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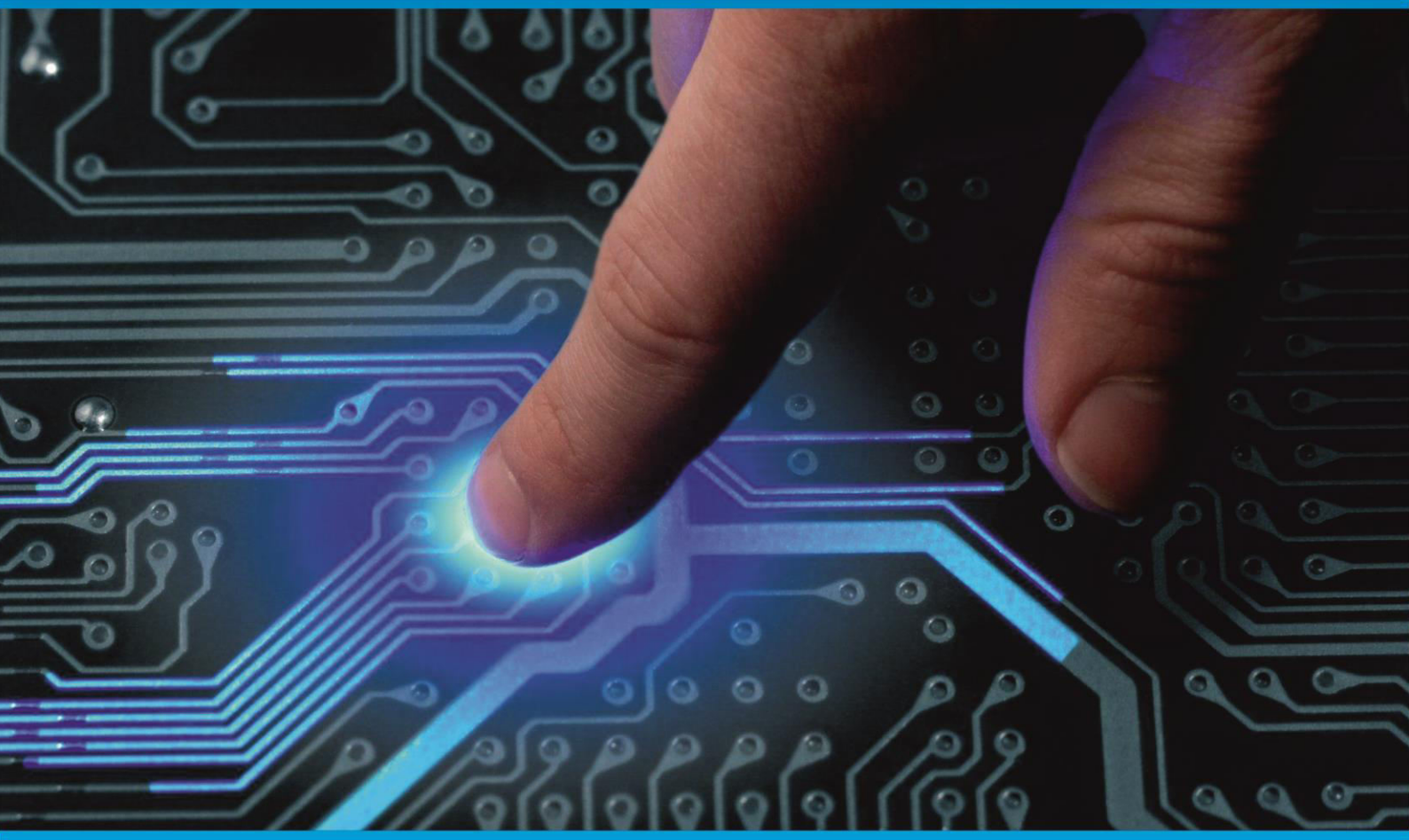

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Instant Follow Up of Garbage Disposal Using Raspberry Pi

