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Smart Garbage and Waste Collection Bin Using IOT

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Abstract— **Many times, in our city we see that the garbage bins or dustbins placed at public places are overloaded. It creates unhygienic conditions for people as well as ugliness to that place leaving bad smell. To avoid all such situations, we are going to implement a project called IoT Based Smart Garbage and Waste Collection bins. The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different and heterogeneous end systems, while providing open access to selected subsets of data for the development of a plethora of digital services. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of the environment also has adverse effects on the health of the society.**

This an advanced method in which waste management is automated. This project IoT Garbage and waste 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.. These dustbins are interfaced with microcontroller- based system having IR wireless systems along with central system showing current status of garbage, on mobile web browser with html page by Wi-Fi. Hence the status will be updated on to the html page. Major part of our project depends upon the working of the Wi-Fi module; essential for its implementation. The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision.

KEYWORDS: GSM Module, Solid waste, MAC micro controller

I. INTRODUCTION

A. Overview of our project:

Internet and its applications have become an integral part of today's human lifestyle. It has become an essential tool in every aspect. Due to the tremendous demand and necessity, researchers went beyond connecting just computers into the web. These researches led to the birth of a sensational gizmo, Internet of Things (IoT). Communication over the internet has grown from user - user interaction to device – device interactions these days. The IoT concepts were proposed years back but still it's in the initial stage of commercial deployment. Home automation industry and transportation industries are seeing rapid growth with IoT. Yet not many articles have been published in this field of study. This paper aims in structuring a state of the art review on IoT. The technology, history and applications have been discussed briefly along with various statistics. Since most of the process is done through the internet we must have an active high speed internet connection. All the equipment's we use in our day to day life can be controlled and monitored using the IoT. A majority of process is done with the help of sensors in IoT. Sensors are deployed everywhere and these sensors convert raw physical data into digital signals and transmits them to its control center. By this way we can monitor environment changes remotely from any part of the world via internet. This systems architecture would be based on context of operations and processes in real-time scenarios.

Smart garbage bin works in the similar manner with the combination of sensors namely weight sensor and odour sensor that indicates its weight and different levels its smell respectively. The sensors will show us the various levels of garbage in the dustbins and also the weight sensor gets activated to send its output ahead when its threshold level is crossed. This project IOT 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 LCD screen, Wi-Fi module for sending data and a buzzer. The system is powered by a 12V transformer. The LCD screen is used to display the status of the level of garbage collected in the bins.

II. SCOPE OF THE PROJECT

As for future works we can add maps to guide civic agencies to the exact location of the issue. RTI could be linked to the application so that users can complaint.

- The government agency is provided with a list Of registered complaints along with the type of problem, location and date and time of complaint to help them schedule their course of actions.
- When the user confirms this rectification the complaint should be closed.
- If the user fails to confirm the rectification the complaint would get expired after a particular duration.
- The app requires the cooperation of the civic agencies so the complaints are addressed regularly or perhaps bring to notice of the people the cause of the issue and

why it cannot be rectified in the near time.

- This application would not only help the people to easily register complaints and support but also help to bring awareness to the civic agencies and prepare plan for rectifying.

III . DATASET DESCRIPTION

The section describes the smart garbage dataset providing information on collection and management of waste performance. The section provides details on the attributes, instances, and sensors used in the domain.

MAIL ID –The attributes contain the information about the mail id for sharing the information to the authority.

LOCATION –The attribute contains the information about the location when the garbage has been overflowed.

CITY - The attribute holds the information about the city where the garbage should be collected.

PHOTO – The attribute holds the information about the photo to be captured and send to the authority.

SENDER – The attribute describes that which person who sends the complaint.

RECEIVER – The attribute describes that which person who receives the complaint i.e authority person.

COMPLAINT – The attribute holds the information about who can raise the complaint.

PHONE NUMBER – The attribute contains the information about the person phone number who raise the complaint

FLOAT SENSOR – Float level sensors are continuous level sensors featuring a magnetic float that rises and falls as liquid levels change.

