Waste Management System

A project report submitted in partial fulfillment of the requirements for the

Second Year of Computer Engineering

by

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2020-21

This work is dedicated to my family.
I am very thankful for their motivation and support.

Internal Approval Sheet

CERTIFICATE

This is to certify that the project entitled **"Waste Management System"** is a bonafide work of **Soham Khochare(9615),Emmanuel Gudinho(9609) and Omkar Surve(9643)** submitted to the University of Mumbai in partial fulfillment of the requirement for term work submission of Mini Project 1- A Second year Computer Engineering.

(Name and sign)
Supervisor/Guide

(Name and sign)
Head of Department

(Name and sign) Principal

Approval Sheet

Project Report Approval

This project report entitled **Waste Management System** by **Soham Khochare(9615),Emmanuel Gudinho(9609) and Omkar Surve(9643)**is approved for the Term work submission of Mini Project –1 A, Second year Computer Engineering

Examiners 1.———————————

2.———————————

Date:

Place:

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Soham Khochare(9615)(sign)_____

Omkar Surve(9643)(sign)_____

Emmanuel Gudinho(9609)(sign)_____

Date: 31st October, 2022.

Abstract

The project is aimed at developing an online waste management system with the help of HTML, CSS and Javascript. The entire project has been developed keeping in mind the distributed client server computing technology. The proposed system for waste management will use various sensors for sensing the type of waste and separate the waste in different categories and inform the respective authorities to collect the waste container. This system will prevent diseases amongst health workers and also save time. This system will be more efficient and convenient as compared to the current waste management system and improve the overall cleanliness around our society.

Acknowledgments

We have great pleasure in presenting the report on **"Waste Management System"**. I take this opportunity to express my sincere thanks towards the guide [Prof, Heena Pendhari], C.R.C.E, Bandra (W), Mumbai, for providing the technical guidelines, and the suggestions regarding the line of this work. We enjoyed discussing the work progress with him during our visits to department.

We thank Dr. Sujata Deshmukh, Head of Information Technology Dept., Principal and the management of C.R.C.E., Mumbai for encouragement and providing necessary infrastructure for pursuing the project.

We also thank all non-teaching staff for their valuable support, to complete our project.

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Date: October 31, 2022

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Chapter 1

1.1 What is “Waste Management”

Waste management or **waste disposal** includes the processes and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process and waste-related laws, technologies, economic mechanisms.Proper management of waste is important for building sustainable and liveable cities, but it remains a challenge for many developing countries and cities. A report found that effective waste management is relatively expensive, usually comprising 20%–50% of municipal budgets. Operating this essential municipal service requires integrated systems that are efficient, sustainable, and socially supported. A large portion of waste management practices deal with municipal solid waste(MSW) which is the bulk of the waste that is created by household, industrial, and commercial activity. According to the Intergovernmental Panel on Climate Change (IPCC), municipal solid waste is expected to reach approximately 3.4 Gt by 2050; however, policies and lawmaking can reduce the amount of waste produced in different areas and cities of the world. Measures of waste management include measures for integrated techno-economic mechanisms of a circular economy, effective disposal facilities, export and import control[1] and optimal sustainable design of products that are produced.The aim of waste management is to reduce the dangerous effects of such waste on the environment and human health. A big part of waste management deals with municipal solid waste, which is created by industrial, commercial, and household activity.

1.2 Importance of “Waste Management System”

Management and disposal of waste has always been a problem in our country for a very long time. Dumping of waste in open sites is a common sight these days. Due to dumping of waste in an open environment it has adverse effects on the health of human beings as well as the health of plants and animals. In India waste collectors play an important role in segregating and recycling waste. Due to which many waste collectors have chances of getting prone to many diseases. This can be prevented by using IoT devices for segregating and recycling waste. Waste management reduces the effect of waste on the environment, health, and so on. It can also help reuse or recycle resources, such as; paper, cans, glass, and so on. There are various types of waste management that include the disposal of solid, liquid, gaseous, or hazardous substances.Another important point to consider is that segregated waste is often cheaper to dispose of because it does not require as much manual or mechanical sorting as mixed waste. Having proper waste management can result in the availability of valuable materials to reuse. This can save money while potentially creating new jobs and business opportunities. Reducing, reusing and recycling your waste is important for the environment, but it can also be profitable. It decreases the amount of waste for disposal, saves space in landfills, and conserves natural resources.

