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GARBAGE CONNECT

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Abstract:
The project focuses on integration of technology with existing system in order to make an efficient Garbage management and to keep our area clean. This method is just a stepping stone for implementation of Internet of Things. There can be many enhancements done for this project which can be change in maintaining our society, environment, cities clean and healthy. Few improvements can be done are: The implementation of more collective bins placed at various places where it automatically detects the location and level of this dustbin with the help of sensors in it. This method can be lead to Smart Waste Monitoring System.
This project is based on a concept of Internet of Things which uses master client configuration for monitoring dustbin levels, uses a mobile app and web app to create and receive alert notifications.
Raspberry Pi is the center and will act as the heart of this system to handle the data of multiple smart bins and to host web app at the same time to provide a user interface. Python web framework like Django can be used to create and host the web app. It receives all data from smart bins through internet and keeps it updated on the predefined time interval. All users can access all this data which will help to keep the system transparent. Workers can take actions on the basis of alerts received on their side.
Smart bins will have level sensors to detect current garbage level and keeps it updated in the Raspberry Pi's database using ESP 8266 Node MCU (Wi-Fi Module) through internet.
Any user using this app can report garbage by clicking image in app and uploading to the server, which will create a notification alert on the municipality worker's app along with image and garbage location captured by mobile GPS.

Keywords: *Raspberry Pi, ESP 8266 Node MCU, Ultrasonic sensor, Web App*

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I. INTRODUCTION

To help society to keep city clean and to collect garbage efficiently in time, we have to come up the idea of Garbage Connect. Garbage Connect will be a very helpful system to improve the garbage management by the municipality within specific time.

After implementation it will also motivate and promote people to contribute in cleaning cities just by using a mobile app to submit garbage images along with their location, so that municipality can take action on it by cleaning the suggested area.

In this world each and every person throws waste which includes plastics, wet waste, dry waste and etc. Each person looks for a place to dispose that waste. Dustbins are the containers that we can throw our waste in that or we can dispose our waste by throwing waste in the dustbins. Dustbins are used as storage place to dispose waste, but we can't estimate the extract amount of waste disposed by the society, and dustbin cannot take more waste than its availability. In this case we need to know the level of waste in the dustbin. Based on the level of waste in the dustbin, by knowing at what level dustbin is filled we can intimate people to use the dustbin or not. The Main components are used in this prototype are Node MCU, Ultrasonic sensor, etc.

Smart dustbins designed will alert the system to empty it once they are full by creating alerts /notifications in the mobile app used by cleaning workers.

This project aims to improve the system for the collection of the garbage with the help of device connected in a network in a city. This project is intended to improve the efficiency of existing system as well as to motivate citizens to contribute in cleaning cities by means of mobile app.

This system has become possible due to two-way communication between smart dustbin and service operator.