LM35 COMPARITOR – Trigger device alarm beyond particular temperature.

VARIABLE RESISTOR – A variable resistor is a resistor of which the electric resistance value can be adjusted.

BOURNS REGISTOR – Bourns is known as a leading supplier of resistive products with a broad line of resistive components that meet a diverse range of application needs.

MICRO SSD CONTROLLER – An mSATA SSD has a smaller form factor than a standard SSD and is designed for use with portable, power- constrained devices such as laptops, tablets and netbooks.

LCD DISPLAY – A LCD material is sandwiched between two sheets of glass to display the message.

PRESSURE SENSOR – A pressure sensor is a device or instrument which is able to measure the pressure in gases or liquids.

IV. LITERATURE SURVEY

This is not an original idea, for the implementation of smart garbage bin; the idea has existed for many years, After the IoT field finding its grip in our lives.

The authors in [1] have made a quantitative analysis between existing dustbins and their serving population. The study first analyses the spatial distribution of dustbins in some areas of Dhaka city using average nearest neighbor. neighbor functions of GIS. Remarkably, the spatial circulation of the current dustbins has appeared to be dominatingly 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. The extent of pollution caused by the existing dustbins was calculated using spatial analyst functions of GIS. It is found that all the dustbins are burnt with wastes and causing pollution to the environment. The results thus obtained would help to understand the present situation of the waste management of Dhaka city and to optimally place the required number of dustbins to prevent further pollution to environment.

The authors in[2] have equipped the smart bins with ultrasonic sensors which measure the level of dustbin being filled up.

The container is divided into three levels of garbage being collected in it. Every time the garbage crosses a level the sensors receives the data of the filled level.

This data is further sent to the garbage analyzer as instant message using GSM module. Placing three ultrasonic sensors at three different levels of the container may be a disadvantage as the cost of the dustbin increases due to the sensors and also the sensors can be damaged due to the rough action by the users.

An IoT-based smart garbage system (SGS) is proposed to reduce the amount of food waste by the authors in [3]. In an SGS, battery-based smart garbage bins (SGBs) exchange information with each other using wireless mesh networks, and a router and server collect and analyze the information for service provisioning.

Furthermore, the SGS 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.

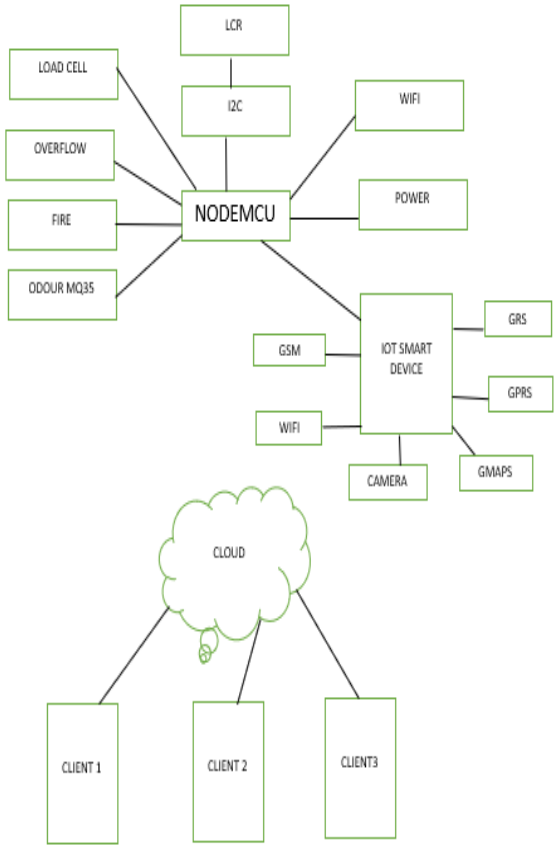
The proposed SGS had been functioned as a pilot project in Gangnam district, Seoul, Republic of Korea, for a one-year period. The test demonstrated that the normal measure of food waste could be decreased by 33%

The authors in [4] has built a framework in which a Camera will be set at each garbage collection point alongside load cell sensor at base of the trash can.

