Smart Trash Can

Renu Kumari*, Manali Shah†, Shivani Shrivastava‡ and Sneha Patil §
Roll numbers: 15IT136*, 15IT218†, 15IT243‡ and 15IT245§
National Institute of Technology, Karnataka
Email: psneha716@gmail.com

***Abstract*—With Urbanization waste production has increased tremendously.The aim of the project is to control the waste management system of Municipal by using Internet.Internet of Things is the concept of connecting any device (so long as it has an on/off switch) to the Internet and to other connected devices. This project connects the trashcan to the internet. It detects the level of garbage in the trash can and notify the Municipal so that the garbage could be cleaned earlier to the overflow stage. This smart trash can uses two ultrasonic sensors, one of which is used to find the level of the garbage in the trash and once the level crosses certain threshold value it notifies the user and the other one is used to detect proximity of the user, so as to automatically open the lid of the trash can using servo motor. This is one of approach method to keep user's hand clean by not touching the lid of the trash can.**

I. Introduction

In today's world, IoT is becoming part of every aspect of our lives. Not only internet of things applications are enhancing the comforts of our lives but also it giving us more control by simplifying routine work life and personal tasks. This project can be used for individual use as well for the welfare of the society. Overflowing garbage bins is a cause of concern for residents in developing countries. Traditionally, municipalities operate on weekly routes to pick up wastes in the garbage bin on designated days, regardless of whether the containers are full or not. It aims to optimize waste collection process. Internet of Things is becoming an increasingly growing concept both in workplace and outside of it. Internet of Things extends internet connectivity beyond laptop computers, smartphone to a diverse range of devices that utilize embedded technology to communicate with the external environment, all via internet.

This project aims to design an IOT enabled trashcan which will automatically and frequently intimate the status of the trashcan to the User/Municipality and automating the trash so as to keep the user's hand clean by not touching the lid of the Can.

The main components used for the Smart Trash Can includes Raspberry Pi 3, 2 Ultrasonic Sensors-HC-SR04, TowerPro MG995 Servo Motor and a Mini Trash Can. This Smart Trash Can is integrated with mail system which notifies the user when it's full by sending a mail.

Project Aim

- Building a Touchless Automatic Motion Sensor Trash Can for ease of use.
- Detecting when the dustbin is getting full.
- Introducing notifications through email about the status of the trash can.

II. Literature Survey

A qualitative analysis has been done in [1] between exiting dustbins and their serving populations. The spatial distribution of the dustbins in some areas of the Dhaka city was analyzed using average nearest functions of GIS. Remarkably, the spatial circulation of the current dustbins has appeared to be dominantly in clustered pattern. Next, an optimal number of additional dustbins were calculated. It is shown that the number of existing dustbins is insufficient in the study area.

An effort to equip the dustbins with ultrasonic sensors have been made in [2], which measures the

level of the dustbin being filled up. Every time the garbage crosses a certain set threshold level, the user is instantly notified using GSM module. An IOT-based smart garbage system (SGS) is proposed to reduce the amount of food waste.

Battery based smart garbage bins which exchange information with each other using wireless mesh network, a router and server has been proposed in [3]. The proposed system includes various IoT skills considering user convenience and increases the battery lifetime through two types of energy-efficient operations of the SGBs: stand-alone operation and cooperation based operation.

III. Problem Statement

To implement a Smart Trash Can built on a micro controller based platform Raspberry Pi 3 interfaced with two Ultrasonic sensors and a servo motor which could notify the user about it's status and to automate the lid of trash can to act as some object approaches to sensor.

A. Objectives

The objectives of the Smart Trash Can are elicited below:

- Building a Touchless Automatic Motion Sensor Trash Can for ease of use.
- Detecting when the dustbin is getting full.
- Introducing notifications through email about the status of the trash can.

IV. Methodology

The System architecture of the Smart Trash Can in shown in Figure 1. Two ultrasonic sensors are used. One for detecting proximity of the user and to automatically open and close the lid of the trash can using servo motor and the other for monitoring the status of the Trash Can. The flow chart outlining the working of the system is depicted in Figure 1.

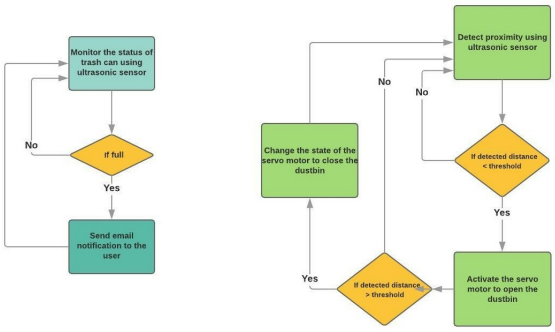

Fig. 1. Architecture of Smart Trash Can

A. Work Done

The System was implemented on a Raspberry pi development board in Linux environment, which supports SMTP (Simple Mail Transfer Protocol), TCP/IP and HTTP. Two ultrasonic sensors are used, one for detecting proximity and the other for monitoring the status of the trash can. Servo motor is used to open as well as close the trash can. The entire application was coded using Python.The send_mail functionality uses smtplib and email Python modules. A notification is sent to the user when the trash can gets full.