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ABSTRACT: The Internet of Things (IoT) is constantly evolving and is giving unique solutions to the everyday problems faced by man. "Smart City" is one such implementation aimed at improving the lifestyle of human beings. We deploy the concept of integrating different case situations in this project. Nowadays the waste materials are gradually increasing. But the methods to clear these wastes are not matching the standards. In most of the places we see flooded dustbins waiting for the garbage man to clear the dustbin. So we propose this paper which enables an active mechanism of clearing the dustbin based on priority. We also enable a mechanism for tracking the entire process of the waste disposal carried out by the garbage department.

KEYWORDS: IoT, garbage disposal, solid waste management, smart city.

I. INTRODUCTION

The Internet of Things (IoT) is constantly evolving and is giving unique solutions to the everyday problems faced by man. "Smart City" is one such implementation aimed at improving the lifestyle of human beings. We deploy the concept of integrating different case situations in this project. Nowadays the waste materials are gradually increasing. But the methods to clear these wastes are not matching the standards. In most of the places we see flooded dustbins waiting for the garbage man to clear the dustbin. So we propose this paper which enables an active mechanism of clearing the dustbin based on priority. We also enable a mechanism for tracking the entire process of the waste disposal carried out by the garbage department. In the proposed system we enable the tracking of full process involved in a solid waste management from the indication of waste to the disposal of wastes by the department. The ultrasonic sensor in the dustbin counts the number of wastes in the garbage. If the garbage reaches the threshold value given by the user, then a message is sent to the garbage monitoring section through IOT. So the garbage man sets the path and arrives to the dustbin based on priority level. The monitoring of waste disposal is done with the help of an RFID reader fitted with the Dustbin and the RFID tag carried by the garbage man. When the person nears the dustbin then the reader reads the RFID tag and transmits the status to the monitoring section through IOT indicating the clearance of garbage in that particular area.

II. EXISTING SYSTEM

In the existing system only the visible problems are resolved. The existing system just indicates the wastes inside the dustbin to the department. But it fails to monitor the proper disposal of wastes by the department. In this system daily routine is followed. This in some cases fails to service the necessary area.

III. PROPOSED SYSTEM

In the proposed system we enable the tracking of full process involved in a solid waste management from the indication of waste to the disposal of wastes by the department. As existing system, we also detect the waste and alert the department when the garbage level reaches the maximum threshold. Our proposed system not only detect the waste and also monitor the entire life cycle of the garbage disposal process. We are using ultrasonic sensor which is fitted in the dustbin and it counts the number of wastes in the garbage. If the garbage reaches the threshold value given by the user, then a message is sent to the garbage monitoring section through IoT and also to the registered phone number as text message. So the garbage man sets the path and arrives to the dustbin based on priority level. The monitoring of waste

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disposal is done with the help of an RFID reader which reads the data stored in the tag and RFID reader fitted with the Dustbin. RFID tag carried by the garbage man contains his informations. When the person nears the dustbin then the reader reads the RFID tag and transmits the status to the monitoring section through IoT indicating the clearance of garbage in that particular area. These entire data are updated in the IoT web application in Real-Time manner. Hence, data such as time of garbage filled up, time of garbage cleared, who cleared, location of the Dustbin are updated in the web application. These data can be used for further analytical proposes. Fig.1 shows the general arrangement of components in the proposed system.