S.no	Name of the Paper	Author(s)	Year	Objective	Advantage
1	Smart Dustbin An Efficient Garbage Monitoring System	Monika K A, Nikitha Rao, Prapulla S B, Shobha G	2016	1. To manage waste efficiently 2. To avoid unnecessary lumping of waste on roadside	1. Contribute a lot towards clean and hygienic environment in building a smart city
2	Garbage monitoring system using IoT	Anitha A	2017	1. To clean the city more efficiently	2. Reducing cost 3. Resource optimization 4. Environment will remain safe and free from all kinds of disease
3	An IOT based Dynamic Garbage Level Monitoring System using Raspberry-pi	Harshita A. Gawad*, Suraj Kadam, Dona Jain, Nirav Patel	2017	To keep the cities clean. To monitor the garbage bins and informs about the level of garbage bins	1. Most efficient ways to keep our environment clean and green.
4	Quantitative Analysis of Spatial Pattern of Dustbins and its Pollution in Dhaka City	M.T.H. Shubho, M.T Hassan, M.R. Hossain M. N. Neema	2019	To understand the present situation of the waste management of city and to optimally place the required number of dustbins to prevent further pollution to env.	Most effienct ways to keep our environment clean and green.
5	Smart Bin Implementation for Smart Cities	Narayan Sharma, Nirman Singha, Tanmoy Dutta	2015	Measure the level of dustbin being filled up	Reducing cost
6	Garbage and Street Light Monitoring System Using Internet of Things	R.M.Sahu, Akshay Godase, Pramod Shinde, Reshma Shinde	2016	Camera will be set at each garbage collection point alongside load cell sensor at base of the trash can.	Contribute a lot towards clean and hygienic environment

V . METHODOLOGY PHASES

BLOCK DIAGRAM



A. Planning Phase:

Planning phase is the first phase and the most important phase in an early phase of development project. The planning for this project is to develop a garbage monitoring system based on Internet of Things (IoT). This suggestion project needs to be discussed and get supervisor agreement before proceeding to another phase.

B. Requirement Analysis Phase:

For this phase, a lot of information about the system is gathered. As the system is about garbage monitoring system based on Internet of Things (IoT), a lot of information about the previous or latest technology of garbage monitoring system is identified. The most important information needed is a user requirement. After requiring a user requirement, information about garbage, ultrasonic sensor, IoT, GSM Modem, Liquid Crystal Display and Node MCU are identified.

C. Design Phase:

Design phase is the third phase or stage that is used to show the flow of the system so that it will be successful. After a process of gathering all the information required in this system, a framework is done to show the flow of the whole system. A framework is important to make a flow system be easy to be understood.

In this phase, a design of context diagram, data flow diagram and entity relationship diagram to show the flow of the system specifically. Then, a setup of an ultrasonic sensor with breadboard, LCD, and Node MCU is created. This system is able to show the flow of garbage monitor system based on Internet of Things (IoT).

D. Implementation Phase:

After gathering all the information and design has been created, this phase is to develop a connection for an ultrasonic sensor using code. If there is any errors or changes needed, it will be solved at this phase

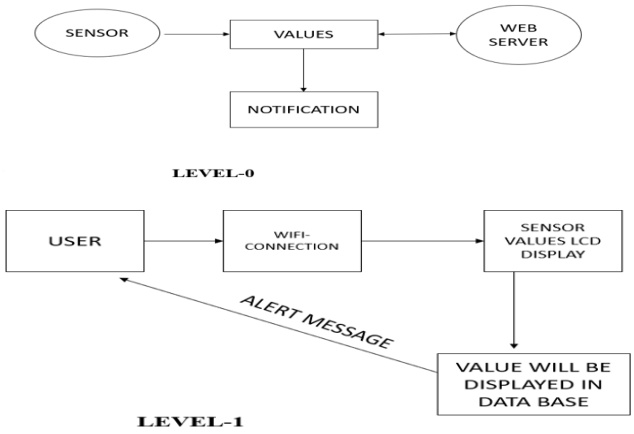
E. Testing Phase:

During testing phase, the system will be tested. During this phase, if there is any problem arise or any changes needed, it will be solved immediately by turning back to design phase to make a revision of the flow.