II. BLOCK DIAGRAM

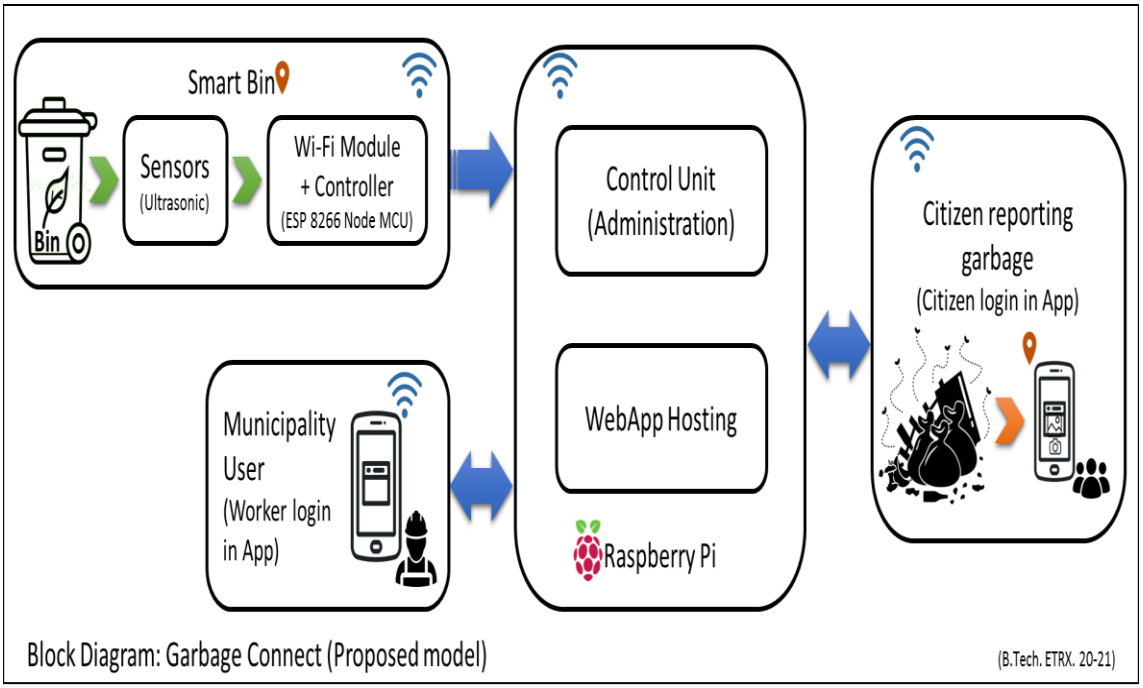


Figure 1: Garbage Connect

III. COMPONENTS

3.1. Raspberry Pi

In Fig.2 Raspberry Pi is small-sized computer with an ARM processor that can run Linux. This component is the Raspberry Pi 3 Model B+, which has 1 GB of RAM, Dual band Wi-Fi, Bluetooth 4.2, Bluetooth Low Energy (BLE), an Ethernet port, HDMI output, Audio output, RCA composite video output, four USB ports, and 0.1”-speed pins that provide access to general purpose inputs and outputs (GPIO). The Raspberry Pi requires a Micro SD card with an operating system on it.

The Raspberry Pi is low cost and small sized computer which can be plugged into a computer monitor or TV. Raspberry Pi is development board in PI series. The Raspberry Pi can be considered as a single bard computer that works on a LINUX operating system. This board has too many features. This board not has only much features it also has terrific processing speed making it suitable for advanced application.

In Our project Raspberry Pi is heart of system. Raspberry Pi is used as server, system to handle data of multiple smart bins and web app at the same time to provide a user interface.

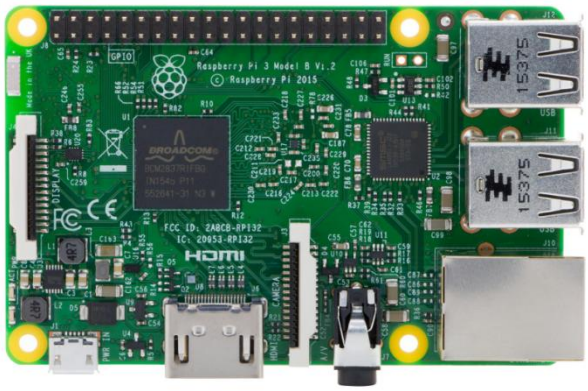


Fig.2 Raspberry Pi

3.1 ESP 8266 Node MCU

ESP 8266 is a Wi-Fi module allows microcontrollers to connect to Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. It has low price and having very few components on the chip.
Node MCU ESP 8266 is a low cost Wi-Fi chip used in the project to provide Wi-Fi access to the ultrasonic sensor. The garbage level of dustbin sends to the raspberry pi using ESP 8266.

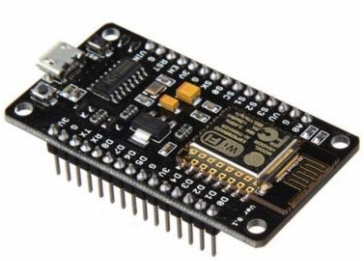


Fig3. ESP 8266

3.3. Ultrasonic Sensor

An Ultrasonic sensor is electronic device which is used to measure the distance of target object. An Ultrasonic sensor measures the distance by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. These ultrasonic waves which are transmitted by the ultrasonic sensor travel faster than the audible sound.

Ultrasonic sensor has two main components: The transmitter and another is receiver. Transmitter is which emits sound using piezoelectric crystal. Receiver is which encounters the sound after it has travelled to and from the target. Ultrasonic sensor measures the distance between the sensor and object by considering the time it takes between the emission of sound by the transmitter to its receiver. The formula for the calculation of

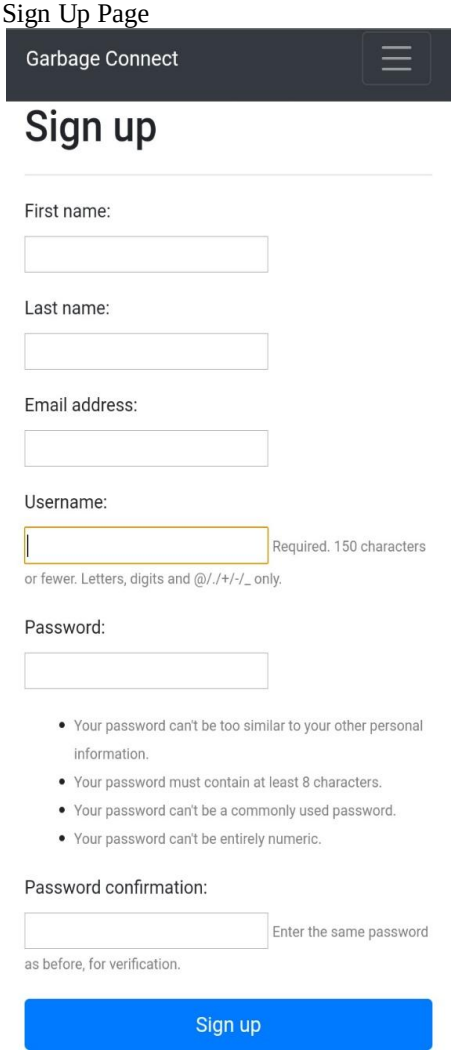
the distance is given by D= ½*T*c, where D is the distance, T is time, and C is the speed of sound 343 meters per second.

