CHAPTER-1

INTRODUCTION

India is home to 1.21 billion people (based on 2011 Census) and the population has increased by almost 181.5 million (mn) since the last decade. The population growth in India has been high and it grew by 22% during 1991–2001 and 18% in the last decade. The beaming economy of the Indian sub-continent has also resulted in a rapid change in the demographics of the country from a rural to an urban society with a fast pace of urbanization, due to which an estimated 600 mn1 Indians will start living in urban areas by 2031. Urbanization brings in a multifaceted challenge related to urban environment tmanagement due to population growth, growing economic activities, industrialization, changing lifestyles, as well as introduction of new technologies bringing in a completely different set of challenges to be faced (e.g. E-waste management). Urban waste management is one such burning issue that has emerged out of the aforementioned factors and has led cities and towns to crumble below piles of garbage left within the open (to rot) as we have a tendency to fail to manage our waste due to a mismatch within the demand and India is home to 1.21 billion people (based on 2011 Census) and the population has increased by almost 181.5 million (mn) since the last decade. The population growth in India has been high and it grew by 22% during 1991–2001 and 18% in the last decade. The beaming economy of the Indian sub-continent has also resulted in a rapid change in the demographics of the country from a rural to an urban society with a fast pace of urbanization, due to which an estimated 600 mn1 Indians will start living in urban areas by 2031. Urbanization brings in a multifaceted challenge related to urban environment management due to population growth, growing economic activities, industrialization, changing lifestyles, as well as introduction of new technologies

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In this paper, we discuss a smart mechanism for improving the management of wastes in cities. The proposed system is based on the foundation of geographic

information systems (GIS), and optimization algorithms. It consists of an IoT based prototype with sensors to measure the waste volume in containers or wastebins, with facility to transmit information over the Internet. The system is simulated in for the city of Pune, using Open Data. The simulation covers a period of one month to model wastebin filling and waste collection. The simulations are done for performing an efficiency comparison of different ways for collection of wastes: Traditional method and dynamic on-demand solution, proposed work (intelligent) for several cases. The effect of this work is an combined system model for smart waste collection system. The rest of the paper is organized into the following sections

1.1 INTERNET OF THINGS

The **Internet of things** (**IoT**) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure. Experts estimate that the IoT will consist of about 30 billion objects by 2020.

The IoT allows objects to be sensed 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 in addition to reduced human intervention. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, virtual power plants, smart homes, intelligent transportation and smart cities."Things", in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, cameras streaming live feeds of wild animals in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring, or field operation devices that assist firefighters in search and rescue operations. Legal scholars suggest

regarding "things" as an "inextricable mixture of hardware, software, data and service". These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.

Applications

The applications for internet connected devices are extensive. Multiple categorizations have been suggested, most of which agree on a separation between consumer, enterprise (business), and infrastructure applications. George Osborne, the former British Chancellor of the Exchequer, posited that the Internet of things is the next stage of the information revolution and referenced the inter-connectivity of everything from urban transport to medical devices to household appliances.

The ability to network embedded devices with limited CPU, memory and power resources means that IoT finds applications in nearly every field. Such systems could be in charge of collecting information in settings ranging from natural ecosystems to buildings and factories, thereby finding applications in fields of environmental sensing and urban planning.

Intelligent shopping systems, for example, could monitor specific users' purchasing habits in a store by tracking their specific mobile phones. These users could then be provided with special offers on their favorite products, or even location of items that they need, which their fridge has automatically conveyed to the phone. Additional examples of sensing and actuating are reflected in applications that deal with heat, water, electricity and energy management, as well as cruise-assisting transportation systems. Other applications that the Internet of things can provide is enabling extended home security features and home automation. The concept of an "Internet of living things" has been proposed to describe networks of biological sensors that could use cloud-based analyses to allow users to study DNA or other molecules

CHAPTER-2
LITERATURE REVIEW

In the existing system there is no indication whether the dustbin is over flown. It is more time-consuming task and it is less effective. Even though the dustbin is not full the cleaner should visit the garbage bin. This process is time consuming and also makes the place unhygienic and it's also expensive.

2.1 Solid Waste Management

Prof M.R.Gidde, Prof Dr.V.V.Todkar, Prof K.K.Kokate, has proposed in Solid Waste Management – a case study about The collected data shows that the maximum proportion of refuse caused by food and garden wastes, proportion of the reuse caused by food and garden wastes, second highest was paper and the third highest was inert material. Percentage of Plastic carry bags was higher, where glass, ceramic and metals were nearly equal with each other.

Provision of litter bins at public places shall be made and there will compulsory segregation at all the sources. As the disposal site is at 8 km away and smaller vehicle are used for the transportation of solid waste, it would be desirable to set up transfer station to economize the expenditure on the transportation.

As manual separation plate form of solid waste is there at the disposal site in village Sawargad, it is the most positive way to achieve the recovery and reuse of material such as metal, plastic, glass and rubber etc. It should be done throughout the year. System should be based on Environmental protection rules (reduce, recycle, reuse and recover) Public awareness, political will and public participation as

essential for the successful implementation of the legal provisions an d to have an integrated approach towards sustainable management of municipal solid wastes.

