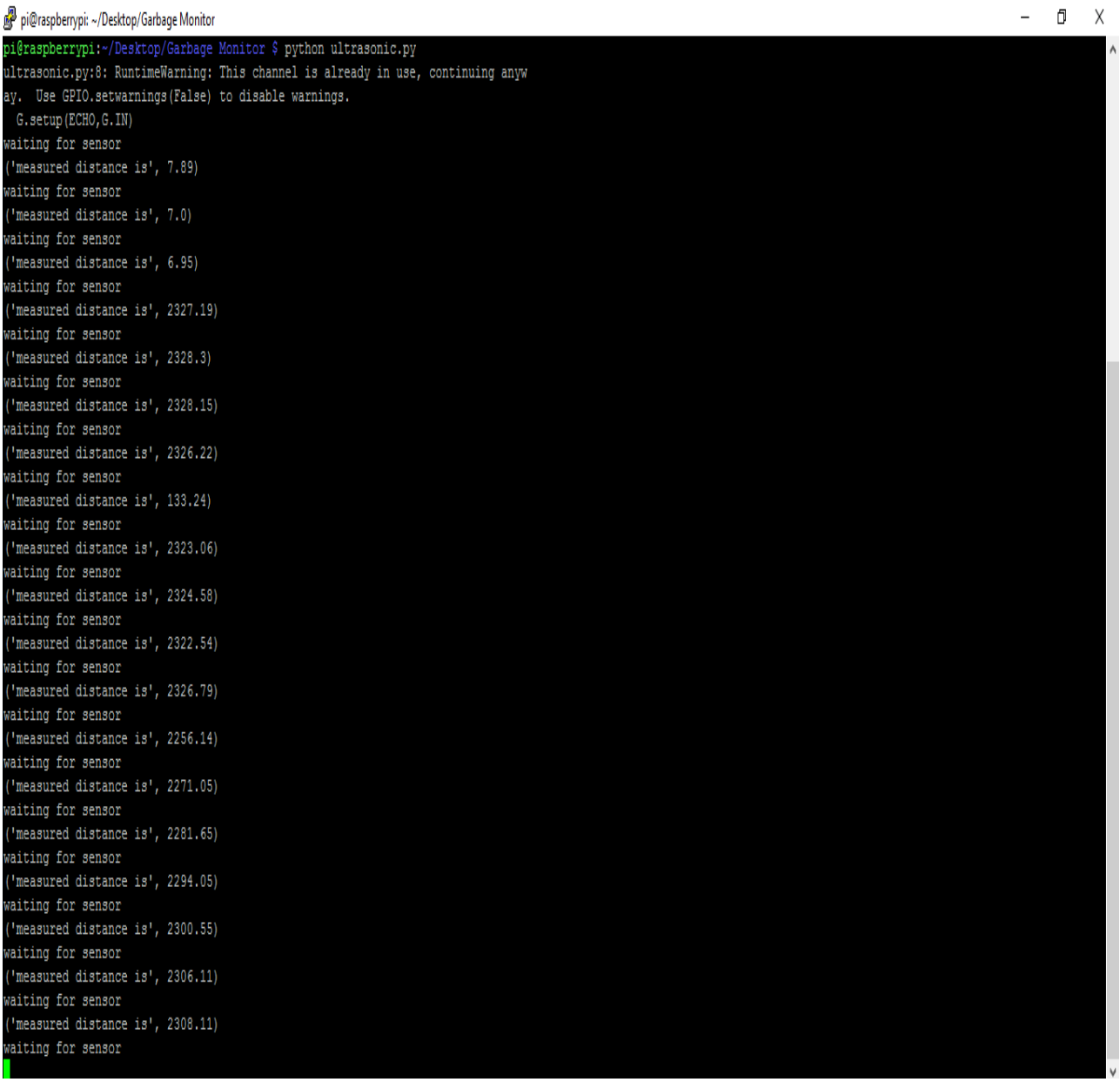
WORKING PRINCIPLE

- Firstly we will have to connect our device to a local network through its IP address.
- Nextly we open the Putty task bar and enter our required IP address which connects to the raspbian device. We enter our pi id name and password and then we are logged in to our device.



