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A Review on Internet of Things (IOT) Based Garbage Monitoring System

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Abstract: ***"Swachh Bharat" is a national campaign by the statutory cities and towns to clean the roads streets and infrastructure of the country. When the massive amount of waste material is collected, it is difficult to separate and unhygienic. Now a day's garbage is separately thrown i.e. dry and wet. The Internet of Things (IoT) shall be able to incorporate transparently and coherently a large number of different and heterogeneous end systems, while providing open access to selected subsets of data for the developing a digital services. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies. One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of the environment also has adverse effects on the health of the society. The detection, monitoring and management of wastes are one of the primary problems of the present period. The traditional way of manually monitoring the wastes in waste bins is a complex, cumbersome process and utilizes more human effort, time and cost which is not compatible with the present day technologies in any way. This is an advanced method in which waste management is automated. In this "IOT based garbage monitoring system" The separate the wet and dry garbage using the moisturized sensor. This system is based on the separation and monitoring of garbage using Arduino Uno, Wi-Fi-module, ultrasonic sensor. Online identification of the garbage level using IOT, ultrasonic sensor and Wi-Fi module makes this system more effective than other system.***

Keywords: IoT, Smart Garbage Monitoring, Smart Bin, Ultrasonic Sensor, Node MCU.

I. INTRODUCTION

This system, we are going to make an IOT based garbage Monitoring System it will tell us that whether the bin is empty or full through the web server and you can know the status of your 'Bin or 'Dumpsters' from anywhere in the world over the Internet. It will be very useful and can be installed in the bins at public places as well as at home. Garbage may consist of the unwanted material left over from the city, public Areas, society, college, home etc. his system is related to the "Garbage Monitoring" and based on "Internet of Things". This system will help to minimize the garbage disposal problems and help to keep the clean city. In this system an Ultrasonic Sensor is used for detecting whether the bin is filled with garbage or not and will measure the distance of garbage from the top of Bin and we can set a threshold value according to the size of bin. We will use Node MCU (ESP8266) for connecting to the web server. Here we have used Local web server to demonstrate the working of this Garbage Monitoring System. This system monitoring the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. The system makes use Node MCU, DHT-11 for sending data. The LCD screen is used to display status of the level of garbage collected in the bins. Where the web page is built to show the status of user monitoring it. The web page gives a graphic view of the garbage level. Thus this system helps to keep the city clean by informing about the garbage levels of the bins by providing graphical image of the bins via IoT Pup web development platform.

II. METHODOLOGY

Garbage Monitoring has become an immense concern in the context of today's modern cities. Improper waste management leads to unclean, unhygienic conditions in the city hence spreading lots of diseases and leads to improper management of logistic and human resources. However, Internet of Things (IOT) has brought about a revolution in the traditional system to develop a smart city project in various fields. Our proposed idea is for proper waste management and optimization of waste collection and disposal system to avoid scenarios of waste overflow in the context of technology enabled smart cities. In this research work waste bins are divided into three categories namely biodegradable, non-biodegradable and metallic. A real-time monitoring of the garbage level inside the waste bin is periodically sent from each location to a centralized cloud platform.

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Whenever the garbage level inside waste bin reaches the threshold, the waste collection vehicles are routed according to the decreasing order of percentage of waste filled in the dustbins of different areas. The main objective of the project is to save resources and strict constraint of the overflowing of waste bins. In this project, HCSR04 ultrasonic sensors are used with Arduino UNO for developing the prototypes. ESP8266 is used to send real-time sensor data to cloud.

