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Waste Tracker

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ABSTRACT

The Smart Waste Tracking System offers an innovative solution to the inefficiencies of traditional waste tracking practices. By integrating IoT sensors in waste bins and cloud computing, the system monitors bin fill levels in real-time and dynamically optimizes waste collection routes. This reduces fuel consumption, travel time, and emissions, while ensuring timely pickups by alerting collection teams when bins are full. It enhances waste management operations, promotes sustainability, and helps reduce environmental impact, ultimately fostering smarter, greener urban environments..

1. INTRODUCTION

The system employs sensors such as ultrasonic or capacitive sensors to measure the waste levels in dustbins, and the data is transmitted via IoT to a central system or application. This system allows supervisor or waste management team to track the status of multiple dustbins in real-time. It also sends automated alerts and notifications to keep everyone updated.

Existing System

In many current waste tracking systems, the tracking of waste collection, transportation, and disposal is often done manually or through outdated methods. Furthermore, waste generation data is not always accurate, which makes it difficult to plan for optimal routes and schedules. Environmental regulations may not always be consistently met due to limited oversight, and there may be a lack of real-time monitoring to ensure waste is processed or recycled.

Proposed System

Effective waste management is crucial in cities because improper disposal methods can result in serious harm to the environment, hazards to public health, and a decline in quality of life. To overcome these issues and improve the waste management process, we have developed a Waste Management Tracking System. This project aims to automate waste detection, segregation, and monitoring using IoT technology. We used IR sensors to detect the presence of waste, and a rain sensor to classify the waste as wet or dry. A servo motor is used to flip the waste into the correct bin based on the type. Ultrasonic sensors are placed in both bins to monitor how full they are. The system is controlled by an ESP8266 Wi-Fi module, and we used the GSM module to send SMS notifications when the bins are full. The data is also sent to the Blynk IoT platform, where bin levels can be monitored in real time. Additionally, we developed a webpage for supervisors to observe the status of bins, receive alerts, and assign schedules to Eco Pickers (waste collectors).

2-REQUIREMENT ANALYSIS

Functional Requirements

Admin Module

The system shall include specific functionalities for the Admin role to efficiently manage users and oversee operations. The Admin will have the ability to securely log in to the system and access various administrative features. These include adding and deleting Supervisors as needed, ensuring that only authorized personnel are in supervisory roles. Additionally, the Admin can add and remove

Ecopickers, maintaining an up-to-date record of the workforce. The system also enables the Admin to view detailed information about all workers for monitoring and management purposes. Once the necessary tasks are completed, the Admin can securely log out to ensure data protection and system integrity.

Supervisor Module

The system provides a dedicated set of functionalities for the Supervisor to ensure effective coordination and management of Ecopickers. A Supervisor can register and log in securely to access their dashboard. Once logged in, they can assign schedules to Ecopickers, ensuring organized and timely waste collection activities. Supervisors are also responsible for adding bin details, which helps in monitoring bin locations and statuses. The system enables Supervisors to receive timely notifications related to bin conditions, schedules, or Ecopicker activities. Furthermore, they can view the status of assigned tasks and bin updates to maintain operational efficiency. After completing their duties, Supervisors can log out securely to preserve data privacy and system security.

Ecopickers Module

The system offers essential functionalities for Ecopickers to manage their daily tasks efficiently. Ecopickers can begin by registering on the platform and then logging in securely to access their personalized interface. Once logged in, they can view their assigned schedules provided by the Supervisor, allowing them to plan and carry out their duties effectively. If any changes are necessary, Ecopickers have the ability to update their schedule to reflect their availability or progress. After completing their work or reviewing their tasks, they can log out securely to maintain the confidentiality of their information and ensure system safety.

Non-Functional Requirements

- **Performance:** Real-time processing of bins.
- **Scalability:** Capable of handling multiple users or units.
- **Usability:** Intuitive interface for easy use.
- **Reliability:** Consistent operation even the hardware or software fails.
- **Security:** Protection of data by proper access control.
- **Maintainability:** Easy to update and troubleshoot.

