

A Working Model of IOT Based Smart Dustbin

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Abstract - As cleanliness is very important with the increase in population monitoring and disposal of the waste becomes an essential need. In the present era, to protect the environment is our first priority. Nowadays due to global warming, there are abrupt changes in the atmosphere. There is a sudden increase in temperature which extremely affects the animals & their habitat. In this paper, the smart bin is built on a microcontroller-based platform Arduino Uno board which is interfaced with GSM modem and Ultrasonic sensor. One ultrasonic sensor is used for the position sensing of the human for opening the lid of the dustbin and another ultrasonic sensor is used to sense the height of the garbage in the dustbin and compare it with the garbage bin depth. The system makes use of Arduino, GSM module for sending a message, servomotor to open the lid, buzzer, LED as an indicator and Solar panel of the streetlight. The system is powered by a 12V battery which gets charged by a solar panel. When the level of garbage crosses the set limit, the system puts on the buzzer. Once the garbage reaches the threshold level ultrasonic sensor will trigger the GSM modem which will continuously alert the cleaning staff and supervisor until the garbage in the dustbin is squashed. This system uses the solar panel of the streetlight as the power source which is the advantage of this project. A 12 V battery is also used in this system for the power supply which gets charged via a solar panel. In bad weather condition, the battery is used as a power backup. In our country disposing the garbage is a serious issue. Even educated people tend to throw the garbage outside the garbage tanks, this is due the presence of insufficient garbage tanks near the roadsides. In the cities most of the road ends having garbage tanks, and most of the people use the garbage tanks in the rightful manner. But now the problem is when the garbage tanks overflow it smells a lot during rainy season. This issue leads to very speedy spread of diseases to the nearby places. In order to avoid this problem, the waste garbage will be sent for burning. But burning the garbage in incinerators releases highly dangerous gases, ash and dust which contributes to global warming, and it pollutes natural bodies. In India, the average resident produces seven and a half pounds of garbage every day. In recent times people face critical trouble in saving the weakening environment, especially

in rural areas, where solid wastes are dumped which overflows on streets. It is observed that cities have no proper controlled structure for garbage disposal. Each year, millions of dollars are spent on picking up the litter. As new technology developed and with modern equipment's, the level of waste produced increases every day. The proportion of chemicals in the waste is increasing with the hectic pace of the modern development. With the use of plastic, a problem has arisen, the plastic never degrades. In order to overcome this issue, we are proposing the IoT based smart garbage system powered with solar cell which is developed for both rural and urban areas to solve the garbage disposal related problems.

1. INTRODUCTION

In the present era, to protect the environment is our first priority. Nowadays due to global warming, there are abrupt changes in the atmosphere. There is a sudden increase in temperature which extremely affects the animals & their habitat. In this paper, the smart bin is built on a microcontroller-based platform Arduino Uno board which is interfaced with GSM modem and Ultrasonic sensor. One ultrasonic sensor is used for the position sensing of the human for opening the lid of the dustbin and another ultrasonic sensor is used to sense the height of the garbage in the dustbin and compare it with the garbage bin depth. The system makes use of Arduino, GSM module for sending a message, servomotor to open the lid, buzzer, LED as an indicator and Solar panel of the streetlight. The system is powered by a 12V battery which gets charged by a solar panel. When the level of garbage crosses the set limit, the system puts on the buzzer. Once the garbage reaches the threshold level ultrasonic sensor will trigger the GSM modem which will continuously alert the cleaning staff and supervisor until the garbage in the dustbin is squashed. This system uses the solar panel of the streetlight as the power source which is the advantage of this

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As population increases, waste management is very essential by the municipalities to keep the city clean and hygienic. With the improvement in technologies, the municipalities have to adapt various methods to manage the solid waste and transform the city into “Smart City”. As waste generation rate is exponentially rising with the increase in population may lead to various diseases. So, waste management plays a significant role. The term normally relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products. Waste management reduces various effects of waste on health, the environment etc. Waste management practices differs from country to country, regions to region and sectors to sectors. In this project efficient garbage management is done using IOT. In the proposed system, the level of the garbage in the dustbins is detected with the help of Ultrasonic Sensor systems and communicate to the authorized control room through IOT. In this project, an Arduino microcontroller is used to interface the sensor system with IOT platform to monitor the desired information related to the garbage for different selected locations. The power to the controller is through battery and it is charged through a solar panel.

