Node MCU based Garbage Monitoring System

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INTRODUCTION

- In the current garbage management and disposal system, the litter bins allotted for each locality or each street are emptied by cleaners at regular intervals of time.

- This system has several disadvantages such as: In certain areas the garbage bins fill at a faster rate than the other and are thus seen overflowing in streets. Such garbage bins pollute the surrounding environment and also form breeding grounds for several harmful pathogens.

- The overflowing garbage bins also release the foul smell. In order to eliminate all these existing problems, proper garbage monitoring is essential.

- Thus, NodeMcu based smart garbage monitoring and disposal system has been proposed as a potential system to the existing problem.

Applications/ Use-Cases

- It is an innovative system which will keep our surroundings and cities clean as it conveys information regarding Garbage Collection in the form of graphical images of the bins via a web page and SMS/Mail alerts and also makes use of Arduino Family microController, NodeMCU,GPS modules and a Wi-Fi module.

- It can also monitor the levels of various gases present in the bin and this feature is of utmost importance for the Health Department. This data on the toxicity of wastes produced can help them lay down precautionary guidelines against infectious diseases.

- Reduction in fuel consumption as well as CO_2 emissions of vehicles as garbage gets collected from the bins only when it is necessary and this boosts the overall efficiency of the automated garbage management system compared to traditional method.

- Considering Smart Cities Program of the Government of India,implementation of this IoT based mechanism can help manage waste better and ensure efficient use of services and resources to enlighten and augment the quality of life of citizens.

