

Smart Dustbin for Efficient Waste Management

Mahesh Chandra Bhatt¹, Dharmendra Sharma², Ashish Chauhan³

^{1,2,3}Assistant Professor Department of Information Technology, SRM IST Modinagar, Uttar Pradesh, India

Abstract - As the urbanization increases, so does the generation of waste also increases. Due to improper waste management, the garbage bins placed around are overflowed with the garbage produced on a daily basis. Also it is not an easy task to check on a daily basis which dustbin is full. It not only makes the environment unhygienic but also is the main cause of many fatal and infectious diseases. Thus, it means that the waste management is the current necessity of the globally. In India also to promote it, the Swachh Bharat Mission was launched with a view of making India clean and hygienic. This paper helps to achieve that goal with an effective method. This paper provides an effective model of an automatic dustbin for this cause. The dustbin will have sensors to detect the garbage level and once it reaches its threshold limit set, then a notification will be sent to the authorized personal to clear the waste. It will also have a sensor that will automatically open the lid of the dustbin, when a person arrives to use it, only if the dustbin is not full. This will increase its effectiveness as the pungent odor will not spread out and thus making environment more hygienic.

Key Words: Sensors, Microcontroller, Servo Motor, IOT (Internet of Things), Waste Management

1. INTRODUCTION

In India due to the adoption of mixed economy, the private sectors rose up very fast and thus caused urbanization rapidly. In 1901 census the percentage of urbanization was 11.4% where as in 2001 census it was 28.53% and in 2011 census it rose to 31.16%. According to a report by the World Bank, by 2030, more than 40% of the country's population is expected to be in urban areas. According to a report of Times of India in 2017, India's urban population produces a whopping 62 million tons of waste every year. From this waste only about 22 - 28% of waste is treated and the rest remains like that without any proper care. This causes air pollution and harms the environment and causes many fatal diseases and leads to slower economic growth. Taken together, the major issue that India's dealing in today is the 'waste management'.

Wastes can be classified as the solid waste and the liquid waste, which in both form are harmful. It can be further classified as organic waste, e-waste, medical waste, re-useable waste, recyclable waste, hazardous waste. The liquid waste comes mainly from the three sources: residential areas, industrial areas, and commercial areas. The example are like dirty industrial water, home

discharges etc. While solid waste comprises of items like metal and tins scarps, food waste, old furniture etc.

The workers come to collect waste in two to three days in India from bins, but the dustbins are full of dust then there are no options to clear the dustbins. It causes the spillage of the waste and thus creates unhygienic environment and causes many diseases. It is caused as the government does not have any means to check the status of the dustbin if it is full or not before the scheduled waste collection day. As the population is increasing at a very fast rate, this current model or scheme of waste collection does not properly works. The major aim of this paper is to develop a prototype for the future bins where the status of bins based on their depth is sent of the officials once it is full and also to make the lid of the bins open and close automatically as the person arrives so as to improve the hygiene of the surrounding areas.

2. PROBLEM STATEMENT

The situation on waste not disposed on proper time is common. The concern worker's do not the information regarding the status of the bin if it's full or not. This causes the unhygienic environment due to not clearing the waste on proper time and causes foul smell in that area, which further causes many infectious diseases.

A. Disadvantages of the current used method

- i. Foul smell
- ii. Spreads diseases
- iii. The city gets a bad image of being dirty

B. Advantages of proposed method

- i. Effective management of city resources
- ii. Reduced expenditure
- iii. Real time updates
- iv. Bins cleared as per need

3. METHODOLOGY

i. Internet of Things (IOT)

The Internet of Things refers to 'connected things'. In simple terms, Internet of Things means connecting the

electronic embedded devices like micro-controller or the micro-processors to the Internet which allows the devices to interact and exchange data. Here, we use the Arduino Uno micro-controller which will be programmed via Arduino ID which is similar to C++.

ii. Arduino IDE

The coding environment for the Arduino is much similar to C++ known as Arduino IDE. The Arduino IDE or the Arduino Integrated Development Environment allows a user to write, compile and upload that code to the arduino for its usage.

iii. Arduino Uno

The arduino is an open - source electronic prototyping platform. It's key advantage is easy to use software and hardware. It is a circuit board comprised of the microprocessor and the Input/Output or the I/O pins which are used for the purpose of communication and to control various physical items like LEDs, servo motors, buttons etc. It gets its power supply from an external source which it further uses to power the other physical items. The arduino uno is based on the 8-bit micro-controller ATmega328P. This acts as main heart of the proposed system and processes all the necessary information's.

