

# Smart Garbage Monitoring System

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**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.

**Keywords :** *Arduino UNO, Ultrasonic Sensor, Wifi ESP module, Garbage*

## INTRODUCTION

Despite the fact that the world is in a phase of up gradation, there is yet another issue that must be managed. Garbage! Pictures of garbage bins being overfull and the refuse being spilled out from the containers can be seen all around. This prompts different ailments as extensive number of insects and mosquitoes breed on it. A major test in the urban areas is strong waste administration. Thus, smart dustbin is a framework which can annihilate this issue or if nothing else diminish it to the base level. Greater part of viruses and bacterial contaminations create in dirtied condition. Defending the Environment utilizing Technology sources is required at present. Dominant part of general society environment is by all accounts contaminated with the waste material. In this way, modernization of the restaurants is required by giving the smart technology food waste in landfills rot, attract pests and dirty our air and groundwater. By updating your kitchen dustbin to smart bin Air you keep 1500 kgs of nourishment waste far 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 populace, the duties

towards waste administration additionally increments. Our waste organization systems and our financial circumstances, notwithstanding doing what needs to be done, are unequipped for dealing with the creating measures of waste generally. So unless another worldview of worldwide collaboration and administration is embraced, a tsunami of uncontrolled dumpsites will be the vital 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 perfect and green.

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 from 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.

## RELATED WORK

Parkash and Prabu V (February 2016) developed a garbage monitoring system for cost reduction, resource optimization, effective usage of smart dustbins. Real time waste management system was implemented to check the fill level of smart dustbins whether the dustbin are full or not. In the system the information of all smart dustbins can be accessed from anywhere and anytime by the concerned person and he or she can take a decision accordingly. This system is indirectly reducing traffic in the city. Municipal solid waste management is one of the major environmental problems of Indian cities. The existing management system of municipal solid waste (MSW) are responsible for hazards to inhabitants. Various studies reveal that about 90% of MSW is disposed of unscientifically in open dumps and landfills, which are effectively creating problems to public health and the environment. In the study by Kanchan Mahajan and

Prof.J.S.Chitode in July 2014, a sincere attempt was made to provide a comprehensive and sincere review of the generation, characteristics, , collection and transportation. The project on solid waste monitoring and management system has been successfully implemented with the integration of communication technologies such as Zigbee, GSM and for truck monitoring system.

Monika K A e.t al(2016) that Various features such as durability, affordability, prevention against damage and maintenance issues are addressed when these smart dustbins are designed. This Smart Dustbin can contribute a lot towards clean and hygienic environment in building a smart city. But since the technology is new in India, proper awareness should be created among the public before it is implemented on a large scale. Otherwise, sensitive devices like sensors might be damaged due to rough action of the users.

Insung Hong e.t al(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 I. Shaikh e.t 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 e.t al(2015) developed a system with the help of which one will be able to keep a track on almost all the government service vehicles to ensure that they carry out their services faithfully. These will help in proper functioning of the service sectors of the government that will contribute for a healthy environment to the citizens of the nation.

Ann M Thomas e.t al(2016) developed an automatic dust bin monitoring system in order to detect the full condition of the garbage bins. The implemented system provides the users timely updates of the status of the bins and thus it eliminates the need of periodic manual checks and overflowing garbage bins. Their project also provides an additional feature to add new message receivers or even alter the existing authorized users. It also aims at classification of different waste and thus promoting waste management.

S.S.Navghane1 e.t al(2016) implemented a smart garbage management system using IR sensor, microcontroller and Wi-Fi module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in a given time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor. This system also helps to

monitor the fake reports and hence can reduce the corruption in the overall management system.

Dr. Sandeep M. Chaware e.t al(2017) developed an integrated system of Wi-Fi modem, IoT, GSM, Ultrasonic Sensor. It was introduced for efficient and economic garbage collection. The developed system provides improved database for garbage collection time and waste amount at each location.

R.B.Tapase1 e.t al(2016) implemented a project by which one can be able to monitor the level of garbage in the dust bins placed at public places, according to that one can collect garbage of particular which will avoid overflow conditions and helps to reduce pollution as well as different hazards of health. The implemented system will reduce the wastage of fuel by reducing the number of trips made by the garbage collection vehicle.

Dr. A. Sumithra e.t al(2016) suggested that reducing environmental pollution is one of the dull assignments since the people are in charge of this risky nature which postures danger to entire world. Furthermore, we, the general population, are capable to annihilate contamination issues. For all intents and purposes all emanations differ every now and then. They proposed a great idea that demonstrated another measurement. In spite of the fact that the general and particular target is fundamentally the same as different activities in this field, the innovative arrangements utilized were altogether different.

