RESEARCH ARTICLE

SMART GARBAGE MONITORING SYSTEM

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ARTICLE INFO	ABSTRACT
	Garbage bins are found at all the places in a particular collage, school, hospital, bank, shopping malls etc. Every time it is not possible to check whether the bin is full or empty, so in this paper we come up with a solution to monitor the status of every bin inside the campus area of any school, collage or any other place. Here we actually use arduino board connected to an ultrasonic sensor and a Wi-Fi module and this entire system is connected to every single bin inside the campus area. The ultrasonic sensor is directed towards the face of the bin and whenever the bin is less than 5 cm empty the status of the bin will be shown as full, otherwise it will be shown as empty. We actually aim to implement the system inside the campus of the VIT University. There will be a webpage displaying the status of the bin. There will be a centralized server which will access the status of the bins at regular intervals and inform the sweepers accordingly. The WiFi module will actually send the data to the nearest router and it is expected to route through the routers and send the correct data to the server every time. This is an IOT-Based Garbage system, and as a part of future work we hope to implement the payment module in this system, where the users using the bin have to pay online maybe weekly or monthly.

INTRODUCTION

In spite of the fact that the world is in a phase of up degree, there is yet another issue that must be managed. Trash! Pictures of waste canisters being overfull and the junk being spilled out from the receptacles can be seen all around. This prompts different infections as vast number of creepy crawlies and mosquitoes breed on it. A major test in the urban communities is strong waste administration. Consequently, savvy dustbin is a framework which can kill this issue or if nothing else diminish it to the base level. Lion's share of infections and bacterial contaminations create in dirtied condition. Defending the earth utilizing innovation sources is required at introduce. Greater part of the general population condition is by all accounts dirtied with the waste material. In this way, modernization of the eateries is required by bestowing the keen innovation.Food waste in landfills rot, attract pests and pollute our air and groundwater. By upgrading your kitchen dustbin to Smartbin Air you keep 1500 kgs of food waste away from landfills in a 10 years!. As per the UN, amongst now and 2025, the total populace will increment by 20% to achieve 8 billion tenants (from 6.5 today).With this expansion in population, the obligations towards squander administration additionally increments. Our waste organization structures and our financial circumstances, notwithstanding getting it done, are unequipped for dealing with the creating measures of waste all around. So unless another worldview of worldwide participation and administration is embraced, a

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tsunami of uncontrolled dumpsites will be the main waste administration technique, particularly in Asia. On the west bank of America, San Francisco drives the path with a landfill transfer redirection rate of 72% and the city has set itself an objective of zero waste to landfill by 2020. This paper gives us a standout amongst the most proficient approaches to keep our condition spotless and green.

Related Work

Parkash, Prabu V (February 2016) built up a garbage monitoring system for cost lessening, asset streamlining, viable utilization of keen dustbins. Continuous waste administration system was actualized to check the fill level of keen dustbins whether the dustbin are full or not. In the framework the data of every shrewd dustbin can be gotten to from anyplace and whenever by the concerned individual and he or she can take a choice likewise. This system is by implication decreasing movement in the city. City solid waste administration is one of the major natural issues of Indian urban areas. The current administration arrangement of municipal solid waste (MSW) are in charge of risks to occupants. Different examinations uncover that around 90% of MSW is discarded informally in open dumps and landfills, which are viably making issues to general wellbeing and the earth. In the study by Kanchan Mahajan, Prof.J.S.Chitode in July 2014, an earnest endeavor was made to give an exhaustive and true audit of the era, qualities, gathering and transportation. The venture on solid waste checking and administration system has been effectively executed with the combination of correspondence advances, for example, Zigbee, GSM and for truck observing system.

Monika *et al.* proposed in 2016 that Various highlights, for example, sturdiness, moderateness, avoidance against harm and upkeep issues are tended to when these brilliant dustbins are composed. This Smart Dustbin can contribute a considerable measure towards spotless and sterile condition in building a savvy city. Yet, since the innovation is new in India, appropriate mindfulness ought to be made among general society before it is actualized on a substantial scale. Something else, delicate gadgets like sensors may be harmed because of unpleasant activity of the clients. Insung Hong *et al.* in April 2014 proposed an IoT-based SGS for replacing existing RFID-based garbage collection systems. To provide differentiation from passive collection bins and other types of RFID-based food garbage collection systems, they proposed components required in external and public environments and designed the SGS based on these components. The system structure of a SGB is of centralized type in which information gathered in each bin is transferred to the server; they also designed a HSGB for improving the battery efficiency of each SGB.