- ❖ Developed by arduino.
- ❖ Total pins - 20 Out of which Digital pins - 14 & Analog pins - 6

iv. IR sensor

The depth of the dustbin or its level is detected by the IR or the Infrared sensors. The IR circuit comprises of the two main sub-circuits a. emitter circuit b. receiver circuit. The IR emitter circuit comprises of a simple IR LED or IR Light Emitting Diode, which emits the IR light of a particular wavelength. The IR receiver circuit comprises of the detector which is an IR photo-diode which is sensitive towards that particular wavelength of IR light emitted by the IR LED in the IR emitter circuit.

v. Ultrasonic sensor (HC-SR04)

The ultrasonic sensors are the sensors which are used for the purpose of measuring the distance. It uses the ultrasonic waves for this cause. The entire process is divided into the emission and the reception phase. In the emission phase it sends the ultrasonic waves to the target and in the reception phase the ultrasonic waves that are reflected back from the target are sensed. The distance is measured on the basis of the time taken between the emission and the reception. Here in this proposed model, the ultrasonic sensor HC-SR04 will be used to detect the distance between the person and the dustbin. If the person

comes close to the dustbin, it will automatically open its lid with the help of servo motor and when the person goes the lid will automatically close down.

* Distance Range - 2cm to 400cm

* Input Pulse width - 10uS

vi. Servo Motor (SG 90)

A servo motor is an electrical device that is commonly used to push or rotate an object. If an object needs to be rotated at any specific angle or at any distance with great precision, then the servo motor is used. It is a simple motor that works on the principle of servo mechanism. When a motion or the force is produced is higher than the input level, and then it's called servo mechanism. Here in this model, the servo motor will be used to automatically open the lid of the bins when the person arrives to use the dustbins.

* Weight - 9 g

* Operational Speed - 0.1s/60 degrees

* Operational Voltage - 4.8 V

* Advantage - Tiny, Light weight , High output power

vii. Wi-Fi Module (ESP8266)

The ESP8266 is a Wi-Fi module which is sully loaded with the TCP/IP stack, which allows the micro-controller to connect to various Wi-Fi networks. It is capable of both

a. Hosting an application

b. Offloading an application from any micro-processor.

* Wi-Fi Protocols: 802.11 b/g/n

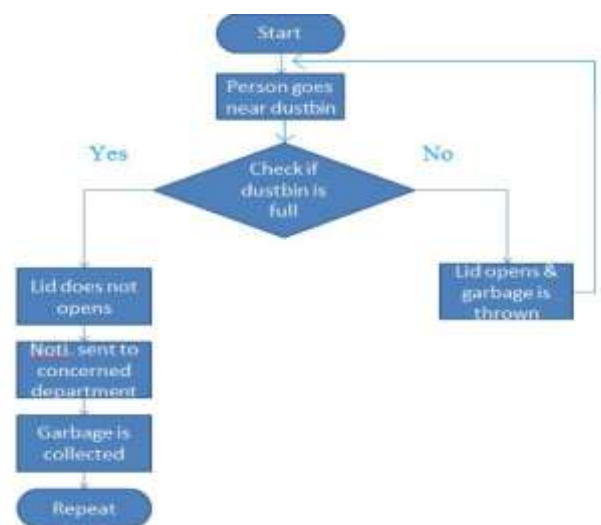


Fig. 1. Flowchart of the model proposed

4. CONCLUSION

The main focus in this proposed model was to improve the waste management process and to enhance the quality of the city's environment. Many times it is observed that the dustbins are not covered and causes the spillage of the waste by birds. It also solves this issue in the current method. The proverb "Cleanliness is next to Godliness" will be truly achievable in the city with this proposed model by providing an automatic opening for the dustbins lid and by providing the dustbin full status to the concerned worker.

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