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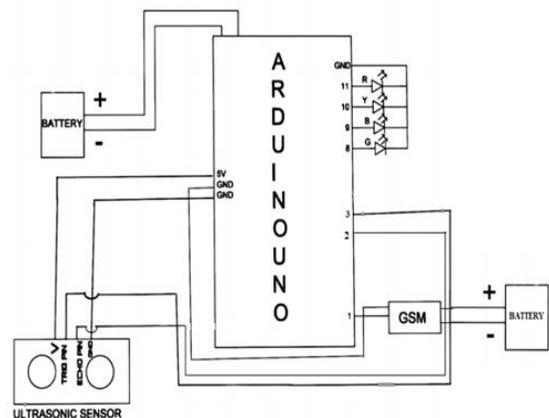
2. RELATED WORKS

In recent years, many issues and research on solid waste have been carried out, by developing a smart dustbin system and conducting socialization to the community. However, these studies must always be improved and carried out so that the waste issue in Indonesia can be reduced and become positive. What is even worse is the issue of plastic waste that continues to increase and flooding as a result of littering into rivers. As for some of these studies such as from studies [1] that developed smart dustbins for the university environment, but this research has not reported about the effects that occur after the implementation of smart dustbins, the improvement found is the need for special care for smart dustbins and recommendations for dustbins placed outside the room.

Furthermore, [2] designed a mobile-based waste handling tool, using a proximity sensor and a weight sensor. In short, when the garbage is full, the system will automatically report the condition to the garbage officer. To be handled and also able to send information on the location of garbage, research has been carried out at several points in Makassar City, but the impact caused by this system has not been reported. Research by [3] which developed a smart dustbin to connect waste information with scavengers and authorities are using the Internet of Things (IoT) to create a clean and tidy city sustainably.

Research by [4] developed a smart dustbin monitoring system using a wireless sensor network that has been tested in the village, but the impact has not been reported. Then from [5] the application of IoT-based smart dustbins that are placed in the corner of the outdoor street, infrared sensors are used to detect objects, make alarms sound and report the condition of the trash when it is full, and report that the smart dustbin is very useful for the environment and for supporting the smart city system in the future. Also, [6] proposes the use of two smart dustbins that are effective for placing in public places in waste management in smart cities with a control system using GSM. Furthermore, [7] explained that in the future there will be a smart city, it must be supported by smart systems, such as smart dustbins. in India, especially for metro stations as tourist arrivals, strived to keep the environment clean, the importance of smart dustbins is recommended in waste management and helping to monitor the cleanliness of a smart city.

3. CIRCUIT DIAGRAM



4. BLOCK DIAGRAM

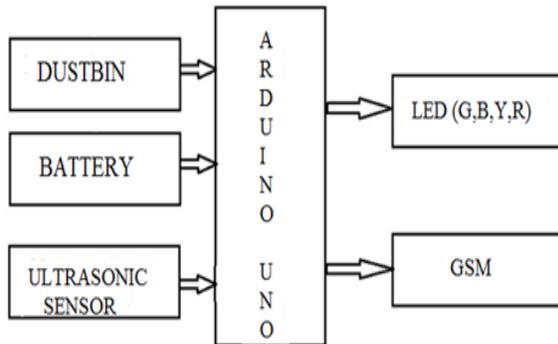


Fig. No .3 Block Diagram of IOT based smart Dustbin

5. CONSTRUCTION

- Above Figure shows the hardware connection setup for IOT base smart Dustbin.
- An Arduino UNO board is connected to HC-SR04 sensor I/O pin.
- Besides, the SIM900A GSM Module is serially connected to the Arduino Uno board.
- The TX port of the GSM Module is connected to the RX port (PIN 2) of the Arduino Uno
- While RX port of the former is tied to the TX port (PIN 3) of the latter. Green, blue, yellow & red LED are also connected to the Arduino Uno.