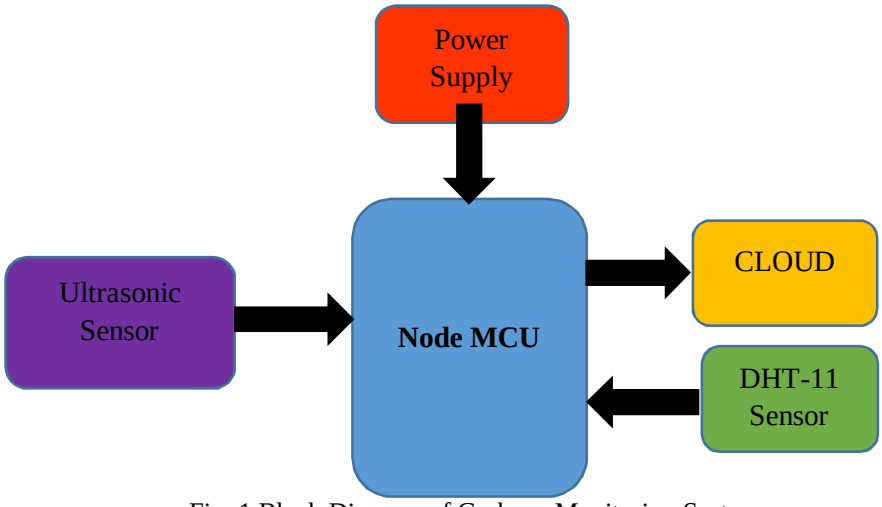


Fig. 1 Block Diagram of Garbage Monitoring System

We have used ultrasonic sensors to detect the level of waste in the dustbin. The Sensor sends ultrasonic waves and calculates the total time taken to reach the obstacle and to get reflected back. Sensor data is sent periodically to the cloud through the Node MCU (ESP8266).We are using Node MCU as our microcontroller which will help us to control all the component as per programming. Node MCU connect to the Internet with the help of coding. Node MCU will monitor the values of ultrasonic sensor and DHT11 and send it to blynk server via Internet. DHT11 used for the measuring the humidity and temperature of the garbage. When the humidity is less than the 50 then the dry garbage will detect, if the humidity is more than 50 then the wet garbage will detect. So that we can see those data values on blynk application. Ultrasonic sensor will monitor the level of garbage present in dustbin whereas Dht11 will monitor the type of garbage wet or dry. Notification will be sent to blynk application after value moving above certain level.

III. COMPONENTS DETAILS

A. Node MCU

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

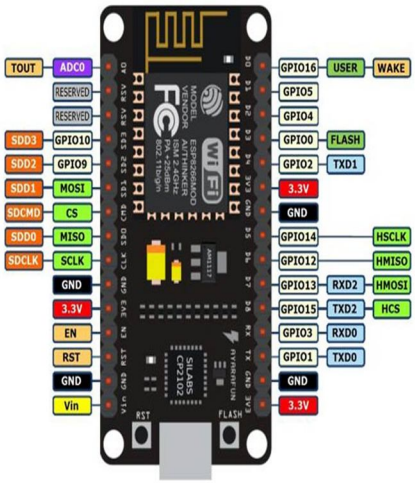


Fig. 2 Mode MCU ESP8266

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NodeMCU ESP8266 Specifications & Features

1) Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
2) Operating Voltage: 3.3V
3) Input Voltage: 7-12V
4) Digital I/O Pins (DIO): 16
5) Analog Input Pins (ADC): 1
6) UARTs: 1
7) SPIs: 1
8) I2Cs: 1
9) Flash Memory: 4 MB
10) SRAM: 64 KB
11) Clock Speed: 80 MHz
12) USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
13) PCB Antenna
14) Small Sized module to fit smartly inside your IoT projects

B. Ultra Sonic Sensor (HC-SR04)

1) *VCC* - The VCC pin powers the sensor, typically with +5V
2) *Trigger* - Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3) *Echo* - Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4) *Ground* - This pin is connected to the Ground of the system.

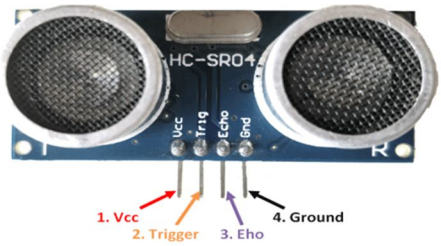


Fig. 3 Ultrasonic Sensor

HC-SR04 Sensor Features

1) Operating voltage: +5V
2) Theoretical Measuring Distance: 2cm to 450cm
3) Practical Measuring Distance: 2cm to 80cm
4) Accuracy: 3mm
5) Measuring angle covered: <15°
6) Operating Current: <15mA
7) Operating Frequency: 40Hz

C. DHT 11

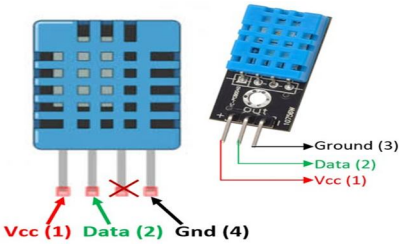


Fig. 4 DHT 11 Sensor

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DHT11 Specifications

1) Operating Voltage: 3.5V to 5.5V
2) Operating current: 0.3mA (measuring) 60uA (standby)
3) Output: Serial data
4) Temperature Range: 0°C to 50°C
5) Humidity Range: 20% to 90%
6) Resolution: Temperature and Humidity both are 16-bit
7) Accuracy: ±1°C and ±1%

D. Blynk App

This guide will help you understand how to get started using Blynk and give a comprehensive overview of all the features.

1) *How Blynk Works:* Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, vizualize it and do many other cool things. There are three major components in the platform:
2) *Blynk App:* Allows to you create amazing interfaces for your projects using various widgets we provide.
3) *Blynk Server:* Responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
4) *Blynk Libraries:* For all the popular hardware platforms - enable communication with the server and process all the incoming and out coming commands.

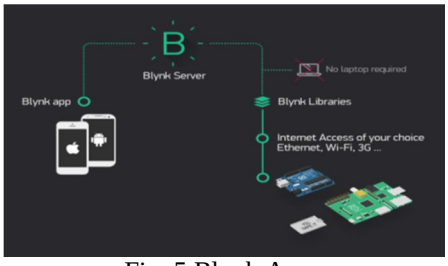


Fig. 5 Blynk App

Now imagine: every time you press a Button in the Blynk app, the message travels to space the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blynk of an eye.

