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IoT Based Intelligent Garbage Monitoring System

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Abstract—

Waste management is simple yet effective ways of reducing the amount of waste dumped into our landfills. But there are people who are unaware or even choose to ignore the fact that waste segregation and recycling are environment friendly solutions to the problem of wastes management and disposal. In the Philippines, there are recycling centers but the process is tedious and done manually. There are guidelines implemented by the government with regards to recycling but these efforts have yet to touch the mindset of the people. Escalating amounts of recyclables that are not maximized and indifference in proper waste segregation has led to the group in developing a solution to this. This project IOT Garbage Management system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of Arduino family microcontroller to control every process and Wi-Fi modem for sending data to server. Dustbins are provided with low cost embedded device which helps in tracking the level of the garbage bins and an unique ID will be provided for every dustbin so that it is easy to identify which garbage bin is full. When the level reaches the threshold limit, the device will transmit the level along with the unique ID provided. These details can be accessed by the concern authorities from their place with the help of Internet and an immediate action can be made to clean the dustbins.

Keywords— **waste management, file servers, Internet of Things, acoustics, ultrasonic sensor, wifi esp8266, android application**

I. INTRODUCTION

Waste management is effective way of reducing dumped trash. Unfortunately, these practices are not widely implemented in the country. People have been negligent when it comes to proper waste disposal, ignoring labels and throwing recyclables that can still be reused. Most are unaware or choose to ignore the fact the waste segregation and recycling can reduce cost, reduce drain in our resources, and lessen the waste being produced. Typical composition of garbage people throw in are 5.8% metals, 3.5% glass, 1.6% plastic, 12.9% papers, 1.8% textiles and 53.7% biodegradables which means only the remaining 20.7% of the wastes should really be going to our landfills. In our country, recycling centers do manual process of sorting wastes leading to a high risk of acquiring sickness. This study aims to automate waste segregation and implement a waste delivery system that would minimize human interference in the waste collecting and segregation process. Garbage may consists of the unwanted material left over from City, Public area, Society, College, Homes etc. This project is related to the "Smart City Waste management is effective way of reducing dumped trash. Unfortunately, these practices are not widely implemented in the country. People have been negligent when it comes to proper waste disposal, ignoring labels and throwing recyclables that can still be reused. Most are unaware or choose to ignore the fact the waste segregation and recycling can reduce cost, reduce drain in our resources, and lessen the waste being produced. Typical composition of garbage people throw in are 5.8% metals, 3.5% glass, 1.6% plastic, 12.9% papers, 1.8% textiles and 53.7% biodegradables which means only the remaining 20.7% of the wastes should really be going to our landfills. In our country, recycling centers do manual process of sorting wastes leading to a high risk of acquiring sickness. This study aims to automate waste segregation and implement a waste delivery system that would minimize human interference in the waste" and based on "Internet of Things" (IOT). So for smart lifestyle, cleanliness is needed, and cleanliness is begins with Garbage Bin. This project will helps to eradicate or minimize the garbage disposal problem. The Internet of Things (IoT) is a recent communication paradigm that envisions near future, in which the objects of everyday life will be equipped with microcontrollers, transceivers for digital communication, and suitable protocol

stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet.

II. WORKING PRINCIPLE

In IoT based garbage management, we are showing one live garbage bin.Each garbage bin has two slots, one for wet and other for dry. Height of waste in both slots is measured with help of ultrasonic sensors and that information is transferred to server via wifi module to PC server.A four way DIP switch is used to give each dustbin an ID and that ID with predefined location information is stored in database on server PC.Dustbin forwards three type of data using WiFi module to PC, 1. ID of a bin , 2. Dry waste in percentage, 3. Wet waste in percentage to PC server through wifi module via network (intranet).C server has display screen which consists of ,Dustbin ID, Location information, Wet waste percentage, Dry waste percentage.Server will send data about the bin to Android app.On Android app, user can view the percentage of Dry bin and percentage of Wet bin.When any bin is about to full , user / driver will get a pop up message on app with text as well as in speech format using TTS.Dustbin side wi-fi , PC and android will be connected to same network, hence it is Intranet communication.
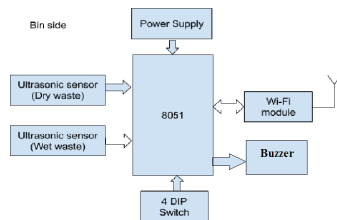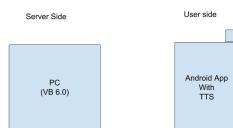
III. BLOCK DIAGRAM