Software Requirements

The software requirements document is the specification of the system. It should include both the definition and a specification of the requirements. It is a set of what the system should do rather than how it should do it. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the team's progress throughout the development activity.

- Operating System : Windows 10 and above
- IDE : Visual Studio Code
- Code Behind **:** Embeded C,HTML,CSS
- Database : MySQL

Hardware Requirements

Hardware Requirements are the most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware.

- Processor :intel core i3
- RAM : 8GB
- SSD card : 512GB
- Mobile Devices : Smartphones, Tablets

3-DESIGN

Design of the project represents the number of

components we are using as a part of the project and the flow of request processing i.e., what components in processing the request and in which order. An architecture description is a formal description and representation of a system organized in a way that supports reasoning about the structure of the system.

Software Architecture

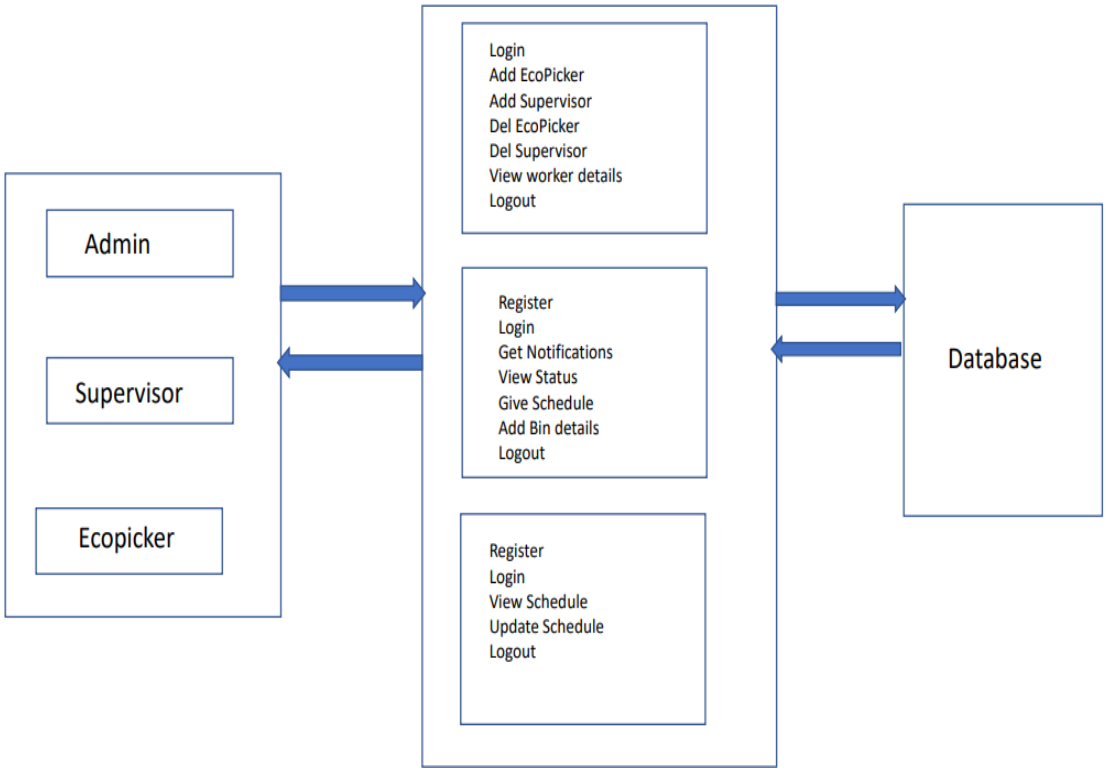


Fig 3.1 Software Architecture

Technical Architecture

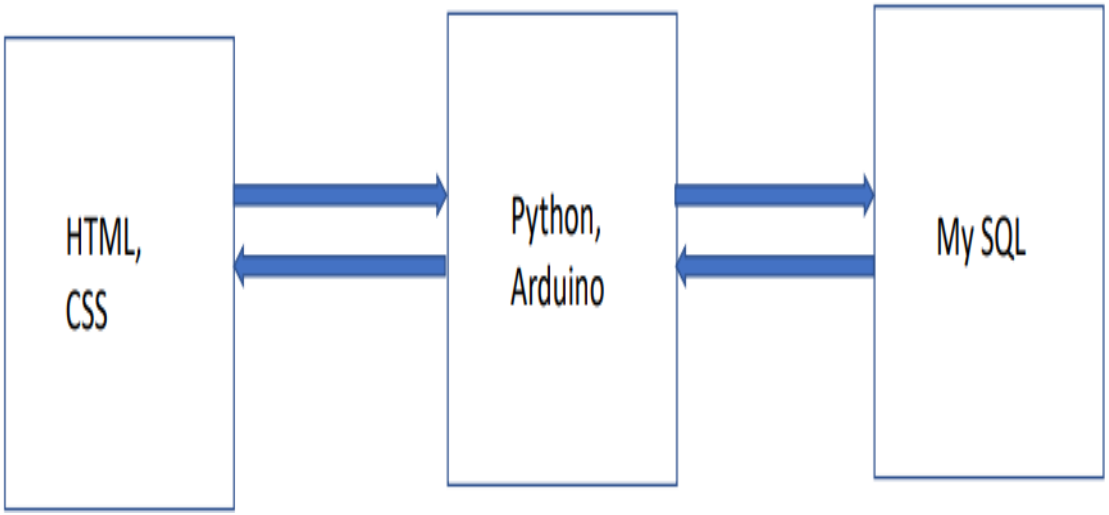


Fig 3.2 Technical Architecture

4-TESTING

Software testing is a process, to evaluate the functionality of a software application with an intent to find whether the developed software met the specified requirements or not and to identify the defects to ensure that the product is defect free in order to produce the quality product. As per the current trend, due to constant change and