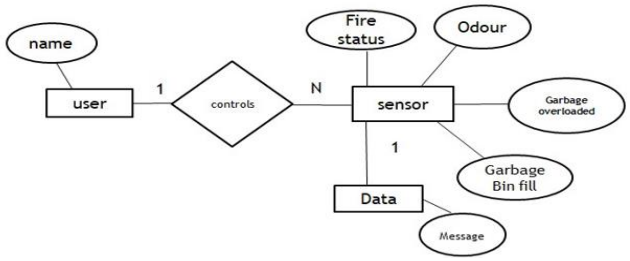
F. Deployment Phase:

After the system has been completely developed and there are no more errors after testing, the system will be deployed for its end of this product.

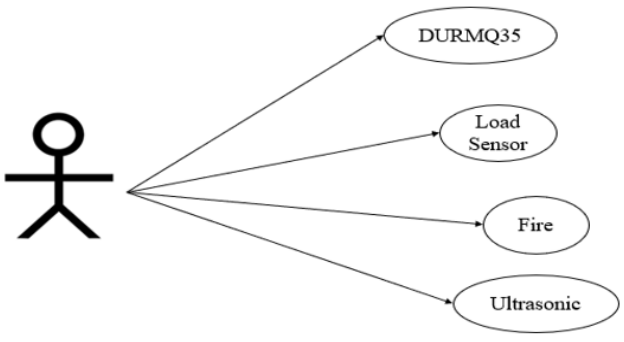
VI. DATA FLOW DIAGRAM (DFD):

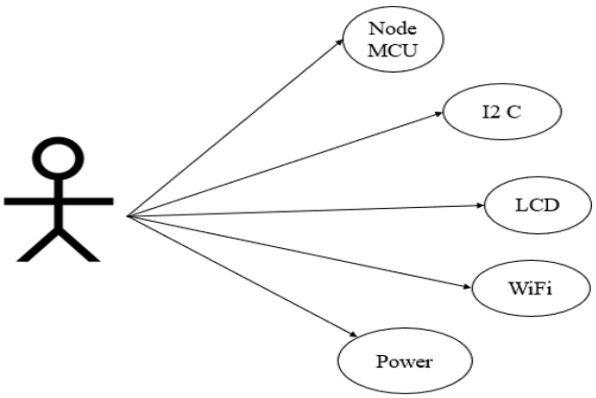


VII. ENTITY RELATIONSHIP DIAGRAM



VIII. USE CASE DIAGRAM





IX. CONCLUSION AND FUTURE ENHANCEMENT

- The mission towards "Clean India" is leading everyone to take initiatives, introduce methods or application that helps the same. There are initiatives to clean up the city but there is a gap between the people who go through problems like potholes, garbage, broken lights, sewage everyday and who have authority and responsibility to solve them.
- The layman finds difficult to take a step forward and complain to civic agency due to improper means of communication and time constraint.
- complaints is the need of the hour. As for future works we can add maps to guide civic agencies to the exact location of the issue.
- RTI could be linked to the application so that users can complaint if their issue has not been rectified for a long time.
- If the user fails to confirm the rectification the complaint would get expired after a particular duration. Right now the target audience of the application is the people of Bangalore City.
- As cleaning the city is not only the duty of civic agency but it is also the duty of citizens, a through medium through which citizens can report
- The app requires the cooperation of the civic agencies so the complaints are addressed regularly or perhaps bring to notice of the people the cause of the issue and why it cannot be rectified in the near time

REFERENCES

Extensive study about the topic was performed and various methodologies used in this domain were found. Predominantly there were two types of analysis: exploratory and predictive. Exploratory analysis visualizes events that have occurred in the past and provides meaningful insights that can be used for decision making

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