6. WORKING

- The whole system is powered by two 12V batteries.
- Ultrasonic sensor is used to sense the height of the garbage in the dustbin and compare it with the garbage bin dept.
- Arduino Uno is used to control and operate the system. It is connected to all the components of the system.
- LED is used as an indicator.
- GSM works with a wireless network, it accepts a SIM card, and operates over a subscriptions to a mobile operator, just like a mobile phone .It sends messages and continuously alert cleaning staff and supervisor.

7. HARDWARE IMPLEMENTATION

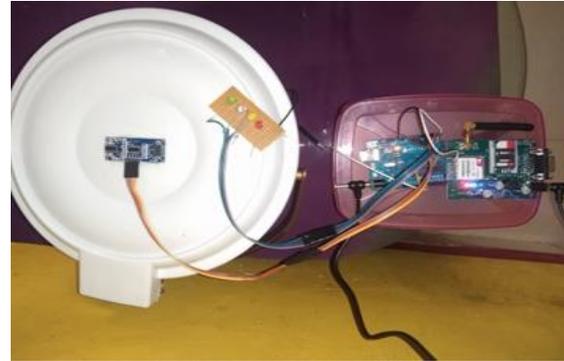


Fig. No .4. Connection Diagram of IOT based smart Dustbin

Above Figure shows the hardware connection setup for IOT base smart Dustbin.

7.1. Condition First: Dustbin is 25% full:



Fig. No .3. Condition First

When dustbin is filled with 25% of garbage, then Green LED blinks.

7.2. Condition Second: Dustbin is 50% full:



Fig. No .4. Condition Second

When dustbin is filled with 50% of garbage , then Blue LED blinks.

7.3. Condition Third: Dustbin is 75% full :

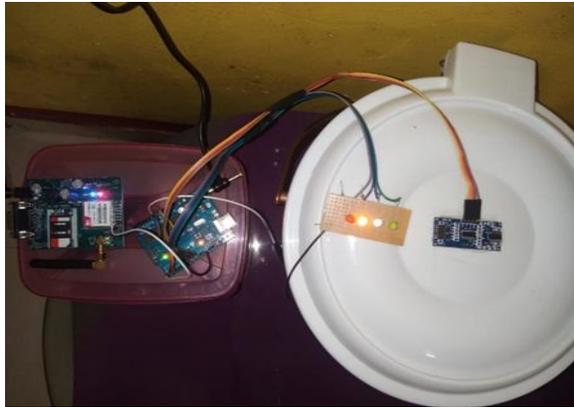


Fig. No .4. Condition Third

When dustbin is filled with 75 % of garbage, then Yellow LED blinks and message is send to cleaning staff.