1.3 Objectives

The overall objectives of the waste management assessment are summarized below:
(i) to assess the activities involved for the proposed and determine the type, nature and estimated volumes of waste to be generated;
(ii) to identify any potential environmental impacts from the generation of waste at the site;
(iii) to recommend appropriate waste handling and disposal measures / routings in accordance with the current legislative and administrative requirements; and
(iv) to categorize waste material where practicable (inert material / waste fractions) for disposal considerations i.e. public filling areas / landfill.

1.4 Motivation

The motivation for this project came from our daily observation. We have observed in our city that there were heaps of waste lying around without any attempts to clean it, this led to spreading of diseases and degradation of general hygiene of the place. We have also observed that segregation of waste takes a lot of time and most of the process is done manually. Due to which many sanitation workers were put at risk of deadly diseases. From our research we also got to know the importance of analyzing waste. Improper analysis of waste sometimes also leads to fires in dumping grounds and landfills which further lead to pollution. These reasons gave us enough evidence that our country needed a newly revolutionized Waste Management System.

Chapter 2

Literature Review

Title of Research Paper	Authors	Year of Publishing	
1.Waste Management Improvement in Cities using Iot	Ajitkumar Shitole	May,2020	1)This paper deals with the concept of waste management and the smart system for waste management with higher benefits to the society.The proposed system for waste management will use various sensors for sensing the type of waste and separate the waste in different categories and actuator to inform the management to collect the waste container. This system will save money and time compared to the already available process of waste management and also improves the society's cleanliness. 2)The System in this paper also had a wet and dry waste separator. As soon as waste was kept on the area where the two plates met, the moisture sensor would sense the water content by creating a voltage which would be proportional to the specific moisture level and hence the water content in the waste was calculated. As a result the moisture content of the wet waste was more than that of the dry waste hence the waste was segregated into the respective compartments using a DC motor. This process was repeated for all smart dustbins. 3)The paper contained details about how

			to establish a Waste Management System using IoT and its applications. With proper use of integrity of software and hardware, this idea can develop better waste control in overpopulated cities and towns. The curriculum of this paper was to just focus on existing systems and solutions to improve the existing system.
2.Waste Management using internet of things(IoT)	1.Supratim Auddy 2.Himadri Nath Saha	August,2017	1. It throws light upon the importance of waste management in India . Poorly managed waste has direct implications to the urban environment, leading to air, water, and soil pollution. 2. This paper gives an overview of waste management and different methods of waste disposal 3. It has come up with an IOT based Smart Solution. A smart bin with a sensor motor which tells us how much waste has been accumulated .It also wirelessly transmits the fill level information to the cloud server. 4. So instead of blindly collecting waste using static routes and schedules users can play in smart waste collection routes and schedules based on where collection is actually needed. This smart solution helps users to need less trucks, less fuel and less time for their collections reducing operational cost by up to 80%.
3.Household Waste Management System using	1.Sonali Dubey 2.Pushpa Singh 3.Piyush Yadav 4.Krishna Kant	2020	1. This paper gives information about IOT and its importance in the making of smart cities. A smart city should have smart education, smart health care,

IoT and Machine Learning	Singh		smart parking lots, smart homes, smart water and weather systems. 2. It has come up with a solution for segregation of biodegradable and non-biodegradable waste using machine learning and sensors. 3.It demonstrates the working of household bins as well as large scale society bins. 4.The objective of this research is to make the society as a smart green society which is environmentally sound and healthy.This model continuously monitors the level of waste in the biodegradable and non biodegradable compartment of the dustbin and also the concentration of poisonous gases.
4.A Review on Smart Garbage Dustbin	1.Shephali Rakhunde 2.Shreya Ghavghave 3.Shraddha Jagtap 4.Priyanka Chimegaokar 5.Mr.J.Y.Hande	2019	1. From this research paper got to know about the alerting sensor ATMEGA 16 and ESP8266, which will give an alert when the Dustbin is full 2. It has also mentioned the RFID tag which will be used as a verification process after cleaning the Dustbin.
5.Smart Bin Waste System:a Review	1.Ayodeji Noiki	2021	1. The segregation of the waste is done into metallic and non metallic waste using RLC metallic detector. 2. It also explains the working of the GSM module which shares the data regarding waste level in the dustin.
6.Waste Management impact assessment	–	-	1. This paper gives an overview about the different types of waste generated on a daily basis. 2. It talks about the measures that should be incorporated into the

			environmental pollution . 3. It concludes that segregation of waste plays an important role in preventing pollution caused due to air pollution.