Hardware requirements
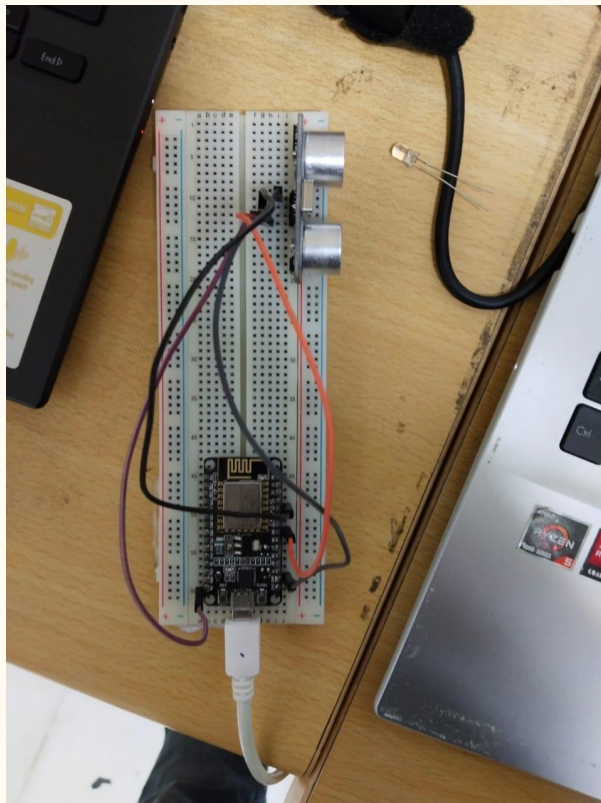

Node MCU
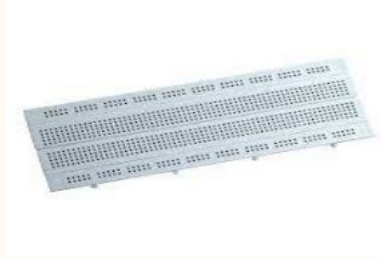
BreadBoard

Jumper Wires

Ultrasonic Sensor

Project Setup

```
if (millis() - sendDataPrevMillis > 5000 || sendDataPrevMillis == 0) {
  sendDataPrevMillis = mill

  Serial.print("Distance in
  Serial.println(distanceCm)
  Serial.print("Level: ");
  Serial.println(level_ind);


  // Update ThingSpeak fiel
  ThingSpeak.begin(client);
  ThingSpeak.setField(1, di
  ThingSpeak.setField(2, le

  int writeSuccess = ThingSp

  if (writeSuccess == 200)
    Serial.println("Data se
  } else {
    Serial.println("Failed to update ThingSpeak");
    Serial.println("HTTP error code: " + String(writeSuccess));
  }

  delay(15000); // ThingSpeak limits updates to once every 15 seconds
  }
}
```
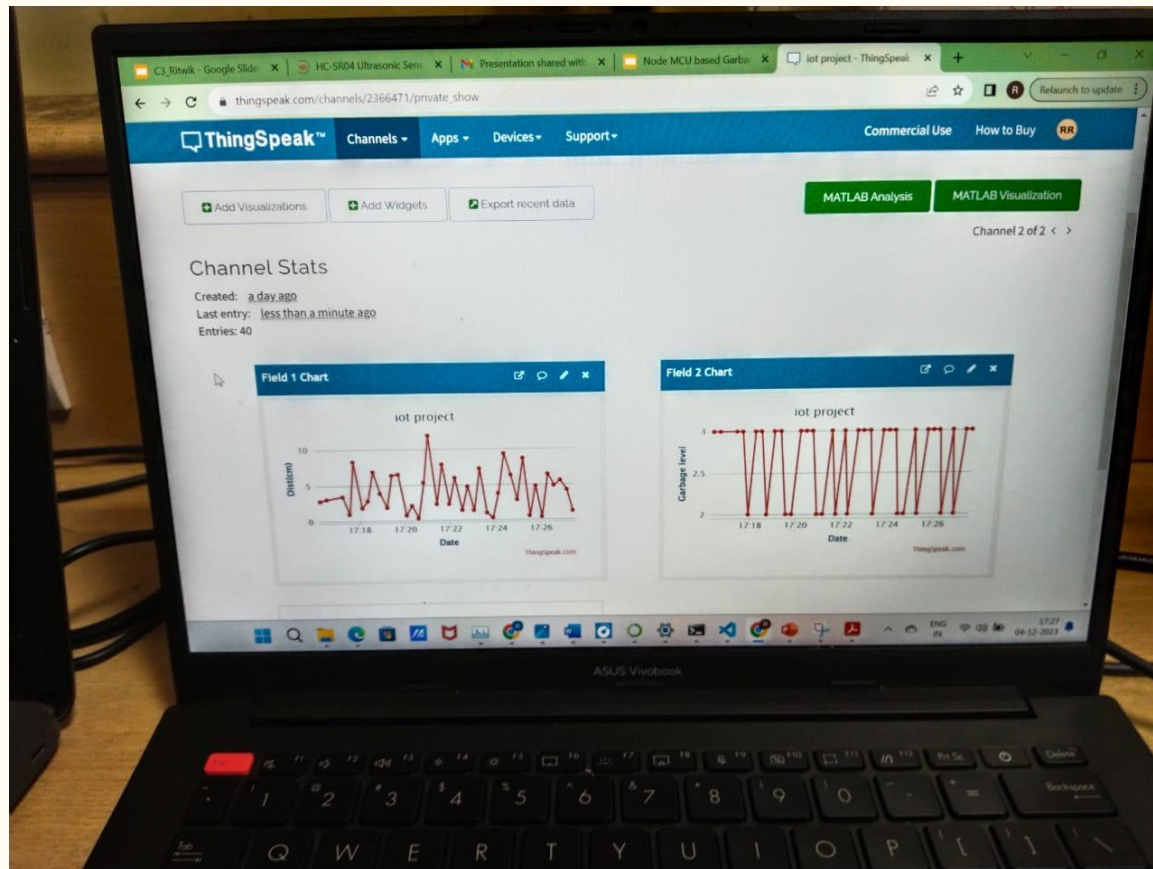
COM4

Data sent to ThingSpeak
Distance in cm: 4.81
Level: 3
Data sent to ThingSpeak
Distance in cm: 5.54
Level: 2
Data sent to ThingSpeak
Distance in cm: 4.20
Level: 3
Data sent to ThingSpeak
Distance in cm: 1.21
Level: 3
Data sent to ThingSpeak

Autoscroll   Show timestamp   Newline   115200 baud   Clear output
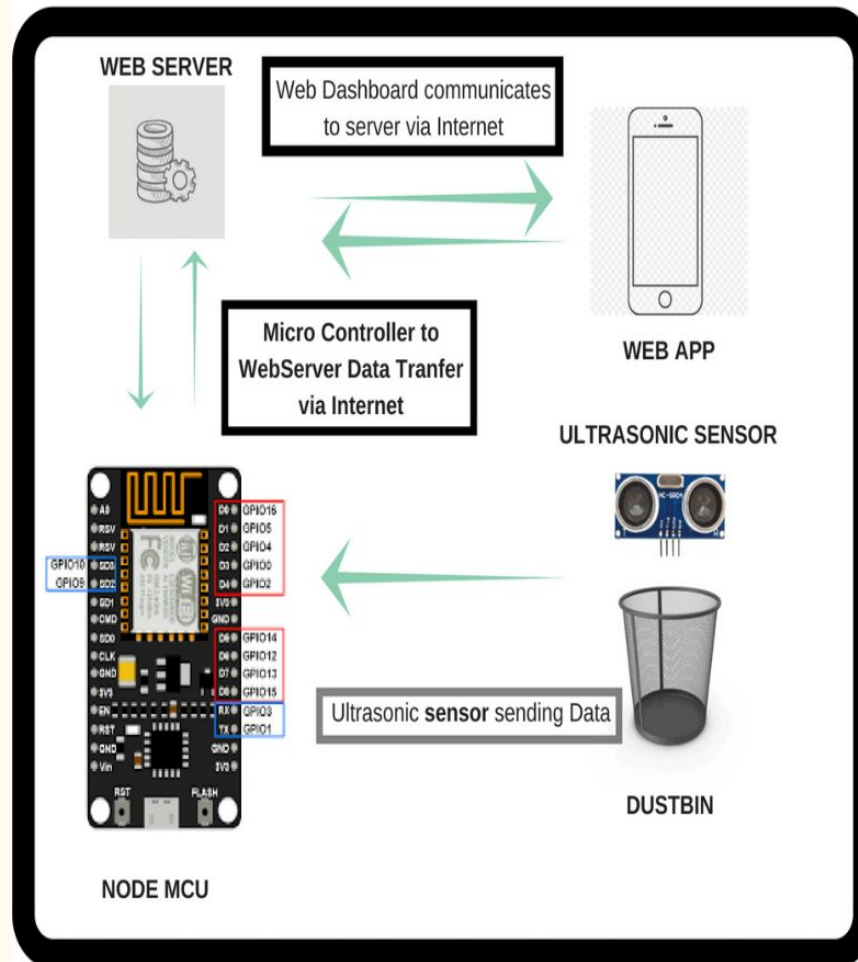
ThingSpeak Setup