There should be sufficient health and safety provisions for workers at all stages of waste handling. Annual report of addition of the strategies for collection of solid waste shall have to be formulated.

2.2 Community-based waste management for environmental management and income Generation in Low-income Areas

Kim Peters in association with Mazingira Institute has proposed the study that has contributed to an understanding of three aspects of solid waste management in sub-Saharan Africa: the relationship of gender to waste management, the need to promote urban agriculture and create demand for organic waste, and the environmental and health significance of solid waste management.

Waste management activities fit within the gender-assigned roles and responsibilities of women, including household maintenance, income generation and community management. When properly organized, composting provides women with the opportunity to stay close to their home or place of business so that they can engage in other activities related to their triple roles. However, many of the women who participated in this study complain that composting adds to their workload, or that other ventures suffered because of their work on the composting projects. Therefore, for many of the women, composting is not meeting their needs and is actually adding to their daily burden. For those groups generating high profits from composting, or those groups also engaging in urban agriculture, composting has improved their circumstances and opportunities.

The opportunity to engage in urban agriculture is therefore a very important determinant of the success of composting, Limited access to land, especially in informal settlements, makes urban agriculture a difficult strategy to promote for many of these women. There is a clear need for local authorities and NGOs to cooperate in

providing access to land for these purposes. This has already worked for the Undugu Society in gaining plots for urban agriculture in Kibera and Kinyago. The other NGOs, FSDA and Uvumbuzi, should consider working with the NCC and the Undugu Society to provide this opportunity to other composting groups.

Even so, the application of compost in urban areas provides only a limited market for the compost, especially considering the amount of organic waste generated. Ideally, the composting groups could be doing very well if they had access to rural markets. The application of urban compost in rural areas could be a significant step in reducing the spread of Nairobi's ecological footprint. These strategies rely not only on the support of rural farmers, but also on finding affordable means of transporting the waste and in creating the political will to support these initiatives.

The environmental importance of waste management has not been quantified in this study, but the anecdotal evidence reported by the women is sufficient to suggest that composting can have a significant impact in improving community health. In fact, many women continue to compost despite the limited financial opportunities it currently presents, suggesting that they are aware of and value the environmental improvements achieved through composting.

In conclusion, this study has demonstrated the important links that can be made between environmental management, income generation and community development. It has also identified waste management at the household and community level as a gendered activity. The success in composting in Nairobi has been achieved partially through the recognition of these roles and the targeting of appropriate community-based organizations. Ultimately, this study has shown that in order for community-based waste management to be a success, it must address more than the need for improved environmental management; it also must provide opportunities for income generation and the development of strong community bonds. Together with the support provided by NGOS, community-based waste management promotes internal solidarity around shared concerns, which in turn

creates a momentum for demanding greater accountability of government and increased room for participatory decision-making. In Nairobi, we are witnessing the beginning of such a process as CBOs and NGOs unite to deal with urban environmental problems and poverty, and the NCC recognizes that it must radically transform its approach to urban service provision.

2.3 Development drivers for waste management

This paper of Wilson, D. C. identifies six broad groups of drivers for development in waste management. Public health led to the emergence of formalized waste collection systems in the nineteenth century, and remains a key driver in developing countries. Environmental protection came to the forefront in the 1970s, with an initial focus on eliminating uncontrolled disposal, followed by the systematic increasing of technical standards. Today, developing countries seem still to be struggling with these first steps; while climate change is also emerging as a key driver. The resource value of waste, which allows people to make a living from discarded materials, was an important driver historically, and remains so in developing countries today. A current trend in developed countries is closing the loop, moving from the concept of 'end-of-pipe' waste management towards a more holistic resource management. Two underpinning groups of drivers are institutional and responsibility issues, and public awareness. There is no, one single driver for development in waste management: the balance between these six groups of drivers has varied over time, and will vary between countries depending on local circumstances, and between stakeholders depending on their perspective.

CHAPTER-3
PROPOSED SYSTEM

We propose a smart waste collection system on the basis of level of wastes present in the wastebins. The data obtained through sensors is transmitted over the Internet to a server for storage and processing mechanisms. It is used for monitoring the daily selection of wastebins, based on which the routes to pick several of the wastebins from different locations are decided. Every day, the workers receive the updated optimized routes in their navigational devices. The significant feature of this system is that it is designed to update from the previous experience and decide not only on the daily waste level status but also the predict future state with respect to factors like traffic congestion in an area where the wastebins are placed, cost-efficiency balance, and other factors that is difficult for humans to observe and analyse. Based on this historical data, the rate at which wastebins gets filled is easily analysed. As a result, it can be predicted before the overflow of wastes occurs in the wastebins that are placed in a specific location. Depending on economic requirements specified at early stages, the optimized selection of wastebins to be collected is expected.

3.1 Components Used

3.1.1 Ultra Sonic Sensor

The Parallax ultrasonic distance sensor provides precise, non-contact distance measurements from about 2 cm (0.8 inches) to 3 meters (3.3 yards). It is very easy to connect to BASIC Stamp® or Javelin Stamp microcontrollers, requiring only one I/O pin. The sensor works by transmitting an ultrasonic (well above human hearing range) burst and providing an output pulse that corresponds to the time required for the burst echo to return to the sensor. By measuring the echo pulse width the distance to target can easily be calculated.