In our system, ultrasonic sensor is used to measure the distance to the waste using ultrasonic sound waves. It has transducer that helps to send and receive ultrasonic pulse waste materials and iutput of it sends to ESP 8266.

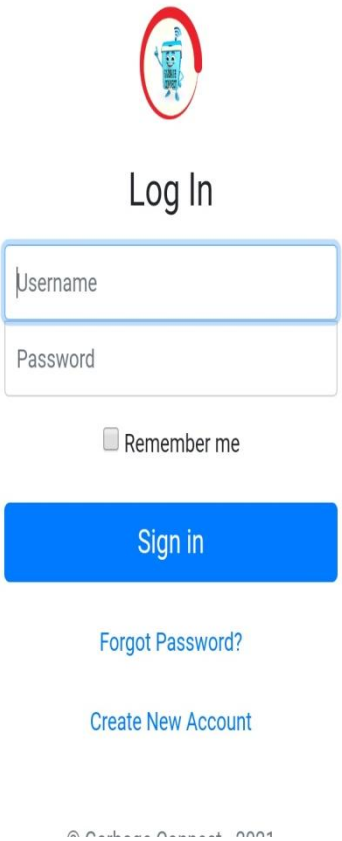
Fig4. Ultrasonic Sensor

➢ **WebApp View**

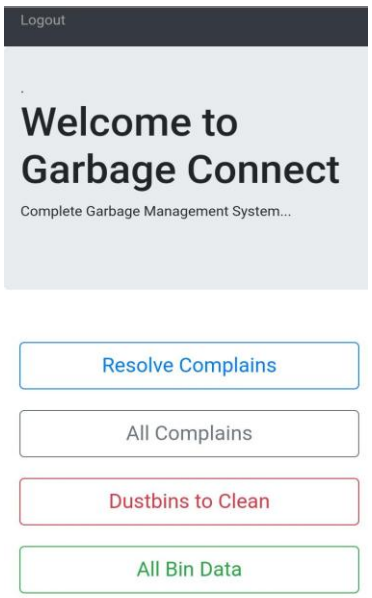
Sign Up Page



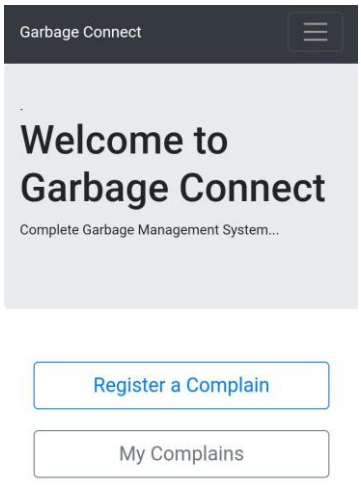
Login Page



Page View when Login as worker



Page View when Login as citizen



IV. WORKING

- This project consists of Raspberry Pi 3 Model B, ESP 8266 Node MCU, Ultrasonic Sensor for level detection purpose, android app, website hosted on Raspberry Pi.
- Raspberry Pi will act as a server whereas all other devices, mobiles will be connected to the server via internet (or if they are in the same network).
- Smart bins will have level sensor + Wi-Fi Module assembly which will update data time to time to the server.
- If any dustbin is full Raspberry Pi will generate alert notification with smart bin's location to worker.
- Users can take photos and upload to the server by using Garbage Connect app.
- This image will be sent to the workers again to the workers again with user's GPS location which will help to validate the data.
- User reported garbage will get notified once action is taken there by municipality and workers mark it cleared.
- Garbage images taken by user can be validated by using some machine leaning algorithm with the help of data of garbage images (This can be considered as a future scope).

V. CONCLUSION

Internet of Things based Dustbins and garbage management system help the people to manage the waste easily and help them reduce the work of calling or waiting for the specific person to make the area clean and makes the environment healthier to live, along with this people will be healthier because of clean cities and environment. Because of clean and healthy environment people will not have any kind of disease caused by the waste material. This is key advantage of this system. This system is fully handled on websites, so all the required data will be stored on the database. Mission "Swatch Bharat" can be implemented easily. This System helps to detect the garbage level reaches its maximum. So that it won't leads to overflow of dustbins. When it reaches to its maximum level it will notify to server and admin can take appropriate action on that. People can send their complaints via mobile android app, and they can view their status of their complaint weather it is resolved or not. This system help in cleaning the surrounding clean and the waste management can be much easier to municipality.

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