

# Smart Dustbin

Apoorv Surana<sup>1</sup>, Vinit Kumar<sup>2</sup>, Vishal Gupta<sup>3</sup> & Arvind Rehalia<sup>4</sup>

Bharati Vidyapeeth, College of Engineering, New Delhi, India

Email: [apoorv360@gmail.com](mailto:apoorv360@gmail.com)<sup>1</sup>, [pathak.vinit45@gmail.com](mailto:pathak.vinit45@gmail.com)<sup>2</sup>,

[vickygupta@gmail.com](mailto:vickygupta@gmail.com)<sup>3</sup> [rehaliaarvind@gmail.com](mailto:rehaliaarvind@gmail.com)<sup>4</sup>

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**Abstract:** The smart dustbin consists of two compartments which are put together ergonomically. The waste is distinguished automatically by the dustbin based on which type of waste it is. The dustbin distinguishes between biodegradable and non-biodegradable waste based on input from the user. The two compartments are for biodegradable and non-biodegradable waste. A Motorised flap mechanism is used on top of the dustbin to put the waste in different compartments based on the commands given by the user through two buttons installed on top of the dustbin. The compartments are equipped with Ultrasonic sensors to detect the amount of waste present in the dustbin and the data is collected by the microcontroller. If any of the compartments of dustbin reaches full mark, the Motorised flap won't let any more waste to enter the dustbin and user will be warned with a sound from a buzzer. The dustbin also has a display on the dustbin to show the data about the garbage produced in a specified span of time. Dustbin is paired to a system using RF module and automatically inform the authority that the dustbin has reached full and needs to be emptied.

**Keywords:** Smart Dustbin, Ultrasonic Sensors, Non-Biodegradable Waste

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## I. HYPOTHESIS

With the initiatives like 'SWACCH BHARAT ABHIYAN' and 'CLEAN INDIA GREEN INDIA' people are encouraged to adapt new ways of working which produce minimal waste. But waste management is also an important measure towards success of such initiatives. Smart dustbin is one such step [1].

A major problem faced in public dustbins in India is maintenance. Dustbins are piled up to the top and the garbage starts accumulating around it. Also, both biodegradable and non-biodegradable wastes are put in same dustbin making it difficult for waste management authorities to distinguish biodegradable waste for processing [2-3].

In our country, most of the waste is burned whether it is biodegradable or non-biodegradable. People all over the world know how important it is to move on to non-conventional sources of energy like biodegradable waste energy, solar energy, wind energy, tidal energy etc. But biodegradable energy is not being harnessed properly in India due to waste management issues discussed above.

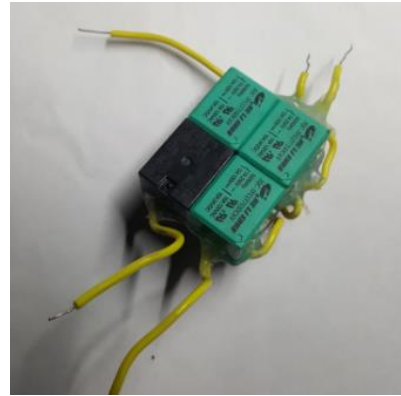
Smart Dustbin does the work of distinguishing waste and monitoring the level of waste at primary level so that authority does not have to do it later [1-3].

## II. METHOD

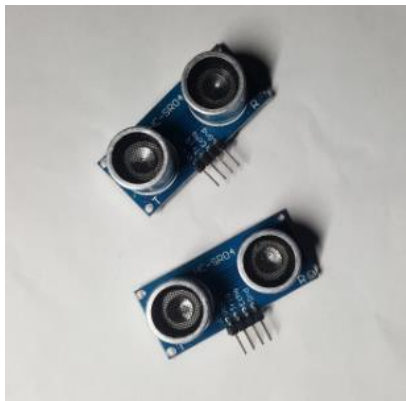
Followings are the components used.



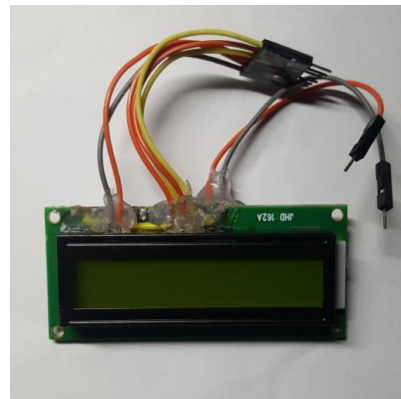
DC Motor



Motor Driver



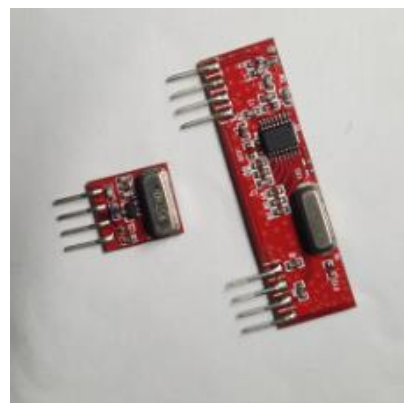
Ultrasonic Sensor



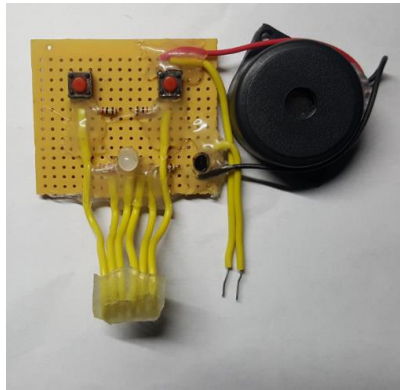
LCD Display



Arduino Microcontroller



RF Module



Buttons, Led, Buzzers



Power Supply

### III. WORKING

When the user puts garbage on a flap on the top of dustbin, garbage won't get into dustbin until the user presses either of the two buttons that is one for biodegradable waste and other for non-biodegradable waste. The machine will then check the amount of garbage in the chosen compartment. If the garbage is reaching full, the flap won't open and a warning will be given to the user in form of a sound sequence from a buzzer [1-3].