3.1.2 Gas Sensor

A gas sensor is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimated.

3.1.3 Node MCU

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications (see related projects). NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

3.2 Architecture and Algorithm

• Access Network Interface: The data collected is sent to a remote server via a wireless link. For our work, WiFi is considered as a network access technology.

• Database: MySql is used for storage of all data collected by the sensors and the trucks.

In this project, the services of cloud computing have been totally utilized by using AWS. Various services provided by AWS are used throughout the development of this application to improve collection efficiency. Fig. 3.0.1 shows the system overview, whose components are briefed as follows.

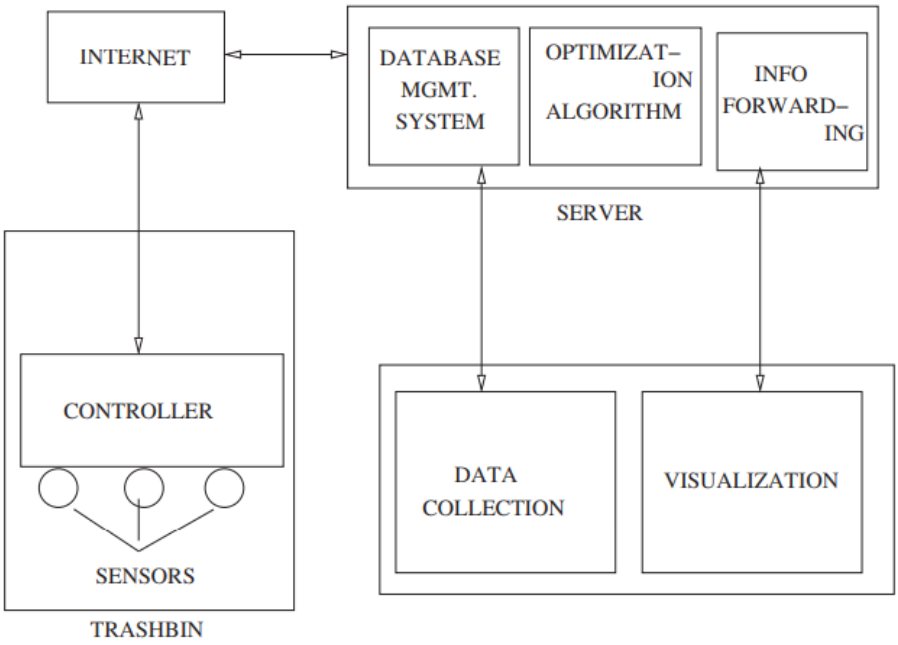

Fig 3.1 System Architecture

• Sensors: We can determine the waste level by measuring the distance from the top of the trash bin to the waste by sonar. The sonar that can be used in this prototype should provide measurement from 2cm to 400cm with 3mm accuracy, which is adequate for typical wastebins, e.g., Ultrasonic Ranging Module (HC-SR04). It is essential to optimize the battery usage for achieving bigger lifespan of the devices.

Sensing and data forwarding rates, and wireless technology used have a strong influence on energy consumption. Collection and forwarding of data can be done once or twice in a day.

• Access Network Interface: The data collected is sent to a remote server via a wireless link. For our work, WiFi is considered as a network access technology.

• Database: MySql is used for storage of all data collected by the sensors and the trucks.

• Optimization algorithms: Once the identification of wastebins have been done, shortest path for collection of same is done. In this work, algorithm 2 is followed for optimization.

• Information adaptation and forwarding: The destination path must be sent to the collectors in understandable format.

Inputs: Number of Wastes generated; Number of Wastebins embedded with IoT devices; Capacity of Wastebins; Nearest-neighbour shortest path algorithm for finding the optimized routes;

Description:

1: install several wastebins at multiple locations in the city;

2: embed each of wastebins with IoT devices;

3: define threshold value for wastes for each of the wastebins;

4: collect the wastes in the wastebins;

5: send the collected data (using algorithm 3) over the Internet to the servers;

6: store and process the information in the server;

7: calculate and send the optimized routes to send the vehicles for waste collection using algorithm 2;

8: empty the wastes from the identified wastebins;

9: use the collected data for monitoring daily selection of wastebins;

10: predict future traffic in specific location as per algorithm 4;

11: update the optimized routes in navigational devices;

Cases considered:

The cases considered are discussed as follows.

• Case 1: In this case, the servers receive message from sensors (embedded within wastebins) from all locations, for waste collection. In this case, vehicle is sent to all the location through the shortest path possible covering all the locations.

• Case 2: In this case, the servers receive message from the wastebins, where the waste level is more than 70%. In this case, vehicle is sent only to those identified locations from where the messages are received, through the shortest path possible covering all the identified locations.

• Case 3: In this case, the servers receive message from the wastebins, where the wastebins are filling at faster rate. In this case, vehicle is sent only to those identified locations from where the messages are received, through the shortest path possible covering all the identified locations.