Benish Shaikh *et al.* (2017) developed a system that monitors the lends of the waste inside the bin so the human effort is reduced. Automatically the level of filling is displayed so it is not necessary to check it manually. Also the wastage of the electricity during the day time is stopped and the air pollution taking place due to burning of waste also be reduced to some extent because of the temperature sensor. The reason is this system is very cheap and easy to maintain that's why it is affordable. Nimmi Pandey *et al.* (2015) built up a framework with the assistance of which one will have the capacity to keep a track on all the taxpayer driven organization vehicles to guarantee that they complete their administrations loyally. These will help in legitimate working of the administration segments of the legislature that will contribute for a sound situation to the residents of the country.

Ann Thomas *et al.* (2016) built up a programmed dustbin monitoring system keeping in mind the end goal to distinguish the full state of the rubbish receptacles. The actualized framework gives the clients convenient updates of the status of the receptacles and in this way it dispenses with the need of intermittent manual checks and flooding rubbish containers. Their task likewise gives an extra component to include new message beneficiaries or even adjust the current approved clients. It additionally goes for arrangement of various waste and in this manner advancing waste administration.

Navghane *et al.* (2016) executed a smart garbage monitoring system utilizing IR sensor, microcontroller and Wi-Fi module. This framework guarantees the cleaning of dustbins soon when the refuse level achieves its most extreme. In the event that the dustbin is not cleaned in a given time, at that point the record is sent to the higher expert who can make fitting move against the concerned temporary worker. This framework likewise screens the phony reports and consequently can decrease the defilement in the general administration framework.

Sandeep Chaware *et al.* (2017) built up an incorporated arrangement of Wi-Fi modem, IoT, GSM, Ultrasonic Sensor. It was presented for proficient and monetary trash accumulation. The developed framework gives enhanced database to rubbish gathering time and waste sum at every area. Tapase *et al.* (2016) implemented a system by which one can have the capacity to screen the level of waste in the tidy containers set at open spots, as indicated by that one can gather junk of specific which will maintain a strategic distance from flood conditions and decreases contamination and diverse perils of wellbeing. The executed framework will diminish the wastage of fuel by lessening the quantity of outings made by the rubbish accumulation vehicle.

Sumithra *et al.* (2016) suggested that Averting ecological contamination is one of the monotonous assignments since the people are in charge of this risky nature which postures danger to entire world. Furthermore, we, the general population, are mindful to annihilate contamination issues. For all intents and purposes all outflows fluctuate now and again. They proposed a fantastic idea that demonstrated another measurement. In spite of the fact that the general and particular goal is fundamentally the same as different ventures in this field, the innovative arrangements utilized were altogether different.

Andre Castro *et al.* (2017) wrote a paper which was introduced as mart monitoring system for open junk jars. The client focused outline approach was utilized to comprehend the necessities of the clients, determine the prerequisites and build up the framework. Ceaseless association of the partners amid configuration stage guaranteed the arrangement between plan goals and the aftereffects of the pilot examine. The framework was assessed by joining quantitative information, that is gathered from the remote sensor arrange and the subjective information that depends on perceptions and meetings.

Vikrant Bhor *et al.* 2015 Amol Deshpande created a paper demonstrates the usage of smart garbage monitoring system utilizing IR sensor, microcontroller and GSM module. This framework guarantees the cleaning of dustbins soon when the junk level achieves its most extreme. On the off chance that the dustbin is not cleaned in particular time, at that point the record is sent to the higher expert who can make fitting move against the concerned temporary worker. Palaghat Yaswanth Sai (February 2017) executed continuous smart monitoring system by utilizing shrewd dustbins to check the fill level of brilliant dustbins whether the dustbin are full or not. In this framework the data of every single shrewd dustbin can be gotten to from anyplace and whenever by the worry individual and he/she can take a choice as needs be. The waterproof sensors utilized are particularly cutting-edge and helpful in identifying the level at exceptionally precise measure.

Problem definition

The increasing number of population results in greater waste generated, which in turn results greater number of bins in a particular place to keep the place clean and healthy. Hence it becomes all the more difficult to monitor every time whether all the bins are full or empty and if it is full the waste must be released form the bin to some sanitary landfill. So this paper comes up with an efficient solution to smartly monitor the status of all the bins, how many it may be with help of Wi-Fi connection throughout the campus. In the further scope of the project we tend to add the payment module of the users to pay online as many times as they use the smart bin. This will reduce the workload of the people working under government officials who have the duty to collect the money from the daily customers dumping their wastes in the bins.