A panel on a side of dustbin consists of

1. 2 Push buttons
2. 1 RGB led
3. 1 buzzer

RGB led is used to indicate 3 operations:

1. Red - Non-Biodegradable waste
2. Green - Biodegradable Waste
3. Blue - When Idle

The amount of garbage in the compartments will be detected by using two ultrasonic sensors on the opposite side of the flap. Sensors will tell the empty distance to the controller which will then calculate the volume ratio of the two compartments.

The Display used is a 16X2 LCD Panel with backlight. It is connected to the microcontroller. It shows data in two types

1. It shows current amount of garbage in each compartment in form of percentage.
2. It gives stars to both Biodegradable and Non-biodegradable waste based on their production in a week or a defined span of time.

The axis of flap is connected to the shaft of a geared DC Motor run by a Motor Driver. The flap determines its mean position by detecting a ground wire on side of the dustbin. The body of the dustbin can be changed easily by just changing the shape of flap and attaching all the other electronics components at the side of any of the dustbin which makes this system universal [1-3].

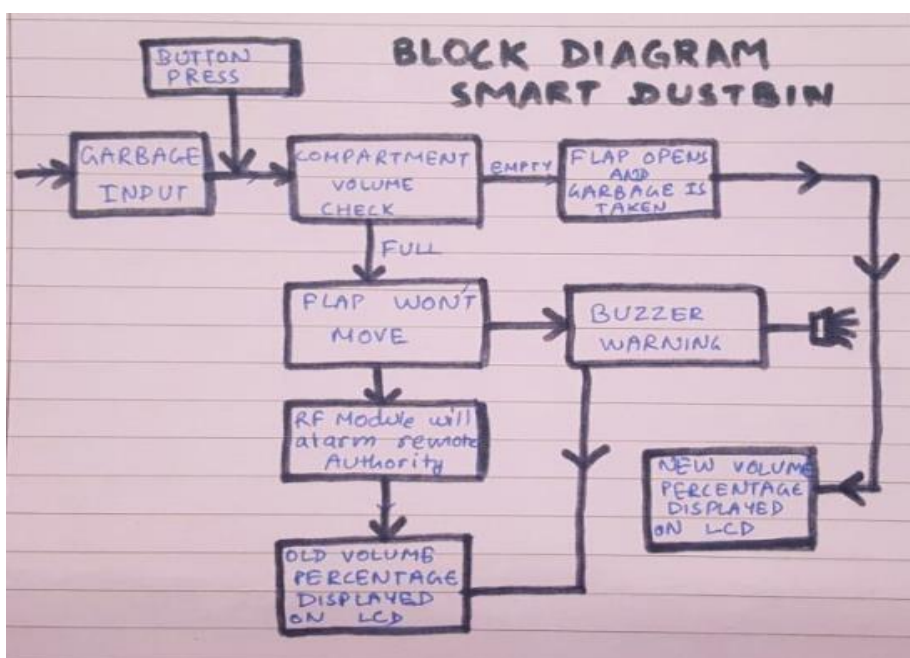


The RF module can be used in various applications for connecting the dustbins

1. It can be used to connect to a remote alarm system to notify the management authority that the dustbin is full and needs to be emptied.
2. It can be used to connect various dustbins in a public place to a computer for management purpose. This adds to the security of dustbins also, that is the authority will instantly get to know when someone will steal the dustbin because dustbin will no longer be detected by the receiver.

This feature can very well help the government of India in tackling the local thieves who steal government property like dustbins, electrical equipment's for a little amount of money.

In Smart Dustbin, the RF Module is used to connect to a remote light system which glows with two colours (for indication of different compartments) to notify the concerned authority that the dustbin is full. Dustbin will also send a dustbin ID in case of multiple dustbins [1-3].



#### IV. SUMMARY

The Smart Dustbin is an easy solution to the problem of distinguishing Biodegradable and Non-Biodegradable waste in the initial stage of cycle of waste production. It also contains some user interacting features which encourage people to use Dustbin instead of throwing garbage anywhere. Connecting it to remote system makes it even more suitable to be used in public places.

#### V. COST

This complete machine costs around Rs 1400 with RF module and remote alarming system which is best suited for public places like malls. Without RF module and remote alarm system, it costs Rs 940 which is best for residential use.

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|--------------------------------|----------|
| 1. Geared DC Motor             | - Rs 50  |
| 2. Driver for motor            | - Rs 70  |
| 3. Ultrasonic Sensors          | - Rs 220 |
| 4. LCD screen                  | - Rs 100 |
| 5. Arduino Uno Microcontroller | - Rs 350 |
| 6. RF module                   | - Rs 110 |
| 7. Buzzer                      | - Rs 20  |
| 8. LEDs and push buttons       | - Rs 10  |
| 9. Wires and DC Power Supply   | - Rs 50  |

The system can be made even better with a GPS module system for ultra-remote monitoring. But it adds a lot to the total cost of the system. Also, a Metal detector mechanism can be added for sensing metal pieces in biodegradable waste and warn the user because in some cases, people feed their biodegradable waste to cattle and toxic metal pieces in their food can be harmful.

**Conflict of Interest:** The authors declare that they have no conflict of interest.

**Ethical Statement:** The authors declare that they have followed ethical responsibilities.

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