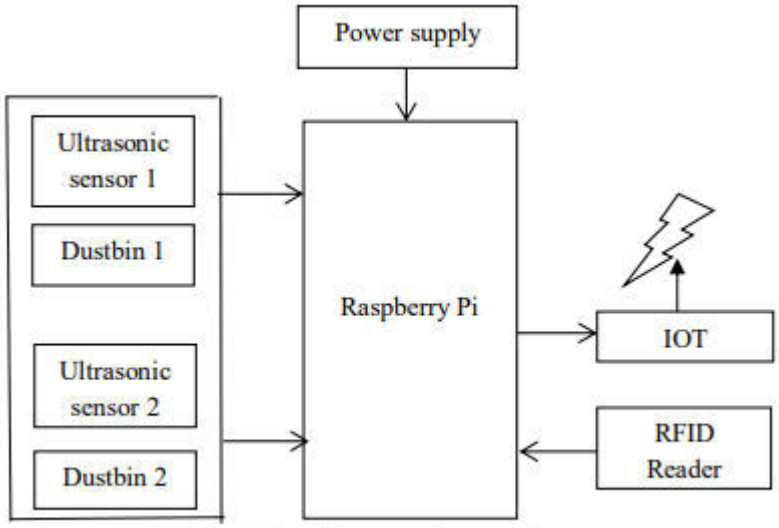

Fig.1 Block diagram of proposed system

IV. HARDWARE REQUIREMENT

The hardware components of the proposed system are raspberry pi 3, ultrasonic sensors, IoT module, RFID reader and tag, power supply.Fig.2 shows the complete hardware setup of the proposed system.

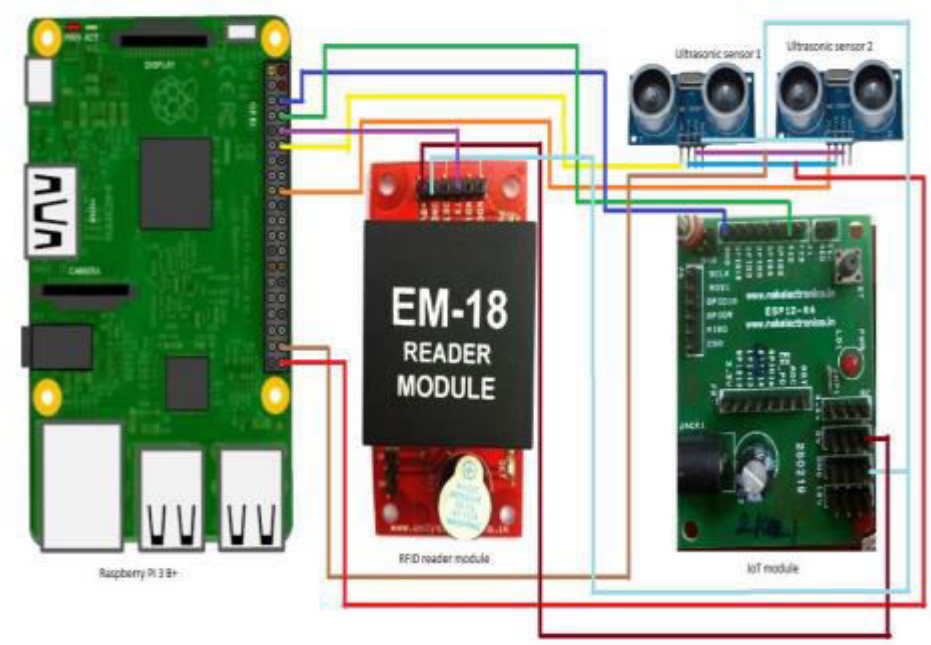

Fig.2 Hardware setup of proposed system

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4.1 Raspberry Pi 3+

The Raspberry Pi 3 Model B is 3rd gen Raspberry Pi model. This single board computer can be used for many applications. It is 10x faster than the 1st gen Raspberry Pi. Additionally it has wireless LAN & Bluetooth connectivity making it as ideal solution for powerful connected designs.

Fig.3 Raspberry Pi 3+

Features of Raspberry Pi 3+ are 1.2GHz 64-bit quad-core ARMv8 CPU, 802.11n Wireless LAN, Bluetooth 4.0,Bluetooth Low Energy (BLE),1GB RAM,40 GPIO pins and Ethernet port.

4.2 IoT module

The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. IoT board featured with SIM900 GPRS modem to activate internet connection also equipped with a controller to process all input UART data to GPRS based online data. Data may be updated to a specific site or a social network by which the user can able to access the data.