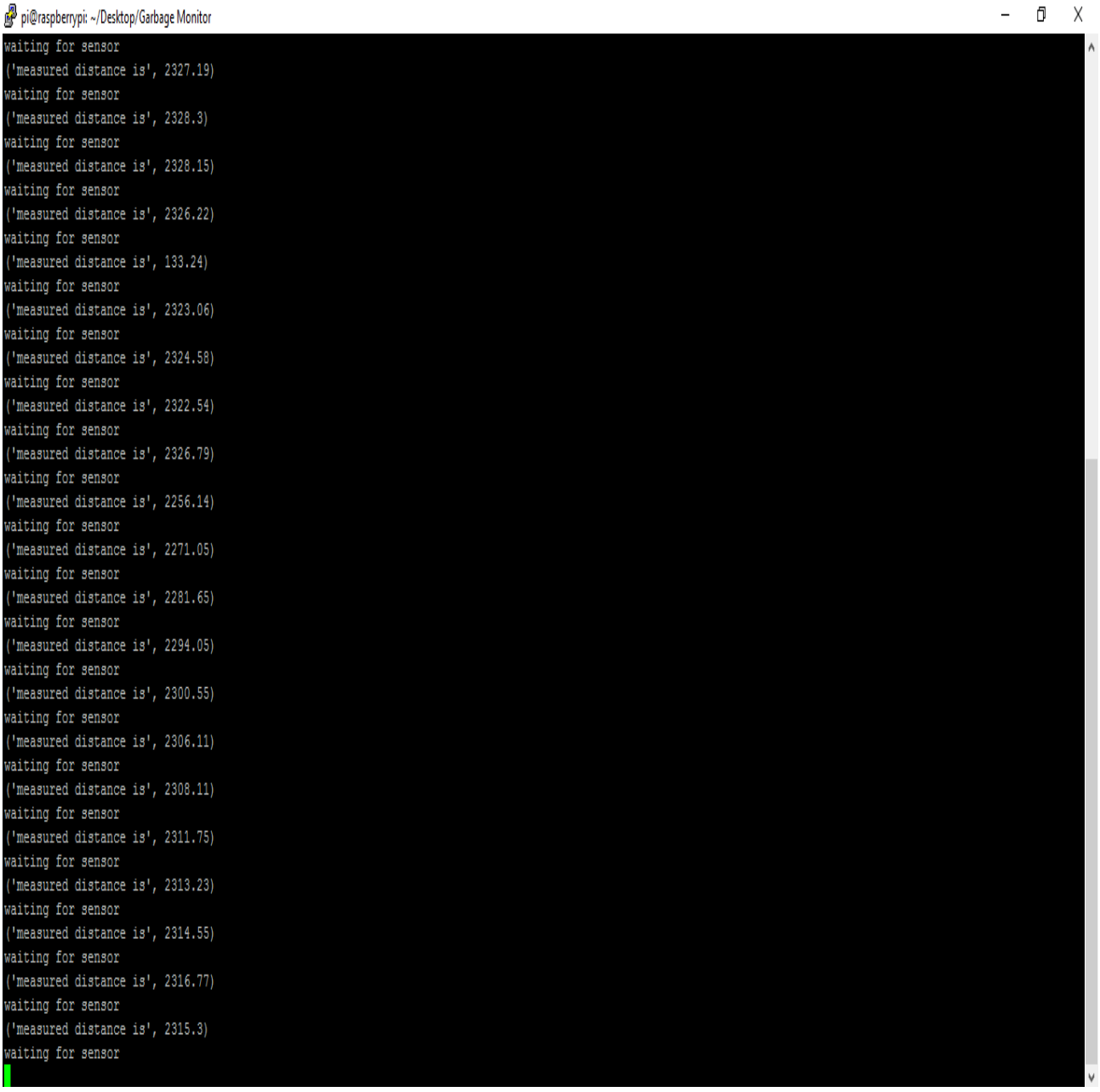
- Then we run the vnc server and there we apply

logic of calculating the distance of the sensor from the garbage in our dustbin at intervals.