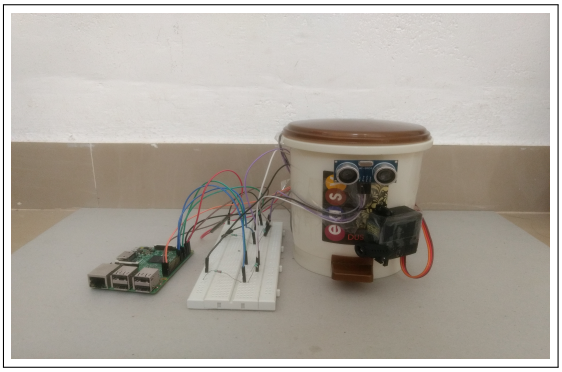

Fig. 2. System Setup 1

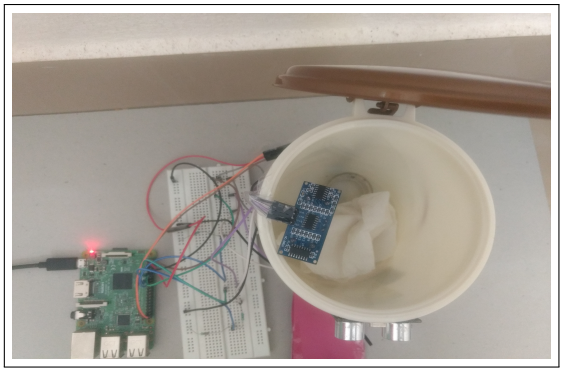

Fig. 3. System Setup 2

V. Results and Analysis

Our proposed system consists of various sensors at different positions of the trash can. These sensors senses their respective parameters according to the program and desired objectives.

The result of analysis of system proposed in this paper can be given in following form:

Real time alert mail sending

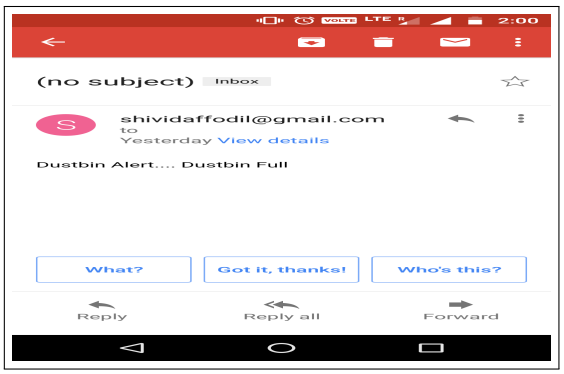

Fig. 4. Alert Message generated by the system

One ultrasonic sensor is placed inside the dustbin so as to monitor the fullness of the trash can. When this sensor senses garbage level up to threshold then system will automatically send the message to the respective authority as shown in Figure 4

VI. Conclusion

In India currently waste collection has been treated in a static way. Using IOT we proposed a dynamic method of waste collection. Waste management has become an important issue as it directly affect public health. Day by day the domestic waste has been growing which lead to waste management being the highest priority in today's world. There is the need for the generated waste to be properly collected and transported with proper waste disposal waste treatment and disposal. Improper handling of waste creates issues in public health and environmental pollution. This paper attempts to provide a practical solution to help the local municipal administration in waste management i.e to monitor the domestic waste clearance at proper time to avoid damage to the public health. In this paper, Waste Collection System architecture using IOT has been proposed. It consists of embedded devices with micro-controller and sensors for sensing the information of the smart trash cans and sending it to the workstations located at the municipal office. The technique proposed is an attempt to improve the current waste collection system in India for the "Clean India Mission".

Acknowledgment

We would like to express our gratitude towards Dr. G. Ram Mohana Reddy and Mr. Ashwin T.S. for their kind cooperation and encouragement which helped us in the completion of this project entitled "Smart Trash Can" submitted to Department of Information Technology, NITK. We would like to thank them for their guidance and constant supervision as well as for providing necessary information regarding the project and also for their support in completing the project.

Individual Contribution

1] Working on automating the lid of the trash can: Manali(15IT218) and Sneha Patil(15IT245) 2] Working on the mail system: Renu Kumari(15IT136) and Shivani Shrivastava(15IT243)

Gantt Chart

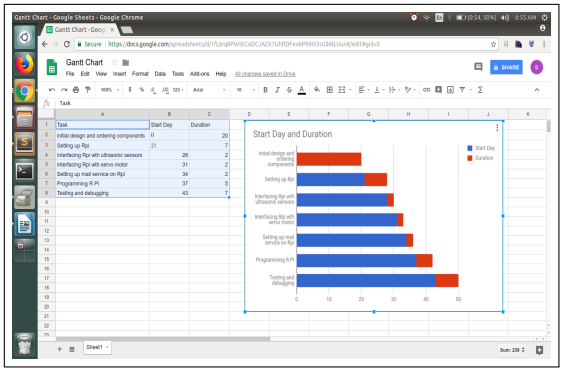

Fig. 5. Gantt Chart

REFERENCES

[1] Alexey Medvedev, Petr Fedchenkov, ArkadyZaslavsky, Theodoros, Anagnostopoulos Sergey Khoruzhnikov, Waste Management as an IoT-Enabled Service in Smart Cities.

[2] Meghana K C, Dr. K R Nataraj,IOT Based Intelligent Bin for Smart Cities.

[3] KasliwalManasi H., SuryawanshiSmitkumar B, A Novel Approach to Garbage Management Using Internet of Things for Smart Cities.