Andre Castro e.t al(2017) authored a paper which was presented as mart monitoring system for public trash cans. The user-centered design approach was used to understand the needs of the users, derive the requirements and develop the system. Continuous involvement of the stakeholders during design phase assured the alignment between design objectives and the results of the pilot study. The system was evaluated by combining quantitative data, that is collected from the wireless sensor network and the qualitative data that is based on observations and interviews.

Vikrant Bor1 created a paper demonstrates the execution of smart garbage ,management system utilizing IR sensor, microcontroller and GSM module. This framework guarantees the cleaning of dustbins soon when the waste level achieves its most extreme. In the event that the dustbin is not cleaned in particular time, then the record is sent to the higher expert who can make proper move against the concerned contractor.

Palaghat Yaswanth Sai (2017) executed real time waste management framework by utilizing smart dustbins to check the fill level of Smart Dustbins whether the dustbin are full or not. In this framework the data of every single keen dustbin can be gotten to from anyplace and at whatever time by the worry individual and he/she can take a choice as needs be. The waterproof sensors utilized are particularly best in class and valuable in identifying the level at extremely precise measure.

### 3. 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:

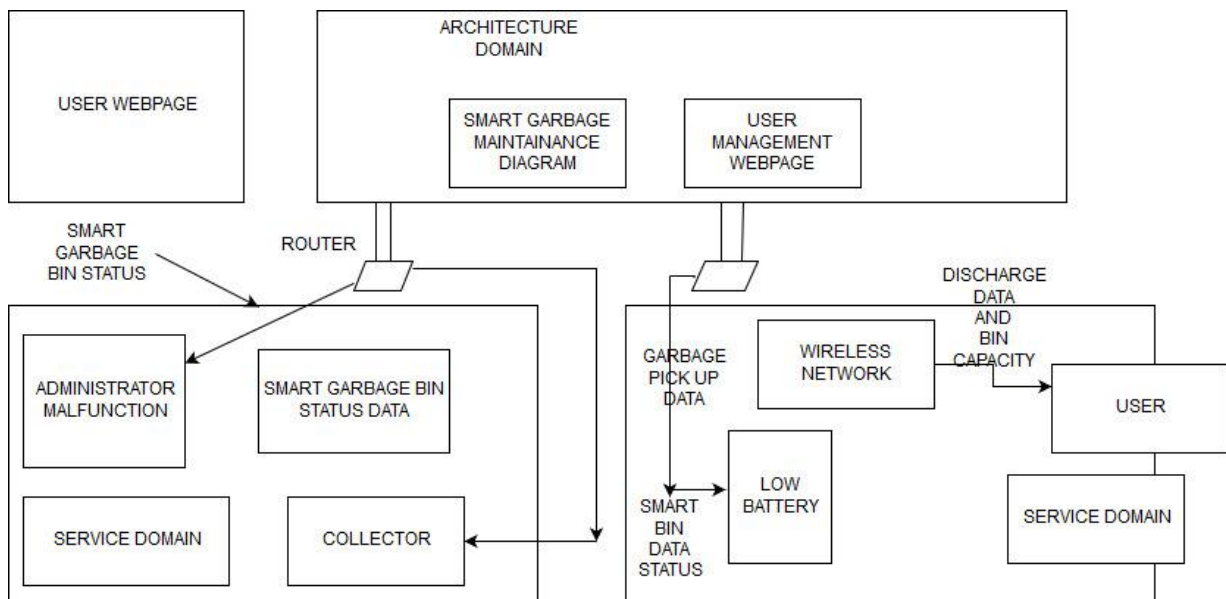
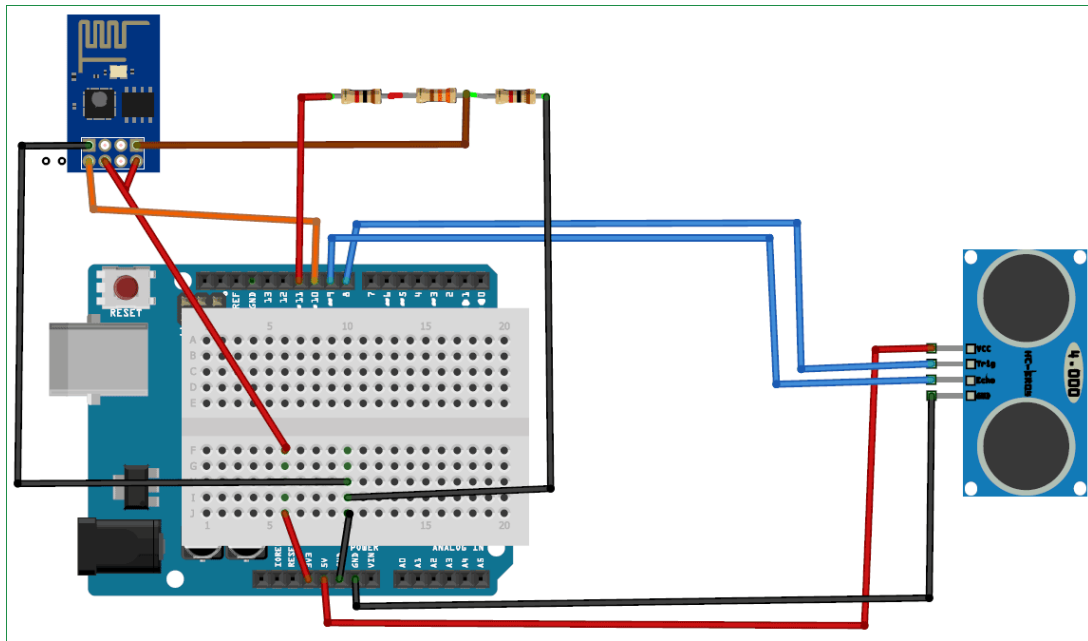
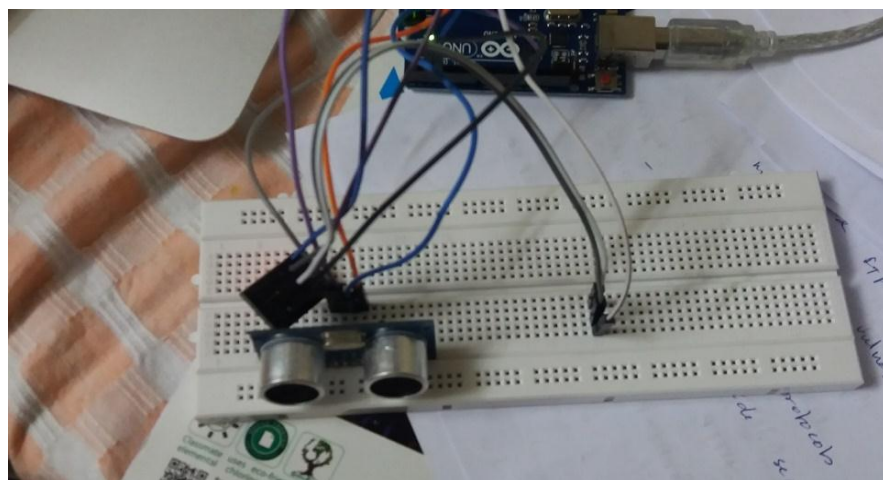
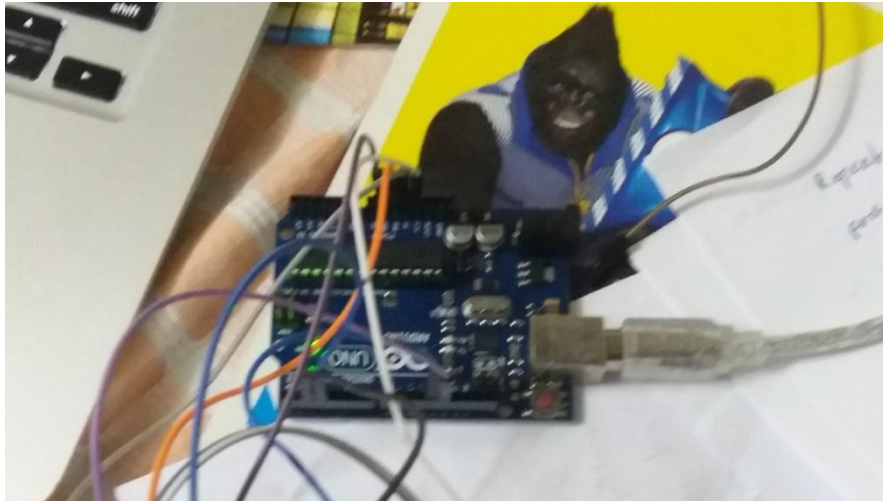


Fig: System Architecture

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 12<sup>th</sup> and 13<sup>th</sup> 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 and report of the persons concerned immediately.