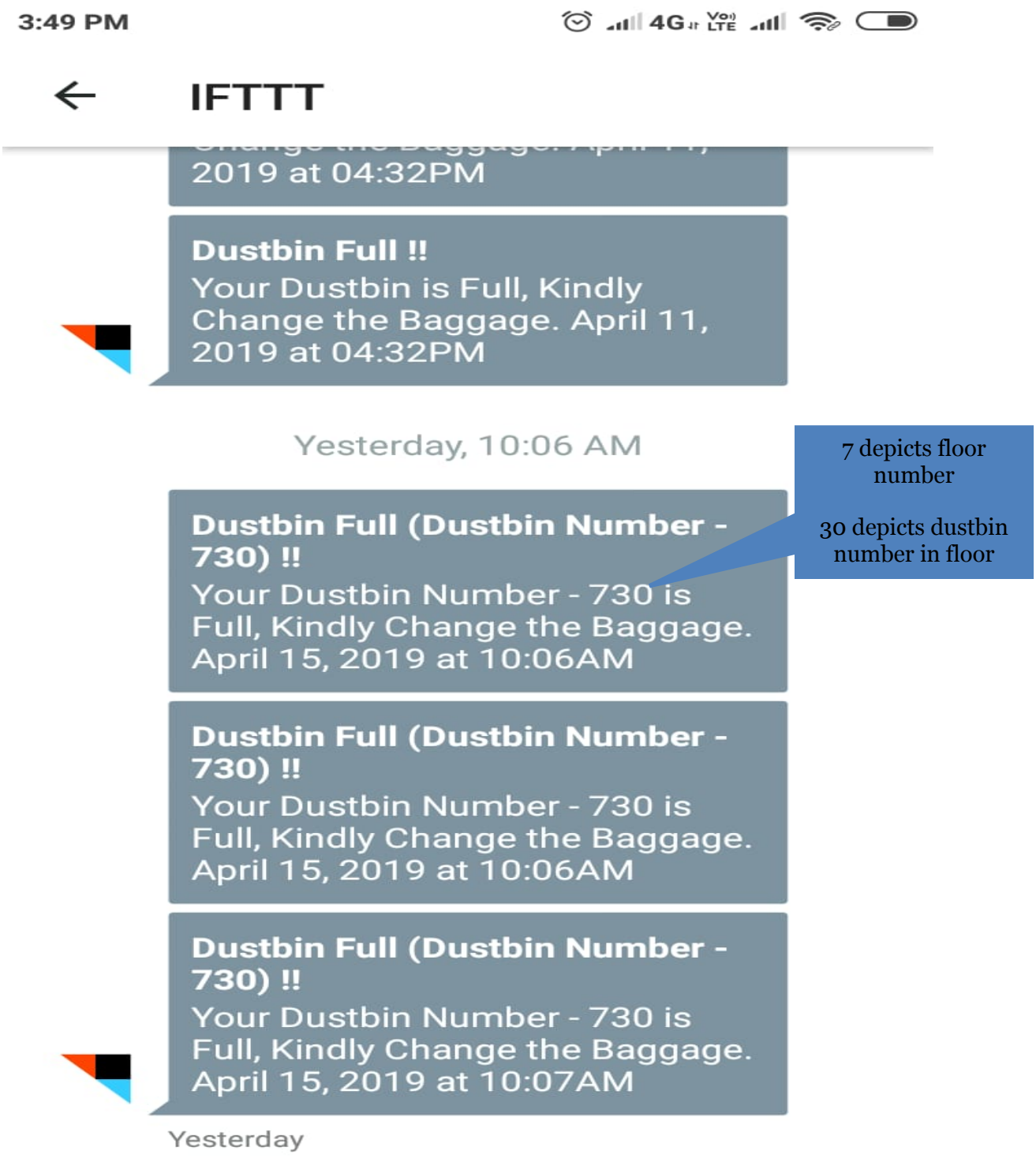


- When the distance exceeds our threshold declared in our program than the message is

passed through the push bullet to the required user for collection of garbage.