Fig.1.Bin side

Fig.2.Server and user side

IV. METHODOLOGY OF THE SYSTEM

- In IoT based garbage management, we are showing one live garbage bin.
- Each garbage bin has two slots, one for wet and other for dry. Height of waste in both slots is measured with help of ultrasonic sensors and that information 8051 microcontroller will transferre to server via Wi-Fi module to PC server.
- A four way DIP switch is used to give each dustbin an ID and that ID with predefined location information is stored in database on server PC.
- Dustbin forwards three type of data using Wi-Fi module to PC, 1. ID of a bin , 2. Dry waste in percentage, 3. Wet waste in percentage to PC server through wifi module via network (intranet).
- PC server has display screen which consists of ,Dustbin ID, Location information, Wet waste percentage, Dry waste percentage.
- Server will send data about the bin to Android app.
- On Android app, user can view the percentage of Dry bin and percentage of Wet bin.
- When any bin is about to full, user / driver will get a pop up message on app with text as well as in speech format using TTS.
- Dustbin side Wi-Fi, PC and android will be connected to same network, hence it is Intranet communication.

V. SYSTEM REVIEW

- Monitors the garbage bins and informs about the level of garbage collected in   the garbage bins.

- Keeps our Environment clean & green.

- Cost & Effort are less in this system.

- Reduces the human efforts required for garbage disposal management and segregation.

- Real time level of garbage filled is known to the authority.

- Based on Internet of Things which is now trending.

- This project can also be used in the" SMART CITY".

- This project is also helpful in the government project of "SWACHH BHARAT ABHIYAN''.

- This project can also be implemented at the Railway stations to monitor numerous dustbins.

- It can also be implemented in different areas by the BMC.

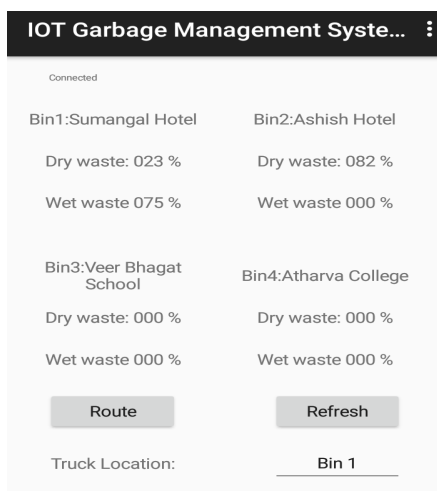## VI.   RESULT

Fig.1. Final output bin side

Fig.2. Final output Server side

VII.   FUTURE SCOPE

- This project will help to get the wet/dry data in a particular area and the system can be developed accordingly.
- The restriction of coverage area can be lifted up by using GPS in the future.
- Ultrasonic sensor is being used in this system to check the level of garbage in the dustbins but in future various other types of sensors can be used with the ultrasonic sensor to get more precise output and to take this system to another level.
- This system can be used in certain areas but as soon as it proves its credibility it can be used in all the big areas.

VIII.   CONCLUSION

This project is the implementation of smart garbage management system using ultrasonic sensor, microcontroller 8051 and Wi-Fi module. This system assures the clearing of dustbins soon when the garbage level reaches its maximum. In major cities the garbage collection vehicle visit the area's everyday depends on the population of the particular area and sometimes these dustbins may not be full.

Our System will inform the status of each and every dust bin in real time so that the concerned authority can send the garbage collection vehicle only when the dustbin is full. It ultimately helps to keep cleanliness in the society.

Therefore, the smart garbage management system makes the garbage collection more efficient.Garbage may consists of the unwanted material left over from City, Public area, Society, College, Homes etc.

This project is related to the "Smart City" and based on "Internet of Things" (IOT). So for smart lifestyle, cleanliness is needed, and cleanliness is begins with Garbage Bin. This project will helps to eradicate or minimize the garbage disposal problem.

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ACKNOWLEDGMENT

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