3.2.1 Algorithm in waste bin sensors

Inputs:

Waste for each day of the week/weekends;

Output:

level of wastes in wastebins;

Description:

1: sense the level of wastes in wastebins every 2 hour during the weekday;

2: sense the level of wastes in wastebins every 1 hour during the weekend;

3: compute the rate at which wastebins is getting field;

4: if the rate is high every 1 or 2 hr, then send message to sever for sending the vehicle for waste collection;

5: if the wastebins level is more than 70% then send the message to the server to send the vehicle for waste collection;

6: if the wastebins level is below 50% then send the message to the server, not to send the vehicle for waste collection.

3.2.2 Analysis algorithm used by the servers

Inputs:

Waste level data for each day of the week/weekends;

Output:

Predicted waste level data for the coming days;

Description:

1: get waste level for every day of the week from all wastebins;

2: observe the changes in the waste levels during the week/weekends;

3: note down the drastic changes during the specific days(s);

4: when wastebins are getting filled faster, send alert to charge/change the batteries (area of research)

5: calculate the distance to wastebins which have significant rise in waste levels;

6: speed up the route optimization process for those days;

7: if the rate fill of wastebins in given area is very high, send alert to municipality to increase vehicles & wastebins;

3.2.3 Advantages and the Future Scope:

The advantage of this work is its contribution in making a Smart city. Among the many challenges that a city faces, waste management is of utmost importance. This is because, it is directly related to health of people living in the area. We are further extending this work to address problems of segregating different kind of wastes (e.g., solid, liquid etc.), and identifying different vehicles for collecting it. The optimization algorithms may be devised accordingly depending on the requirements.

Web Server Architecture

Web Server Architecture follows the following two approaches:

1. Concurrent Approach
2. Single-Process-Event-Driven Approach.

Concurrent Approach

Concurrent approach allows the web server to handle multiple client requests at the same time. It can be achieved by following methods:

- Multi-process
- Multi-threaded
- Hybrid method.

Multi-processing

In this a single process (parent process) initiates several single-threaded child processes and distribute incoming requests to these child processes. Each of the child processes are responsible for handling single request.

It is the responsibility of parent process to monitor the load and decide if processes should be killed or forked.

Multi-threaded

Unlike Multi-process, it creates multiple single-threaded process.

Hybrid

It is combination of above two approaches. In this approach multiple process are created and each process initiates multiple threads. Each of the threads handles one

connection. Using multiple threads in single process results in less load on system resources.

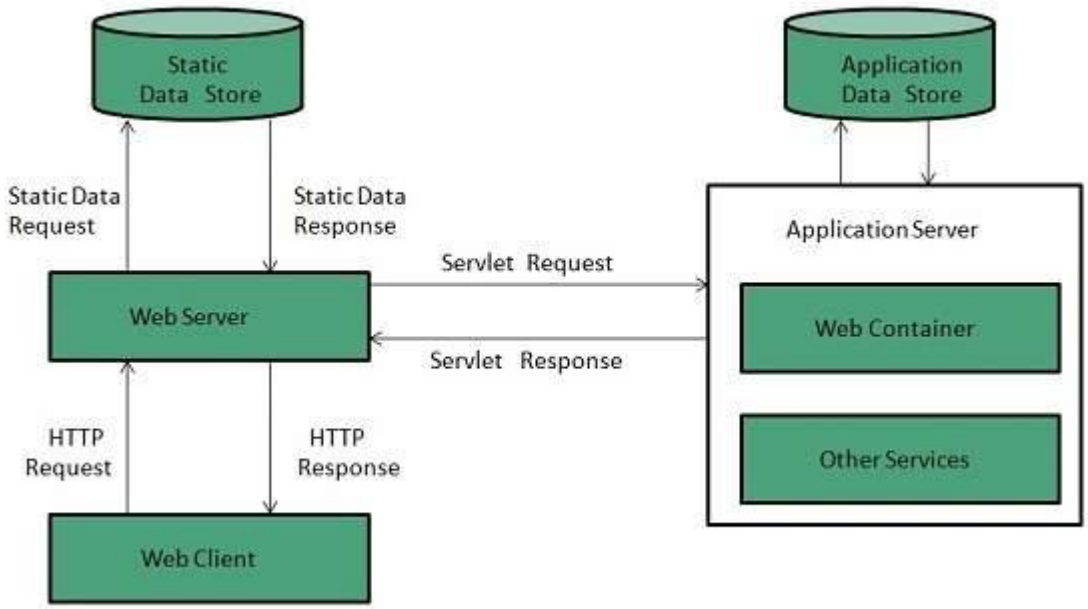

Fig 3.1 web server architecture

3.3 Module Description

The garbage management System Project is a Web-based application. In Garbage Management Project, we use PHP and MySQL database. It has three modules

1. Admin
2. Driver
3. User

1.Admin

Admin is the super user of the website who can manage everything on the website. Admin can log in through the login page.