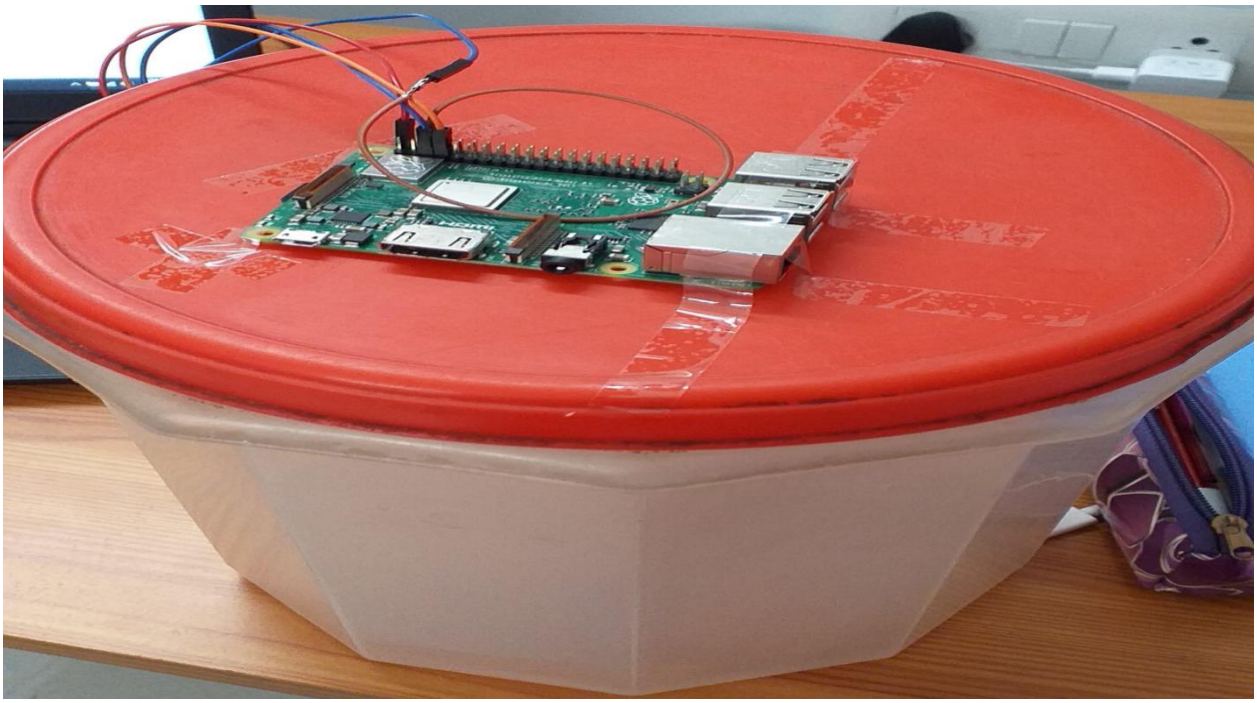


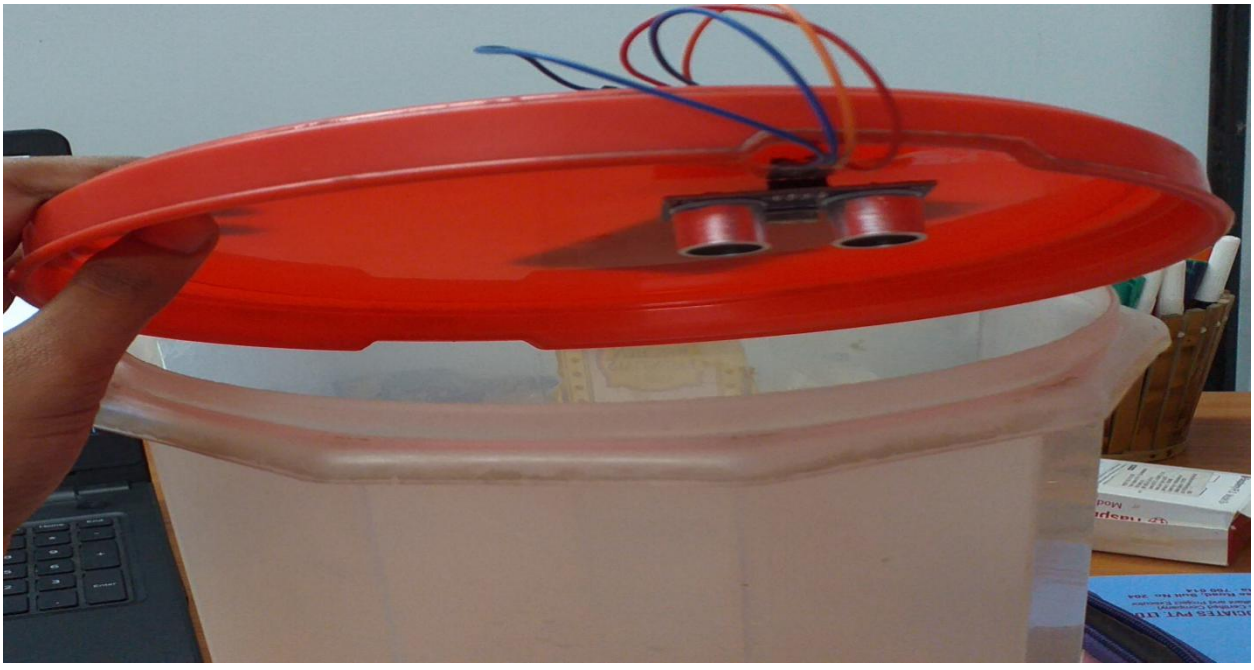
- The message via push bulletin is delivered to the required user as follows-