Chapter 3

Proposed System

3.1 Project Description

Our Waste Management System will basically help in analyzing waste with the help of sensors. This analyzed data will then be put up on the website for people to see for further research. We will also be making a wet and dry waste separator which will separate the waste making the work of sanitation workers easy

Modules

- **Analyzing the waste**: Our waste management system will have a dustbin with sensors in it to analyze the waste. This dustbin will also notify the garbage trucks when the dustbin is full so that they can empty it, this will prevent overflowing of waste. Sensors present in the dustbin will detect the level of moisture in the waste.

- **Website**: Waste Management System will also have a website which will have a nav bar through which we can navigate between login page,home page, location page and page about awareness of waste management. The website will also show the analyzed data of waste such as moisture content. The location page will show the location of the dustbin on the website.

- **Segregation of Waste**: Waste Management System will have a motor which will be used to segregate wet waste and dry waste using a sensor which will detect moisture content in the waste.

3.2 Problem Statement

- Increased volumes of waste generated puts more pressure on the waste management system hence demanding for a more efficient system
- Current waste management system puts health sanitation workers at risk of severe diseases which can be prevented using IoT devices.
- Many public dustbins are not emptied on time thus leading to waste accumulation around the dustbin which can be solved using sensors and GPS.
- Sanitation workers invest a lot of time in separating wet and dry waste, our motors will help in making their task easier and save time

Drawbacks of Our Waste Management System

- If anything gets stuck in the sensor it will not work properly
- Detection of waste depends fully on the IR sensor

Flowchart:

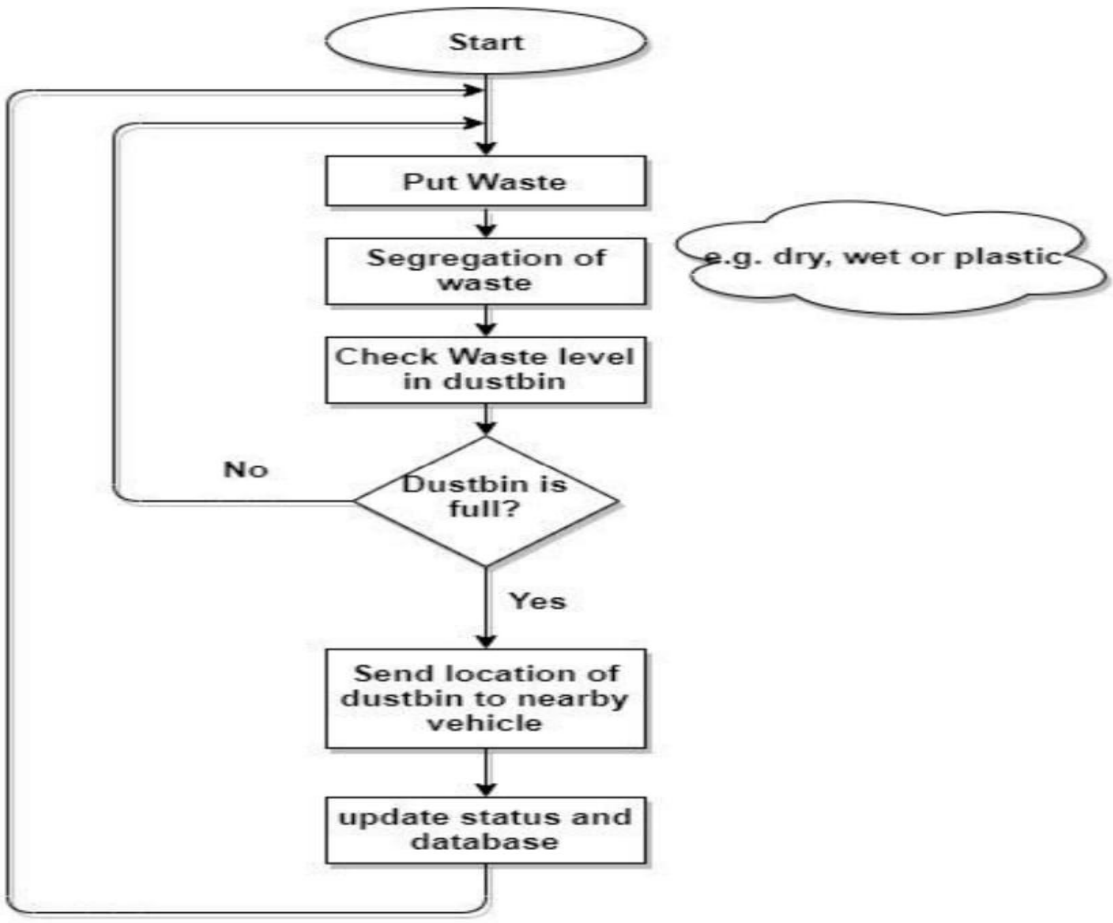


Fig.3: Flow Diagram of the Proposed System

Component Diagram:

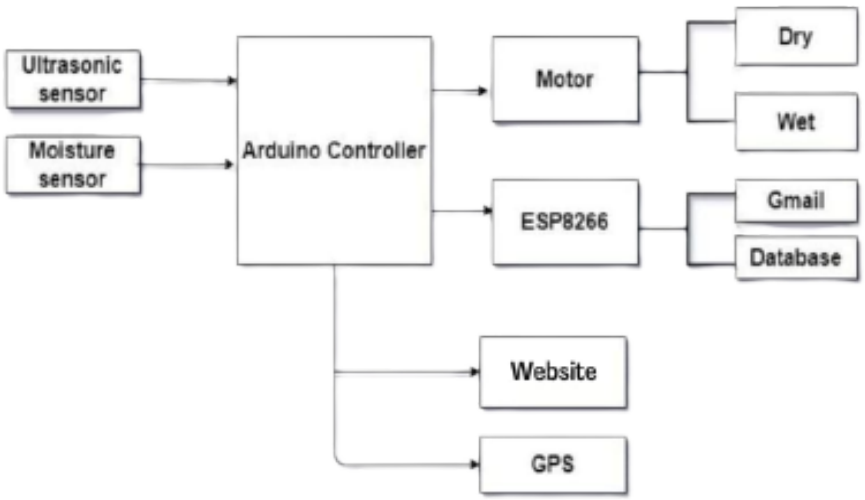


Fig.2: Component Diagram of Proposed System

Chapter 4

Hardware and Software requirements and Implementation Plan for next Semester

- **Software Specifications:**

For Frontend Development of our website, we will be using the following languages:

HTML: The Hyper Text Markup Language or HTML is the standard markup language for documents designed to be displayed in a web browser.

CSS: Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language such as HTML or XML.

JavaScript*:* JavaScript often abbreviated to JS, is a programming language that is one of the core technologies of the World Wide Web, alongside HTML and CSS. All major web browsers have a dedicated JavaScript engine to execute the code on user's devices.

For Backend Development of our website, we will be using the following languages:

Express.js: Express.js, or simply Express, is a back-end web application framework for building RESTful APIs with Nodejs, released as free and open-source software under the MIT License. It is designed for building web applications and APIs.

SQL Database: SQL is Structured Query Language, which is a computer language for storing, manipulating and retrieving data stored in a relational database. SQL is the standard language for Relational Database Systems.

For ArduinoUno:

We will be using C/C++ language for typing the program in Arduino IDE. When we work with Arduino, we commonly use the Arduino IDE, a software available for all the major desktop platforms which gives us 2 things:

1. A programming editor with integrated libraries support.
2. A way to easily compile and load our Arduino programs to a board connected to the computer.