Dashboard: In this section, admin can view all the detail in brief like new lodged complaints, Assigned lodged complaints, Rejected lodged complaints, Completed lodged complaints, total drivers,total bin cleaning in progress, and total bin cleaned.
Create Bin*:* In this section, admin can manage bin(add/update/del).
Driver*:* In this section, admin can manage driver(add/update/del).
Pages: In this section, admin can manage about us and contact us pages.
Complain: In this section, admin can view the complain which is received by users and assign it to the driver
Driver Complain Response: In this section, admin views the status of complain which is marked by or done by the driver.
Driver Bin Response: In this section, the admin views the status of the bin which is marked by or done by the driver.
Search: In this section, admin can search the bin allotted to the driver and lodge complaint by bin id and complain number respectively.
Reports: In this section, admin can generate between dates reports of the following details

2.Driver

Dashboard: In this section, driver can view all the detail, in brief, like assign complaints, in progress lodged complaints, competed lodged complaints, assign garbage bin, bin cleaning in progress, and total bin cleaned by him/her.

Assign Complain*:* In this section, the driver can view the assigned lodged complaint which is given by the admin, and also have the right to change the status of work.

Assign Garbage Bin: In this section, the driver can view the assigned garbage bin which is given by admin, and also have right to change the status of work.

Search: In this section, driver can search the bin allotted to him/her and lodge complaint by bin id and complain number respectively.

Reports: In this section, driver can view reports of the following details.

a) Collected Bin Report: In this report, driver can view the count of work assigned, completed work, and remaining work between two dates.

b) Lodged Complain Report: In this report, driver can view the count of assign complain, completed complain and remaining complain between two dates.

CHAPTER-4
SYSTEM REQUIREMENTS

In this chapter, the system design, objective of this system along with system environment and modules used in this system are briefly explained with required diagram.

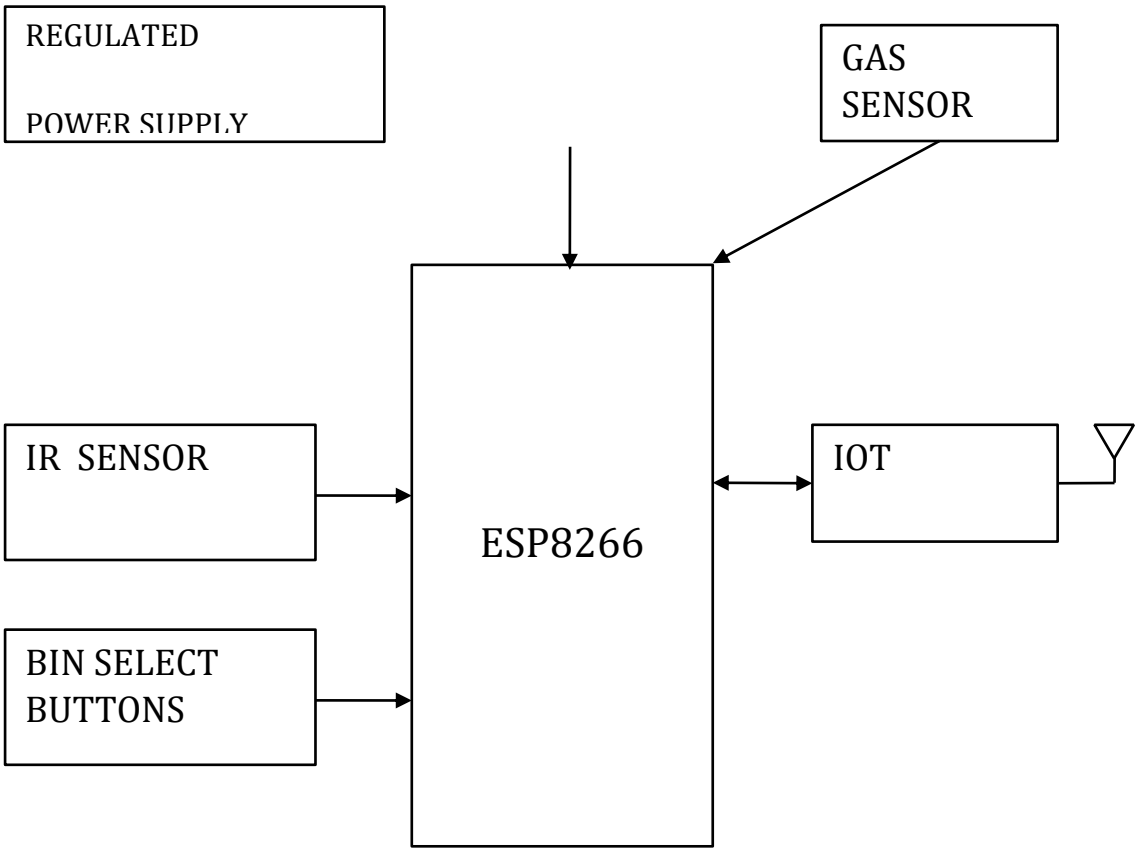

Fig 4.1 System Design

SYSTEM ENVIRONMENT

The technologies used in the application and its hardware and software requirements are briefly explained below.