Proposed Work

In this project we actually make use of 3 components arduino UNO, Ultrasonic sensor, and Wi-Fi ESP module. There will a centralized web server which will display the status of every bin in the campus whether it is full or empty. We make the connection of the arduino board to the ultrasonic sensor and Wifi modem and the laptop as shown below:
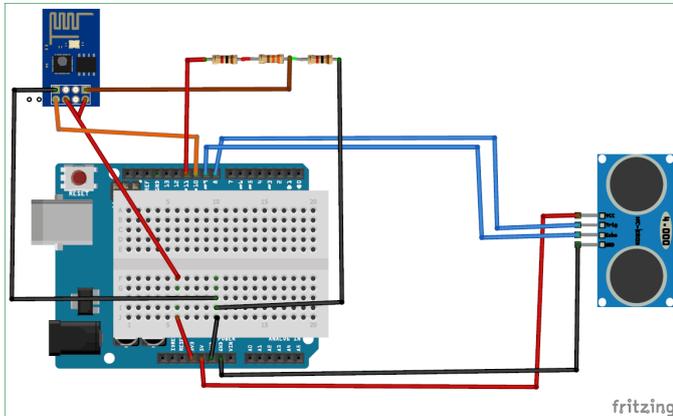
Components required

The components required for the project are as follows:

- Arduino Uno
- ESP8266 Wi-Fi module
- HC-SR04 Ultrasonic Sensor
- 1k Resistors
- Breadboard
- Connecting Wires (M2F & F2F)
- Computer with Arduino IDE

Ultrasonic sensor

- High accuracy and stable readings
- measurable distance 2cm to 400cm
- emits ultrasound at 40KHz (inaudible)
- 4 Pins
  - VCC : To supply necessary voltage
  - GND : To ground the device
  - TRIG : signal from emitter
  - ECHO: signal from receiver.
- The time difference between TRIG and ECHO signals let Arduino compute the distance as it is aware of sound's speed.

ESP8266 Wi-Fi Module

- Wi-Fi module which gives Arduino access to wifi or Internet.
- It runs on 3.3V
- 5V coming from Arduino can damage
- Total 8 pins, but only 4 pins are of our interest.
  - VCC
  - CH-PD
  - TX
  - RX
- TX and RX responsible for communication of module with Arduino.

Block Diagram
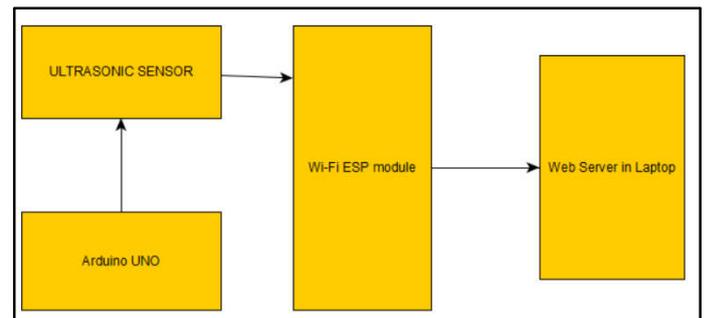
Implementation

We have used 4 wires to connect the ultrasonic sensor to the arduino board correctly. There are 4 pins of the arduino board trigger, echo, Vcc and GND. The trigger and echo pins are connected to 12th and 13th analog pin of the board respectively. The Vcc pin is connected to the pin of 5 volts and GND pin is connected to the GND pin of the board respectively. Next we see WiFi module which is connected to the 3.5 volts in the arduino board. We can see the blue led blinking in the module which tells us that the Wifi connection is able to send to the data to the required server ip address of 192.40.60.82 and is being able to show the status of the data whether it is full or empty. Finally we try to create an attractive front end design for the purpose of VIT university where the administrator will be able to monitor the status of all the bins inside the campus ans report ot the persons concerned immediately.
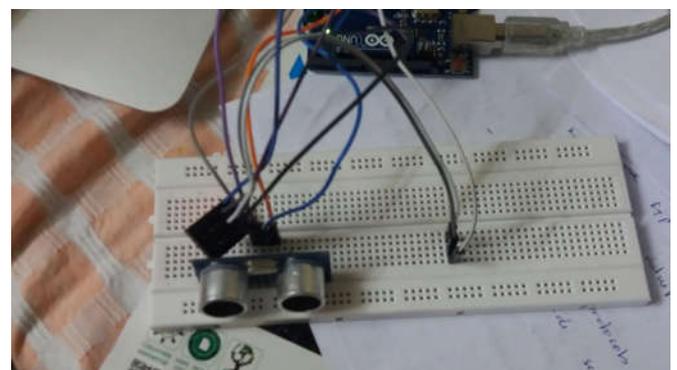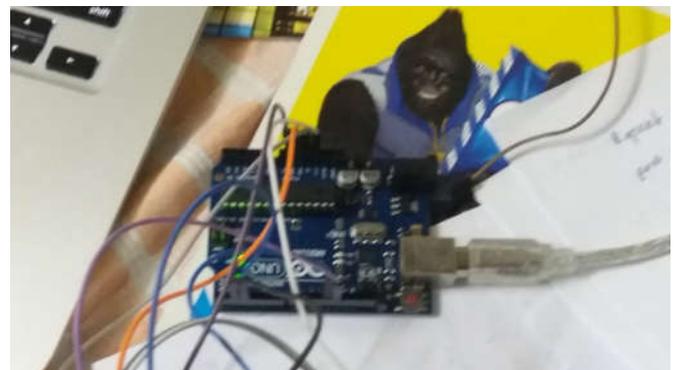