Software requirements

- VS Code :- Code for editing webpage and C++ code

- ThingSpeak :- For storing data related to each dustbin .For eg:- Garbage level, distance of garbage from the sensor .

- Arduino IDE :- Arduino is an open source hardware platform used for connecting code to hardware devices
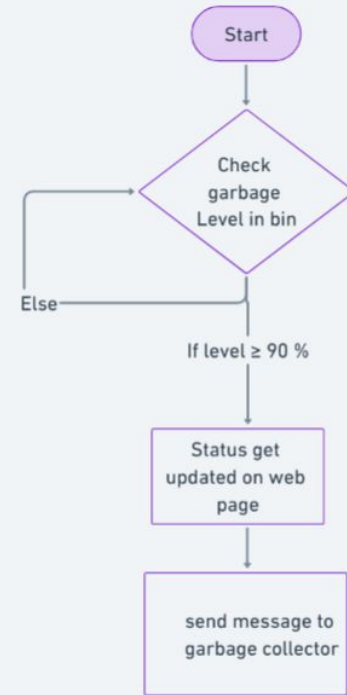
Technology requirements

- A Ultrasonic sensor is appended to the highest point of each bin.

- The ultrasonic waves from the sensor are reflected back from the trash in the container. Utilizing this, we compute the level of void space in the bin.

- The level of void space in a container is continually shipped off the server utilizing our Wi-Fi module.

Architecture Diagram

WEB SERVER

Web Dashboard communicates to server via Internet

WEB APP

Micro Controller to WebServer Data Tranfer via Internet

ULTRASONIC SENSOR

D0	GPIO16
D1	GPIO5
D2	GPIO4
D3	GPIO0
D4	GPIO2
3V3	
GND	
D5	GPIO14
D6	GPIO12
D7	GPIO13
D8	GPIO15
RX	GPIO3
TX	GPIO1

GPIO10 SD3
GPIO9 SD2

Ultrasonic **sensor** sending Data

DUSTBIN

NODE MCU

Data Flow Diagram

GUI of Web App

IoT Term Project

Group 4

Members:

1. Rahul Singh
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3. KP Singh
4. Anup
5. Ritwik

Fetch sensor data from cloud

Timestamp	Distance(cm)	Garbage Level
2023-12-02T13:15:53Z	0.00000	3
2023-12-02T13:16:10Z	0.00000	3
2023-12-02T13:16:27Z	0.00000	3
2023-12-02T13:16:45Z	0.00000	3
2023-12-02T13:17:02Z	0.00000	3
2023-12-02T13:17:19Z	0.00000	3
2023-12-02T13:17:36Z	0.00000	3
2023-12-02T13:17:53Z	0.00000	3
2023-12-02T13:18:11Z	0.00000	3
2023-12-02T13:18:28Z	0.00000	3
2023-12-02T13:19:13Z	0.00000	3
2023-12-02T13:19:30Z	0.00000	3
2023-12-02T13:19:47Z	0.00000	3
2023-12-02T13:20:04Z	0.00000	3
2023-12-02T13:20:22Z	0.00000	3
2023-12-02T13:20:39Z	0.00000	3
2023-12-02T13:20:56Z	0.00000	3
2023-12-02T13:21:13Z	0.00000	3

FUTURE SCOPE

In the Future,features like Treatment of the Toxic wastes and Automatic Garbage Segregation can be incorporated in our Proposed System. This will lead to less human intervention and well-being and safety of the Municipal Workers who face

a lot of risks due to the hazardous wastes that they collect and dispose . We will also like to implement multi-sensor setup and instead of periodically sending the data we would like to incorporate the functionality to send data only when there is change in level of garbage.

Conclusion

This concludes our implementation of our term project. The project can be further worked on by incorporating multiple sensors.