TECHNOLOGIES USED

i) IOT

Cloud computing refers to the on-demand availability of computer system resources, particularly data storage (cloud storage) and computational power, without the need for the user to actively manage them. Functions in large clouds are frequently distributed over numerous locations, each of which is a datacenter. Cloud computing relies on resource sharing to accomplish coherence and is often based on a "pay-as-you-go" approach, which can assist reduce capital costs but can also result in unwanted running costs for uninformed users.

In this project, the services of cloud computing has been totally utilized by using AWS. Various services provided by AWS are used throughout the development of this application.

ii) UI UX Designing

UI refers to the creation of the interface, which can be visual or developed mainly with languages such as HTML, CSS, or Javascript, while UX focuses on usability, focusing on analysis and social relationships. The UI designer is primarily responsible for the visual aspect of the interface, while the UX focuses on ensuring that the navigation and actions performed by the user are consistent, the UI is responsible for deciding the user's journey, while the UX focuses on the processes and actions that trigger the use.

HARDWARE & SOFTWARE TOOLS:

1. Development Device - PC with Windows 7 OS
2. Target Device - ESP8266-12E
3. C Variant - Embedded 'C'
4. IDE - Arduino IDE
5. Compiler - AVR-gcc
6. Programmer - Inbuilt ICSP Programmer

WEB DEVELOPMENT TOOLS:

1. Development Device - PC with Windows 7 OS
2. Target Device - PC with Windows 7 OS as Server
3. Backend Language - PHP
4. Database - Flat file Based OR MYSQL
5. Markup Language - HTML 5 with CSS 3
6. PC Application - XAMP Server

DESCRIPTION OF MODULES

The development of this application has been divided into six modules as listed below.

- User authentication
- Flat File database
- Data Display
- Hardware interface

User authentication

User authentication is a security process that prevents unauthorized users from accessing your device or network. It's a login procedure where an application requests personalized passwords to give you authorized access to it. If a user lacks the proper login rights to the network, their authentication fails. User authentication is effective in reducing cyber threats to the barest minimum. The first step is to input your login credentials on a login page or username and password bar. The next step is to authenticate your login information. The authentication process starts when the server you are trying to access decrypts the personalized information it receives. This information is then compared with the credentials you have successfully keyed and stored in the database. Finally, the computer either approves or declines the authentication request you made.

Flat file Database

A Flat file database is also known as the text database. In the Flat file database, each line of the plain text file holds only one record. These records are separated using delimiters, such as tabs and commas. The advantage of a flat-file

database is that it is easy to understand and helps us to sort the results easily. It is an excellent option for small databases. It requires less hardware and software components. Flat file databases usually have a simple structure, reflecting the straightforward nature of the underlying data. The first row of a flat file contains the field name for each column in the database, and each row after the first represents a single record.

"Flat file database" may be defined very narrowly, or more broadly. The narrower interpretation is correct in database theory; the broader covers the term as generally used. Strictly, a flat file database should consist of nothing but data and, if records vary in length, delimiters. More broadly, the term refers to any database which exists in a single file in the form of rows and columns, with no relationships or links between records and fields except the table structure.

Terms used to describe different aspects of a database and its tools differ from one implementation to the next, but the concepts remain the same. FileMaker uses the term "Find", while MySQL uses the term "Query"; but the concept is the same. FileMaker "files", in version 7 and above, are equivalent to MySQL "databases", and so forth. To avoid confusing the reader, one consistent set of terms is used throughout this article.

Plain text files usually contain one record per line, There are different conventions for depicting data. In comma-separated values and delimiter-separated values files, fields can be separated by delimiters such as comma or tab characters. In other cases, each field may have a fixed length; short values may be padded with space characters. Extra formatting may be needed to avoid delimiter collision. More complex solutions are markup languages and programming languages.

The term has generally implied a small, simple database. As computer memory has become cheaper, more sophisticated databases can now be entirely held in memory

for faster access. These newer databases would not generally be referred to as flat-file databases.

Using delimiters incurs some overhead in locating them every time they are processed (unlike fixed-width formatting), which may have performance implications. However, use of character delimiters (especially commas) is also a crude form of data compression which may assist overall performance by reducing data volumes — especially for data transmission purposes. Use of character delimiters which include a length component (Declarative notation) is comparatively rare but vastly reduces the overhead associated with locating the extent of each field.

However, the basic terms "record" and "field" are used in nearly every flat file database implementation.

Data Display

Companies and organizations have websites to display content including text, images, and data that introduce themselves to their users. Therefore, using a database to store essential information is the most common approach . The data is stored in a database. Database management system like MySQL or FlatFile perform tasks to present the data accurately on the webpage. We fetch data from localserver database and display on the login page. This is done with the help of HTML, JS ,CSS ,PHP.

Hardware Interface

Hardware interfaces exist in many of the components such as the various buses, storage devices, other I/O devices, etc.It contains electronic components of the computer used to process data Hardware interfaces refer to the connection and communication of different devices. Each type of hardware interface defines a method of communicating between a peripheral and the central processor. The process of connecting devices together so that they can exchange the information is called interfacing. The data from our hardware components is fetched and written in the flat file, which is then displayed on the page.