RESULTS AND DISCUSSION

These 3 pictures show the displays or the front end of the system when implemented. For the garbage being less than 5cm empty the status of the bin will show full else it will show empty. The centralized server will see the whole website which

displays the status of each bin the university. The Wifi ESP modules attached to the UV sensor shows the display of the products. The status of the bin is either shown as full or empty, however it cannot predict the percentage of how much full the garbage bin is, it just shows the extreme conditions either full or empty. Some limitations of this monitoring system are as follows;

- It stops working entirely if the Wifi module gets damaged.
- Sometime it becomes difficult to load the data on the server due to some connection problem.
- There must be fast and efficient Wifi connection enough for the administrator to check the status of the bins every time.
- The administrator cannot check the status of the bins if he is outside the campus, as the data is not uploaded in cloud, although we are trying our best to upload it.

This webpage shows how to check the bins of the men's hostel block; it is assumed there are only 4 bins in each floor of every block in average, and not more than that. It is same for the next picture which shows the status of the bins for respective floors and blocks of the women's hostel. The third page shows the status of the bins of other buildings like TT, SMV, MB, GDN, CDMM etc. Throughout the cases we have assumed there are only 4 bins in each floor of the buildings. The front end will be changed according to the number of bins added or deleted from the floors. The last picture shows the result the line that will be displayed when you click the above links of the status of bins, depending on whether the bin is less than 5cm full or more than 5 cm full.

IOT Garbage Monitoring System

Basket is Empty
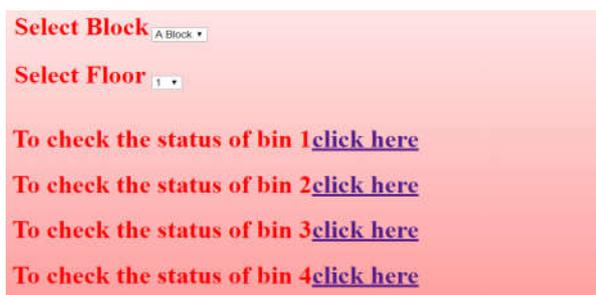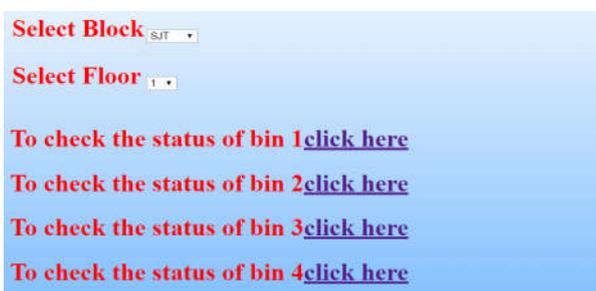
Conclusion

Different highlights, for example, solidness, moderateness, counteractive action against harm and upkeep issues are tended to when these shrewd dustbins are planned. This Smart Dustbin can contribute a considerable measure towards perfect and sterile condition in building a brilliant city. However, since the innovation is new in India, appropriate mindfulness ought to be made among the general population before it is actualized on a vast scale. Something else, delicate gadgets like sensors may be harmed because of harsh activity of the clients. As a scope of the future work we tend to implement the payment module in the entire monitoring system. We hope to develop an android application where the people will be able to access from their mobiles, two things mainly, the location of the nearest bin, and also whether it is full or empty. We also hope to put the entire thing in cloud, so that people from anywhere can check the status of the bins, and the limitation of constrained area is removed.

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