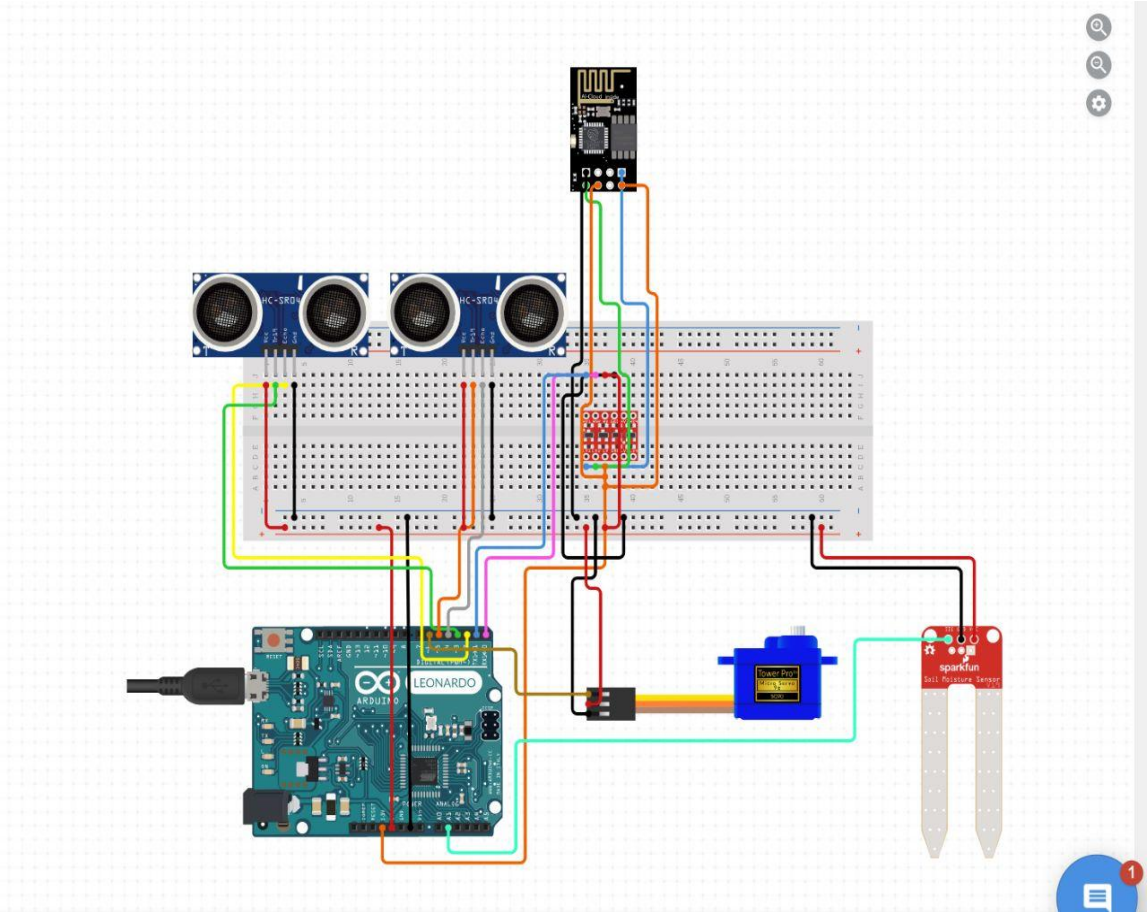
- **Hardware Specification:**

1. Arduino Uno 9V: We'll be using ArduinoUno for programming
2. Servo Motor: Servo Motor will be used for segregation of Wet waste and Dry Waste
3. Ultrasonic Sensor (Motion Sensor): To measure the level of garbage in the dustbin
4. 9V battery
5. M2M, F2M, F2F jumper wires.
6. IR Sensor: To detect the presence of the garbage.
7. GSM 900 module: To send SMS/Notification to the concerned Authorities.

- **Implementation Plan for Next Semester:**

Our Future vision is to complete our full fledged project, by connecting the hardware (Dustbin) with the software (Website). We will be making use of different sensors for sensing different types of functions (Level, object, etc.).
We will be using the data collected from ArduinoUno and Display it on our website accordingly.

Hardware Diagram:



Chapter 5

Summary and Conclusion

Summary:

Smart dustbin is an IOT model which senses the level of waste in the Dustbin using an Ultrasonic sensor. The Dustbin will segregate dry and wet waste using servoMotor. The data will be shared using the GSM module and be displayed on the Website. The moisture sensor will have a threshold value set to segregate the waste into wet and dry waste. The ultrasonic sensor will detect the level of waste in the dustbin and inform the respective authorities using mail.

Conclusion:

To Conclude we have established a Waste Management System using IoT and its applications. With proper use of integrity of software and hardware, this idea can develop better waste control system in overpopulated cities and establish a Waste Management System using IoT and its applications. With proper use of integrity of software and hardware, this idea can develop a better waste control in overpopulated cities

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