HTML

HTML, or Hyper-text Markup Language, is used by web programmers to describe the contents of a web page. It is not a programming language. You simply use HTML to indicate what a certain chunk of text is-such as a paragraph, a heading or specially formatted text. All HTML directives are specified using matched sets of angle brackets and are usually called *tags*.

php

php is a server-side scripting language designed for web development but also used as a general-purpose programming language. as of january 2013, php was installed on more than 240 million websites (39% of those sampled) and 2.1 million web servers. originally created by rasmus lerdorf in 1994,[5]the reference implementation of php (powered by the zend engine) is now produced by the php group, while php originally stood for personal home page, it now stands for php: hypertext preprocessor, which is a recursive backronym.

php code can be simply mixed with html code, or it can be used in combination with various templating engines and web frameworks. php code is usually processed by a php interpreter, which is usually implemented as a web server's native module or a common gateway interface (cgi) executable. after the php code is interpreted and executed, the web server sends the resulting output to its client, usually in the form of a part of the generated web page; for example, php code can generate a web page's html code, an image, or some other data. php has also evolved to include a command-line interface (cli) capability and can be used in standalone graphical applications.

The standard php interpreter, powered by the zend engine, is free software released under the php license. php has been widely ported and can be deployed on most web servers on almost every operating system and platform, free of charge.

Despite its popularity, no written specification or standard existed for the php language until 2014, leaving the canonical php interpreter as a de factostandard. since 2014, there is ongoing work on creating a formal php specification.

During the 2010s php as a platform has matured significantly, largely by influence from other software communities and projects such as npm. in addition to standard library improvements, the work of php-fig in the form of psr-initiatives, composer dependency manager and the packagist repository have been a significant factor.

Uses:

- PHP is a general-purpose scripting language that is especially suited to server-side web development, in which case PHP generally runs on a web server. Any PHP code in a requested file is executed by the PHP runtime, usually to create dynamic web page content or dynamic images used on websites or elsewhere.
- It can also be used for command-line scripting and client-side graphical user interface (GUI) applications. PHP can be deployed on most web servers, many operating systems and platforms, and can be used with many relational database management systems (RDBMS).
- Most web hosting providers support PHP for use by their clients. It is available free of charge, and the PHP Group provides the complete source code for users to build, customize and extend for their own use.

Wifi

Wi-Fi has emerged as the single most popular wireless network protocol of the 21st century. While other wireless protocols work better in certain situations, Wi-Fi technology powers most home networks, many business local area networks and public hotspot networks.

Some people erroneously label all kinds of wireless networking as “Wi-Fi” when in reality Wi-Fi is just one of many wireless technologies

Wi-Fi can be configured in one of two modes, called infrastructure mode Wi-Fi and ad-hoc mode Wi-Fi. Nearly all Wi-Fi setups use infrastructure mode, where client devices within range all connect to and communicate through a central wireless access point. Ad hoc Wi-Fi allows clients to connect directly to each other without the use of an access point.

Wi-Fi consists of a data link layer protocol that runs over any of several different physical later (PHY) links. The data layer supports a special Media Access Control (MAC) protocol that uses collision avoidance techniques (technically called Carrier Sense Multiple Access with Collision Avoidance or *CSMA/CA* to help handle many clients on the network communicating at once

Wi-Fi supports the concept of channels similar to those of televisions. Each Wi-Fi channel utilizes a specific frequency range within the larger signal bands (2.4 GHz or 5 GHz). This allows local networks in close physical proximity to communicate without interfering with each other. Wi-Fi protocols additionally test the quality of the signal between two devices and adjust the connection’s data rate down if needed to increase reliability. The necessary protocol logic is embedded in specialized device firmware pre-installed by the manufacturer.

CHAPTER-5

RESULT AND IMPLEMENTATION

The sensor detects objects by emitting a short ultrasonic burst and then "listening" for the echo. Under control of a host microcontroller (trigger pulse), the sensor emits a short 40 kHz (ultrasonic) burst. This burst travels through the air at about 1130 feet per second, hits an object and then bounces back to the sensor. The sensor provides an output pulse to the host that will terminate when the echo is detected, hence the width of this pulse corresponds to the distance to the target.

OUTPUT:

5.1 LOGIN MODULE(DRIVER):

Login: Helps the garbage cleaner to know about the level and decomposition of garbage in dust-bin and also helps the admin level users to access all the information and see the ratings of the driver.