Fig.4 IoT Modem

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Features of IoT modem are +12v 1Amp DC power supply, Auto data update, provided with 3 links, Data updating to a specific web site, Data updating to a social network.

4.3 Ultrasonic sensor

Ultrasonic sensor emits ultrasonic wave pulses, and it is measured by the time of ultrasonic pulse reaches the object and back to the transducer. The sonic waves emitted by the transducer are reflected by an object and received back in the transducer.

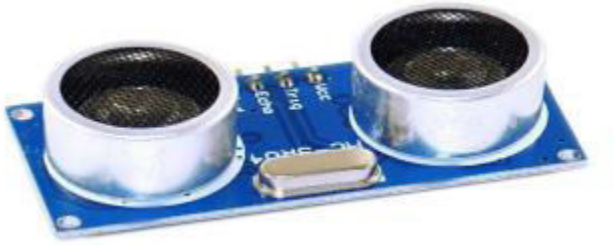

Fig.5 Ultrasonic sensor

The ultrasonic sensor will switch to receive mode after emitted sound waves. The time between emitting and receiving of waves is proportional to the distance of the object from the sensor. Ultrasonic transmitter emitted an ultrasonic wave in one directional. Ultrasonic spread in the air and would return immediately when it encountered obstacles on the way. At last the ultrasonic receiver would stop timing when it receives the reflected wave. The distance is calculated.

Fig.6 RFID Reader

4.4 RFID Reader and Tag

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves and the tag responds by sending back its data.

An RFID tag is a microchip combined with an antenna in a compact package; the packaging is structured to allow the RFID tag to be attached to an object to be tracked. "RFID" stands for Radio Frequency Identification. The tag's antenna picks up signals from an RFID reader or scanner and then returns the signal, usually with some additional data (like a unique serial number or other customized information).A passive tag is an RFID tag that does not contain a battery; the power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID the coiled

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antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory.

Fig.6 RFID tag

4.5 Power supply

12 Volt 2A Power Adapter Supply AC to DC Plug. This powers the IoT board and 5V power adapter provides power supply for Raspberry Pi.

Fig.7 12V Power adapter

V. SOFTWARE REQUIREMENTS

We developed our IoT web application by using Kotlin, PHP, MYSQL and android studio. Data from Raspberry Pi is directly send to web app through IoT. Monitoring and tracking of garbage is made easy by this web app. Front end of the web app is developed by using Kotlin. Backend of the web app is developed by PHP and MYSQL as database. We used Android Studio as IDE. We also used Python as programming language in Raspberry Pi. Fig.8 shows the homepage of IoT web application.

5.1 Python

Python is widely used as high-level programming language for general purposes. It is widely used for various purposes. Python is created by Guido Van Rossum and first released in 1991. The main features of Python are automatic memory management and dynamic type system, supports multiple programming paradigms, including object-oriented, imperative, functional programming, and procedural styles. Python has a large and comprehensive standard library. In our proposed system, programming parts are written in Python programming language.

5.2 Kotlin

Kotlin is an open source programming language developed by Google in 2017 officially. Kotlin programming is mainly used for developing UI of mobile and web applications. It is a high level strongly statically typed language. Features of kotlin are null safety, efficiency, lazy-loading, extension functions, collections and streams. We used Kotlin for developing front end of our web application.