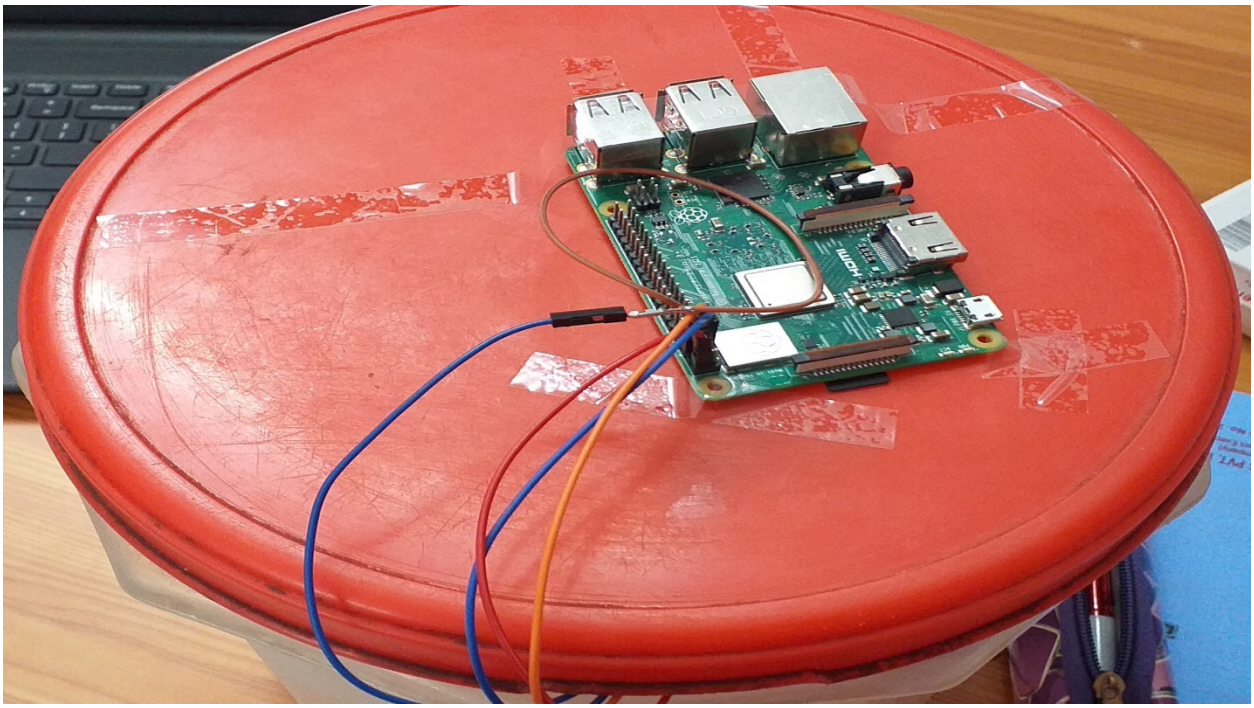


- The dustbin number depicts that the first digit is the floor number and the trailing digits depicts the dustbin number in that floor.

IMAGES OF DEVICE CONNECTIVITY







RESULT AND CONCLUSION

The conclusions of our projects can be summarized as follows-

- The project is done in such a manner that it is easily accessible and can be fixed in dustbin very easily.
- The project summarizes the fact that the project that the part of the device are cheap and can be easily available hereby in marketplace.
- This project can be visualized and extended to a higher level and higher span of area so that the facility can be available at a higher level.