IV. CONCLUSION

This implementation of Smart Garbage Collection System using IOT, assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned official. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It is ultimately helps to keep cleanliness in the society. This is quite a significant project in its originality and concept. We are using Internet of Things theory which gives this project its uniqueness about the concept. The project aims at cleanliness of the areas where trash bins are located and the very basic management that it contains with it. It aims at advanced management of the whole garbage collection system. We use ultrasonic sensors and its other hardware microcontrollers and processors such as for analyzing the garbage levels and sending information about it to administrators and then garbage trucks are being deployed by them.

V. FUTURE SCOPE

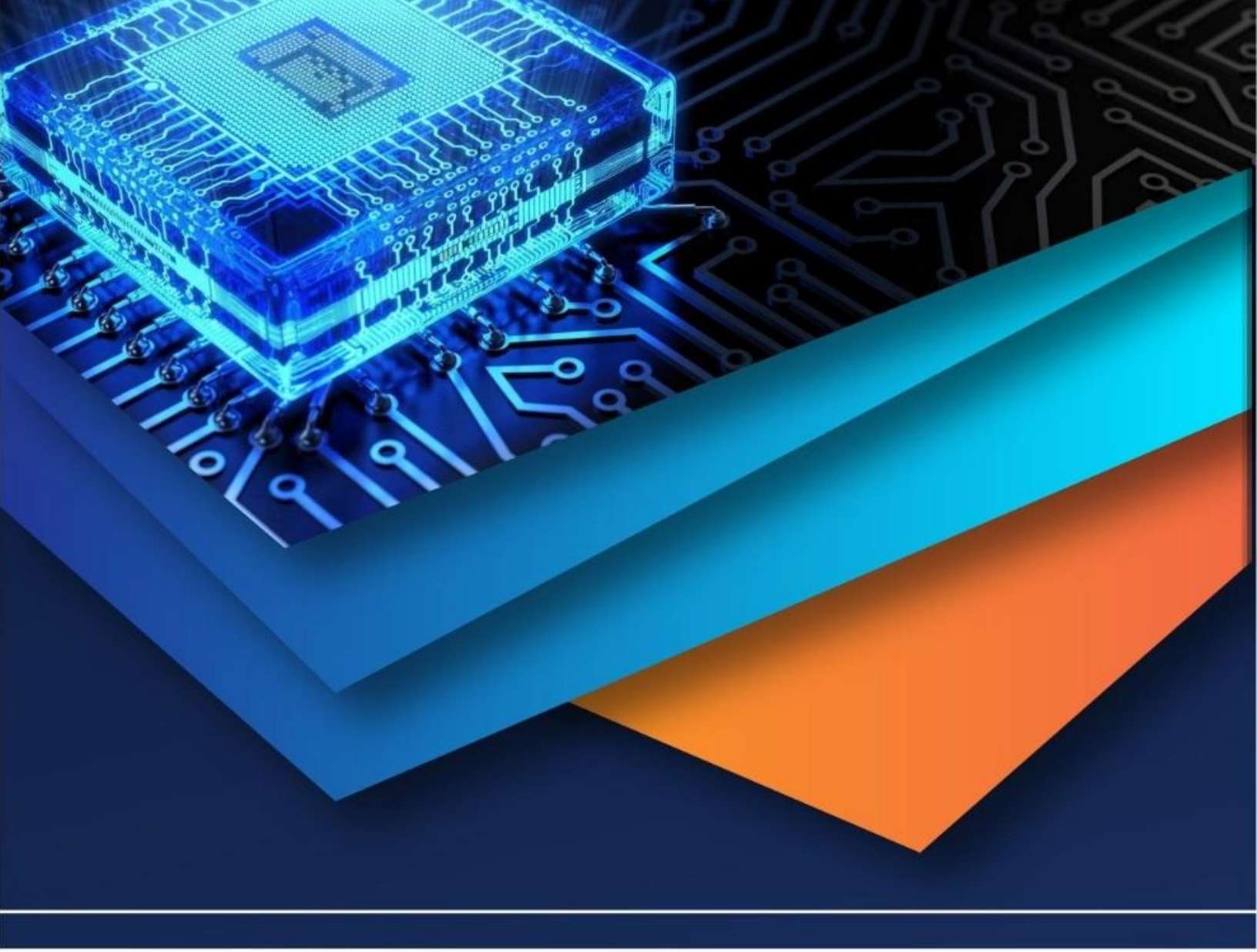
When considering a region with excessive waste disposals, one can make use of a load cell by providing a threshold value to detect the full condition of the garbage bin and also provides more accurate results. The scope for the future work in this system can be implemented with time stamp in which real time clock shown to the concern person at what time dust bin full and at what time the waste is collected from the smart dustbin. We can generate electricity with the help of solar panel in this garbage monitoring system. By adding cameras to this system we can monitor the surrounding of system more effectively.

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