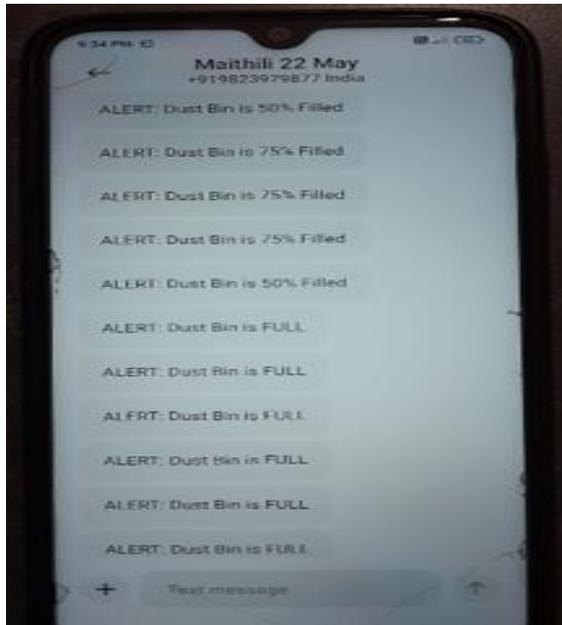


Fig. No .6. Message send

7.4. Condition Forth: Dustbin is 100% full.

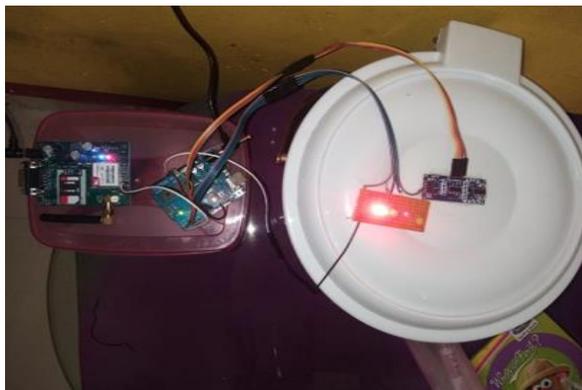


Fig. No .7. Condition forth

When dustbin is filled with 100% of garbage, then Red LED blinks, and message send to cleaning staff.

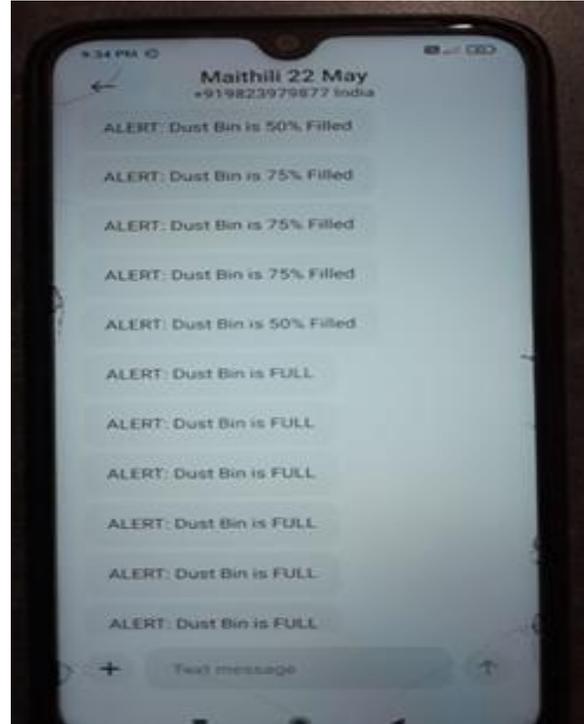


Fig. No .8. Message send Resonant coils through fluctuating magnetic fields.

9. APPLICATIONS

- Empowered Swach Bharat Mission
- Support Digital India.
- Real time-based cleaning our cities.
- It makes our system transparent between Municipal Corporation, Workers and Public.
- Green city
- Objective smart city
- In colleges, Industries.

10. CONCLUSION

This system help the local municipal administration in waste management system. i.e. monitoring of domestic wastage clearance at proper time to avoid damage to the public health. A web server is also get information about the bins in the area. It uses sensor for sensing information of Bins and sending to workstation, which is situated at municipal office for finding shortest path.

This project came in comfortable which a worthy elucidation for maintaining green environment. The proposed system is an attempt to improve current waste collection system in India for the “Clean India Mission”.

11. FUTURE WORK

The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision. We have often seen garbage spilling over from dustbins on to streets and this was an issue that required immediate attention. The proverb “Cleanliness is next to god and clean city is next to heaven” inspired us to conceptualized the project. Smart dustbin helps us to reduce the pollution. Many times, garbage dustbin is overflow and many animals like dog or rat enters inside or near the dustbin. This creates a bad scene. Also, some birds are also trying to take out garbage from dustbin. This project can avoid such situations. And the message can be sent directly to the cleaning vehicle instead of the contractor’s office. Swatch Bharat Abhiyan is a national campaign by the Government of India, covering 4,041 statutory cities and towns, to clean the streets, roads, and infrastructure of the country. In our system, the Smart dustbins are connected to the internet to get the real time information of the smart dustbins. In the recent years, there was a rapid growth in population which leads to more waste disposal. So, a proper waste management system is necessary to avoid spreading some deadly diseases.

- This project is made for demo concern, it can be taken to product level.
- It can be made durable, by making it compact and cost effective.
- Two bins can be placed to collect wet and dry waste separately.
- We waste can be decomposed and used for making biogas.
- We can send message to higher authority.

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