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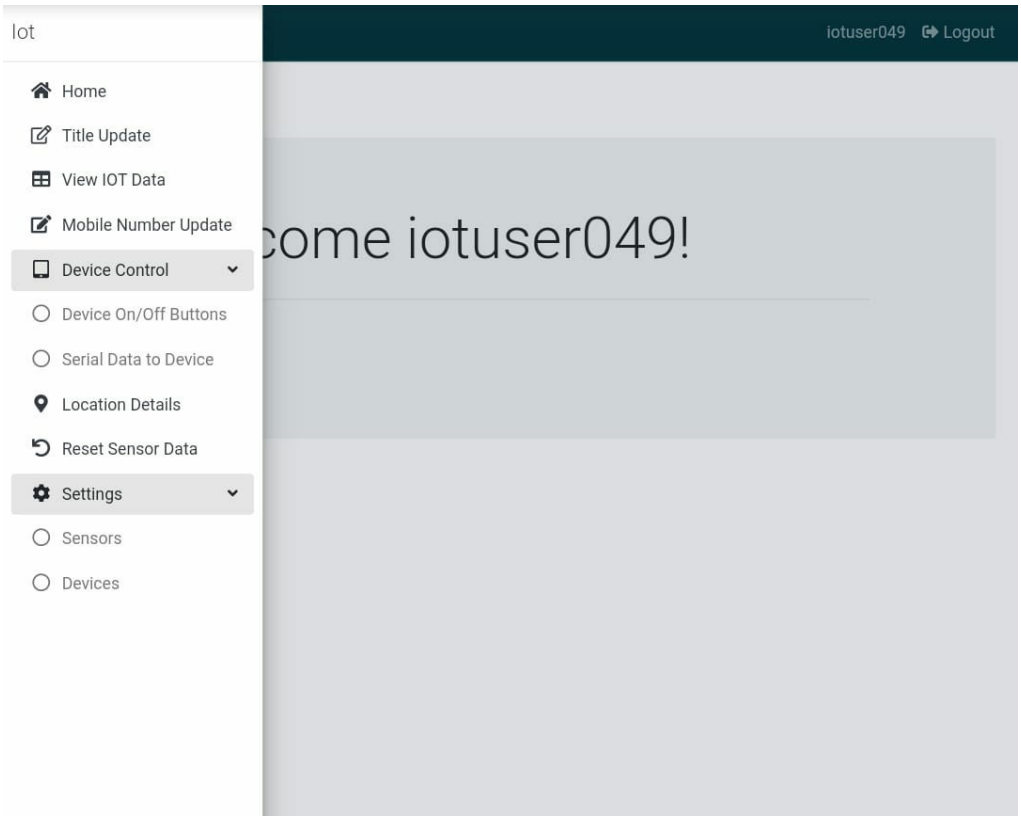

Fig.9 Homepage of web application

5.3 Android studio

Android studio is the official Integrated Development Environment (IDE) for android application development. Android Studio provides more features that enhance our productivity while building Android apps . Android studio was developed by Google and it was first announced on 13th may 2013. The important features of Android studio are flexible Gradle-based build system and fast and feature-rich emulator for app testing.

5.4 MySQL

MYSQL is the most popular Open Source Relational Database Management System. A relational database organizes data into one or more data tables in which data types may be related to each other, these relations help structure the data. Structured Query Language is a language programmers use to create, modify and extract data from the relational database, as well as control user access to the database. MYSQL is developed by MySQL AB founded by David Axmark and it was initially released on 23 may 1995 later it was acquired by Sun Microsystems.

5.5 PHP

PHP is a general-purpose scripting language best suited to create web development. PHP code is usually processed on a web server by a PHP interpreter implemented as a module, a daemon or as a Common Gateway Interface (CGI) executable. PHP is created in 1994 by a Danish-Canadian programmer Rasmus Lerdorf. PHP is widely using for developing back end of both web and mobile applications. Features of PHP are easy to use, it is secure, Client/Server architecture, scalable, speed and memory efficiency.

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VI.ALGORITHM

Fig.10 shows the complete algorithm of the proposed system.

