

Smart Bin Tracker

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Abstract : With the ever-growing population and the infrastructure advancement taking place in the developing countries, waste management is an eminent problem for both urban and rural governing bodies. The workforce is very limited and efficient utilization of the available resources, both human and machinery is very difficult. A major part of the waste management in urban and rural areas is the disposal of daily waste generated for homes and other small entities. The human resource has to work at odd hours and even that is not adequate enough as garbage can be seen lying around, unattended to, and in urgent requirement of removal due to its hazardous nature.

The Bin Tracker is a Smart Garbage Monitoring System which will be a prototype of an important example of a smart waste management system. It'll be based on a NodeMCU. The HC-SR04 ultrasonic sensor will be used to detect whether the Trash Can is filled with garbage or not. The sensor will detect the distance of the garbage from the top of the Trash Can and will respond in accordance with a set threshold value. The NodeMCU is used to connect the whole system with a Blynk app server. The prototype will send a message to the person in control through a medium and will inform him/her of the need to clear up the Trash Can. The real-time nature of the whole process is its USP.

Index Terms: Node MCU, Bin Tracker, HC-SR04 Ultrasonic sensor

I. INTRODUCTION

The Bin Tracker is a Smart Garbage Monitoring System which will be a prototype of an important example of a smart waste management system [1] [2]. It'll be based on a NodeMCU microcontroller [3]. The HC-SR04 ultrasonic sensor will be used to detect whether the trash can is filled with garbage or not. The sensor will detect the distance of the garbage from the top of the trash can and will respond in accordance with a set threshold value. The NodeMCU will be used to connect the whole system with Blynk app server. The prototype is expected to send a message to the person in control through a medium and will inform him/her of the need to clear up the trash can. The real-time nature of the whole process is its USP.

II. HARDWARE COMPONENTS

The hardware components used in making the bin tracker are listed as follows:

1. Node MCU

2. HC-SR04 ultrasonic sensor

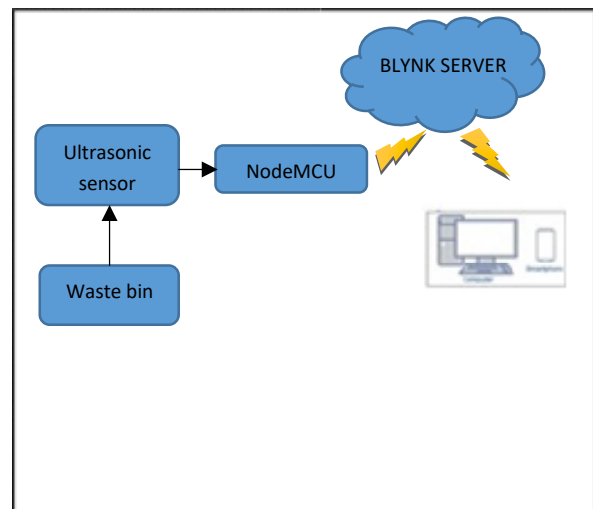


Fig. 1 Block diagram of Bin Tracker

III. METHODOLOGY

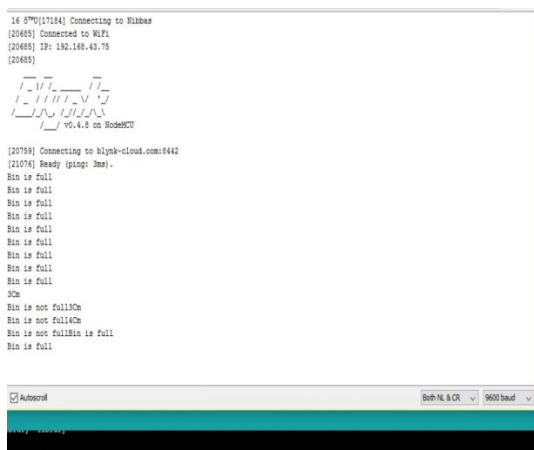
The methodology followed while designing and implementing The Bin Tracker is as follows:

Before implementing the circuit physically, circuit simulation software like Proteus or Fritzing is used to check whether the circuit which has to be designed is working correctly or not. The basic idea to detect whether the trash can is filled with garbage or not is by means of using an Ultrasonic sensor. The Ultrasonic Sensor installed at the top of trash can measures the distance of garbage from the top and a threshold value according to the size of Trash Can will be put in the code. If the distance is more than this threshold value, means that the trash can is full of garbage and a message "Basket is Full" is displayed on the serial monitor of Arduino IDE and if the distance is less than this threshold value, then a message "Basket is Empty" is printed. BLYNK[5] APP is used to interface with NodeMCU to collect and monitor live data from the

sensors The NodeMCU is used for connecting the Ultrasonic sensor to the Internet and to send and receive data. The data is sent to the App in JSON (JavaScript Object Notation)format. The circuit is implemented on a breadboard. Arduino IDE is used for writing, compiling and uploading the code to the NodeMCU. A small dustbin is used and paper bags, cloth bags act as garbage to help with the testing and demonstration process. The prototype sends a responsive message when the expected limit of trash in the can is reached so that the person monitoring the whole system is updated in real-time. The components used need to work in synchronization with each other and the ultra-sonic sensor is expected to send the signal according to the set delay and the NodeMCU is expected to update the server with the latest relevant information. The outcomes outlaid were successfully achieved by the designed prototype.

IV. RESULTS AND DISCUSSION

The prototype sends a responsive message when the expected limit of Trash in the Can is reached so that the person monitoring the whole system is updated in real-time. The components used need to work in synchronization with each other and the ultra-sonic sensor is expected to send the signal according to the set delay and the Wi-Fi module is expected to update the server with the latest relevant information. The outcomes outlaid were successfully achieved by the designed prototype.



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16:07:01[17184] Connecting to Kibbae
[20485] Connected to WiFi
[20485] IP: 192.168.43.75
[20485]
[20759] Connecting to blynk-cloud.com:8442
[21076] Ready (ping: 0ms).
Bin is full
Bin is full
Bin is full
Bin is full
Bin is full
Bin is full
Bin is full
Bin is full
Bin is full
Bin is full
Bin is not full0cm
Bin is not full14cm
Bin is not fullBin is full
Bin is full
  
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Fig. 2 Results generated on Arduino IDE



Fig. 3 Message generated on BLYNK app

V. CONCLUSION

In this paper IoT applications are used to design a real-time Smart Bin [6] for solid waste management. The design is based on a NodeMCU microcontroller and the tracking for filling of bin is done with the help of ultrasonic sensor. NodeMCU is used to connect the whole system to the BLYNK App. The prototype shall send a message to the person to inform him/her of the need to clear up the trash can. The Smart Bin shall bring efficiency in solid waste management system and contribute to the health and hygiene of users. These smart bins can be used by households as well as municipal bodies. The flow of information shall help municipal bodies to use their resources properly and efficiently. Its use can reduce the expenditure of these bodies on solid waste management and save a lot of -taxpayer's money.

VI. FUTURE SCOPE

The prototype can be used with a GPS system[4] which allow us to determine the position of the dustbin which is required to be emptied. On a large scale it can be used as a waste management system to eradicate a lot of latency in day to day working of waste disposal departments of various municipalities in India. It can be connected to an image-recording device that can allow to us to have a look at the surroundings to acknowledge any kind of dirtiness or if any particular trash can is of inadequate size for the area it is placed in. Other than the specific applications, the concept of the Bin Tracker can be used in other areas such as Water-level monitoring, Smart Parking System using IoT, Fuel-level monitoring at Filling Stations etc.

REFERENCES

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