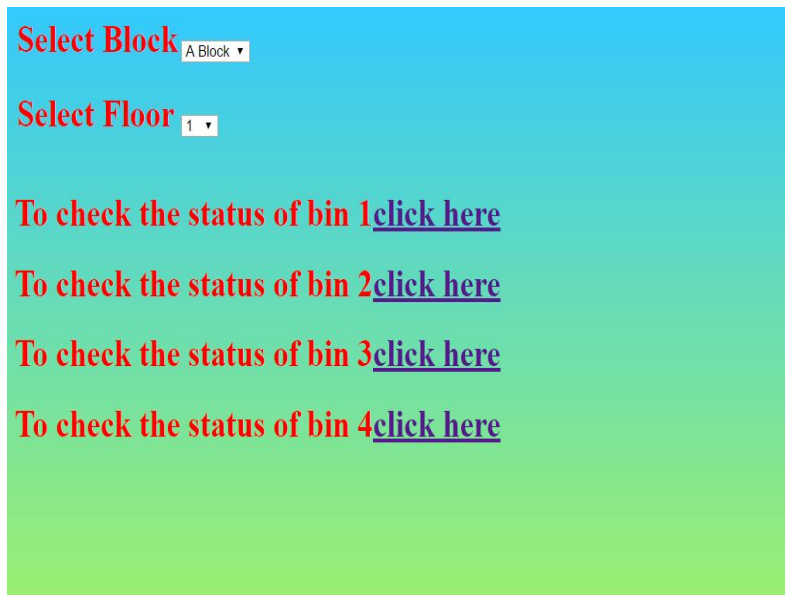


#### 4. RESULTS AND DISCUSSIONS

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.

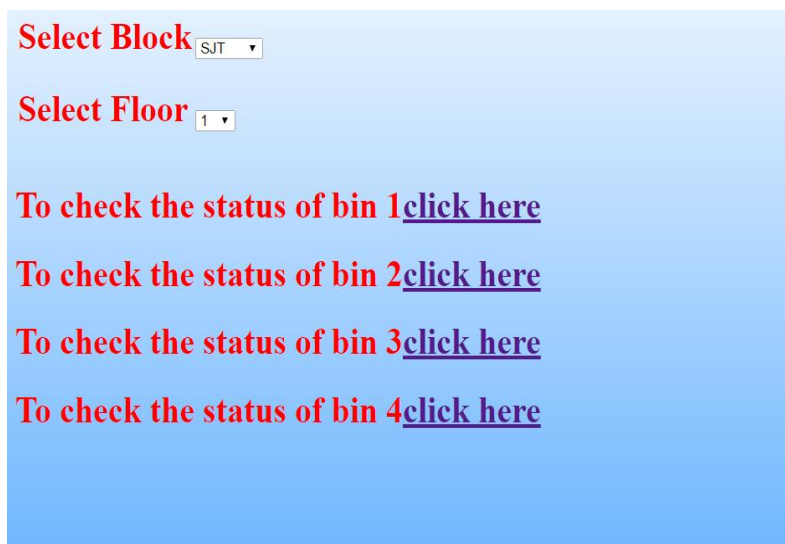


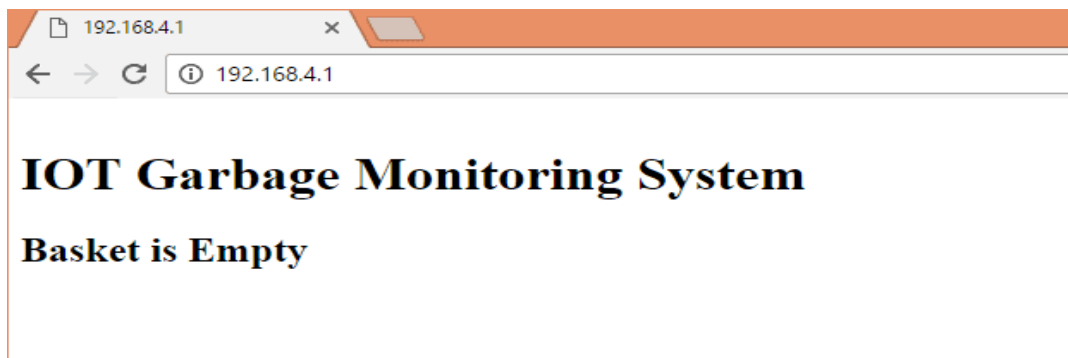


This webpage shows how to check the bins of the men's hostel block; it is assumed there are only 4 bins in each floor of every block in average, and not more than that. It is same for the next picture which shows the status of the bins for respective floors and blocks of the women's hostel. The third 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.





## 5. CONCLUSION AND FUTURE WORK

Different features, for example, durability, affordability, prevention against harm and support issues are tended to when these smart dustbins are manufactured. This smart dustbin can contribute a great deal towards spotless and clean condition in building a smart city. In any case, since the innovation is new in India, appropriate awareness ought to be made among general society before it is executed on a substantial scale. Something else, sensitive devices like sensors may be harmed because of activities of the dustbin users.

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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