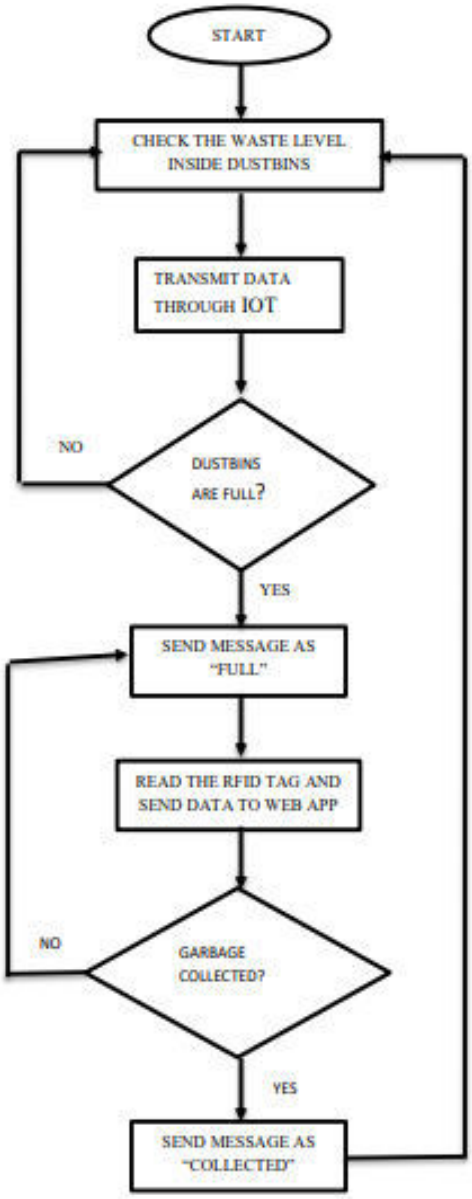

Fig.10 Algorithm of proposed system

VII. RESULT AND CONCLUSION

A.RESULT

Garbage levels of Dustbin 1 and Dustbin 2 are updated for every seconds. Current status of the dustbin is updated every 5 seconds to the web app through IoT. When the garbage level reaches the maximum threshold level, status of the dustbin becomes FULL and this data is send to web app. This information is passed to the registered phone number as text message for informing that the dustbin is full and need to be cleaned quickly. When the garbage man shows his RFID tag to RFID reader which is fitted to the dustbin, that person's name, date and time of clearance, location of the Dustbin are updated to the database. When the wastes are collected, this data is also send to the web app and the

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"COLLECTED" message is send to the registered phone number. Here the status, date and time of the dustbins are updated for every time intervals in the web app through IoT shown in Fig.11.

#	DUSTBIN_1	DUSTBIN_2	STATUS	Date & Time
1	NA	EMPTY	NA	2021-03-06 13:36:04
2	EMPTY	NA	NA	2021-03-06 13:36:00
3	NA	EMPTY	NA	2021-03-06 13:35:53
4	FULL	NA	NA	2021-03-06 13:35:48
5	NA	EMPTY	NA	2021-03-06 13:35:44
6	EMPTY	NA	NA	2021-03-06 13:35:39
7	NA	EMPTY	NA	2021-03-06 13:35:34
8	EMPTY	NA	NA	2021-03-06 13:35:28
9	NA	EMPTY	NA	2021-03-06 13:35:24
10	EMPTY	NA	NA	2021-03-06 13:35:18

Fig.11 Output

B.CONCLUSION

The main purpose of the project is to make the garbage disposal process very effectively, also we can monitor garbage disposal process from beginning to end by using web application easily and know the locations. With reference to existing systems, considering their disadvantages we have proposed a solution which is effective and simple. In this we not only detecting the overflowing of wastes but also collecting data about the whole process and use this data for further simplification and effective ways for disposing wastes. In conclusion this projects idea is to ease the burden of the municipalities in an efficient way in monitoring and disposing the wastes and to use the data to maintain the places free from wastes effective. Since there are lot of problems in solid waste management these things would make it easy and less complicated and to stand in this technological fast-growing world.

VIII. FUTURE SCOPE

The future scope of this would be developing the system for commercial purpose as a real time response system along with an application for both android and IOS including the necessary features. Also, implement the web app with ML and Big Data analysis for effective solid waste management.

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