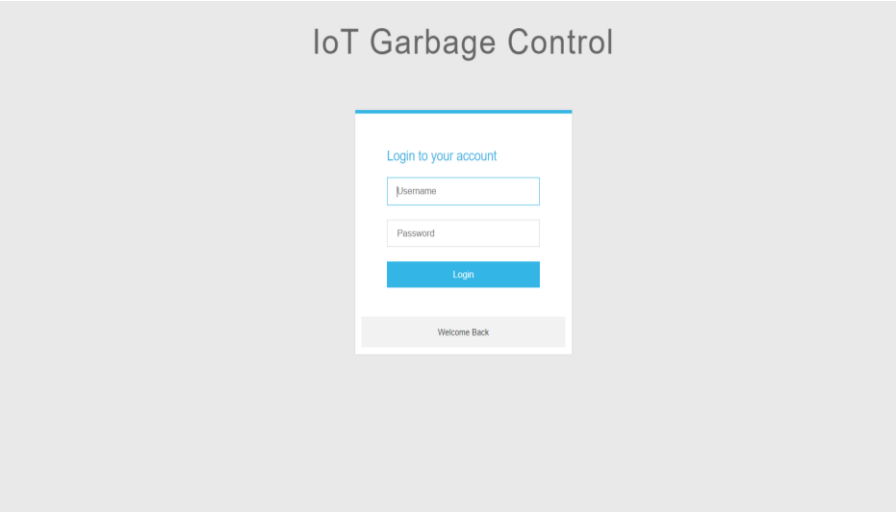

Fig 5.1 Login Module

5.2 DASHBOARD(DRIVER):

This output shows us the dashboard of the driver and it shows about the details of the dustbin and shows the decomposition level and indicates whether it needs to be cleaned or not.

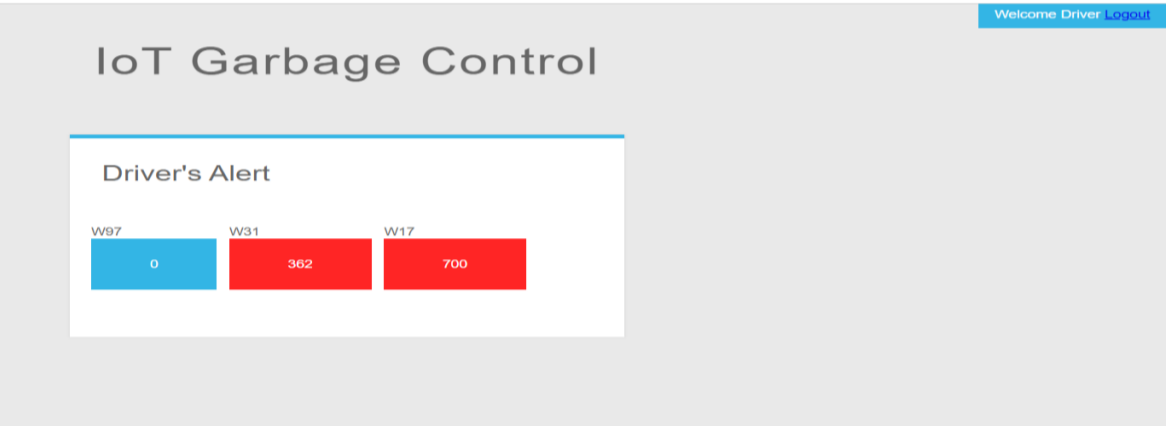

Fig 5.2 Driver Dashboard

5.3 DASH BOARD (ADMIN LEVEL):

This output is accessible for the admin level and it shows the decomposition level and level of waste in the particular dustbin.

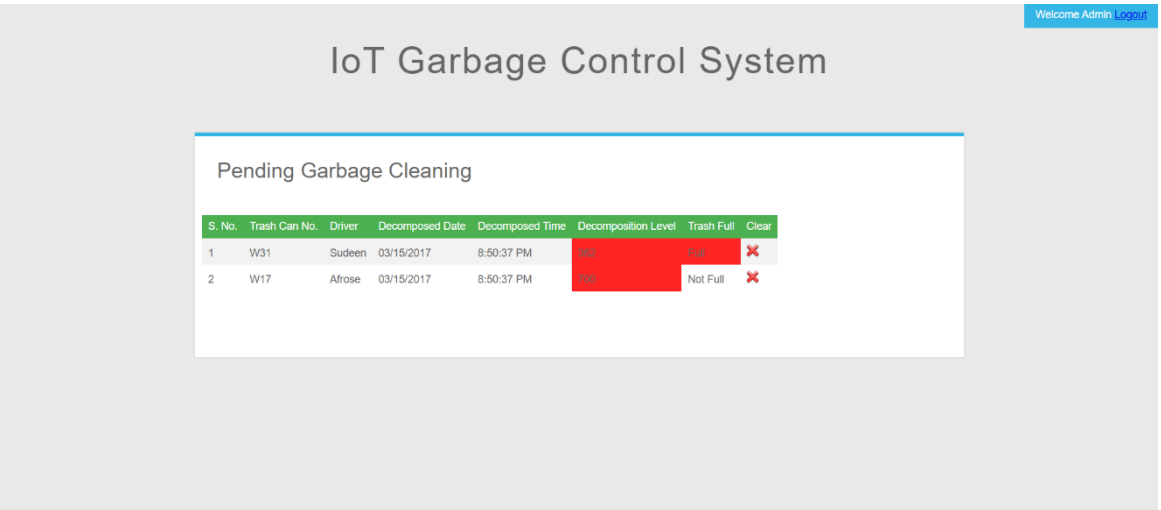

Fig 5.3 Admin Dashboard

CHAPTER-6
CONCLUSION

We presented an intelligent waste collection system. The system is based on IoT sensing prototype. It is responsible for measuring the waste level in the wastebins and later send this data (through Internet) to a server for storage and processing. This data helps to compute the optimized collection routes for the workers. In future, we would like to enhance the system for different kind of wastes, namely solid and liquid wastes.