development in digitization, our lives are improving in all areas. The way we work is also changed. We access our bank online, we do shop online; we order food online and many more. We rely on software's and systems. What if these systems turn out to be defective? We all know that one small bug shows huge impact on business in terms of financial loss and goodwill. To deliver a quality product, we need to have Software Testing in the Software Development Process.

Some of the reasons why software testing becomes very significant and integral part in the field of information technology are as follows.

Unit Testing

During This first round of testing, the program is submitted to assessments that focus on specific units or components of the software to determine whether each one is fully functional. In this phase, a unit can refer to a function, individual program or even a procedure, and White box testing method is usually used to get the job done. One of the biggest benefits of this testing phase is that it can be run every time a piece of code is changed, allowing issues to be resolved as quickly as possible. It quite common for software developers to perform unit tests before delivering software to testers for formal testing.

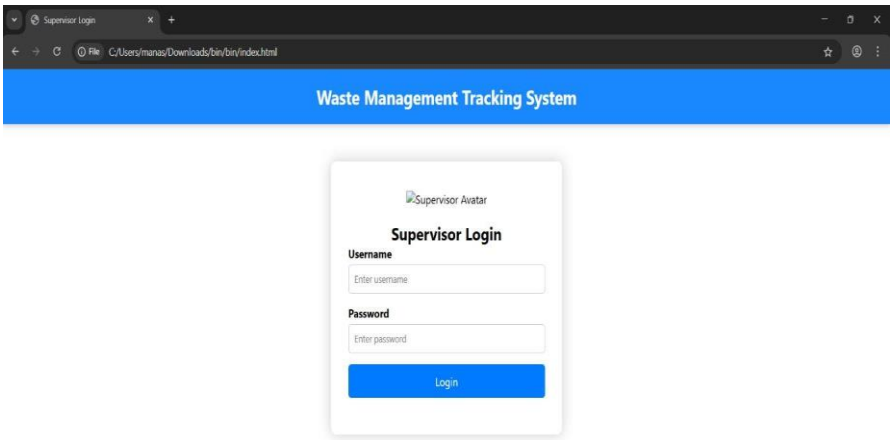
Integration Testing

Integration testing allows individuals the opportunity to combine all of the units within a program and test them as a group. This testing level is designed to find interface defects between the modules/functions. This is particularly beneficial because it determines how efficiently the units are running together. Keep in mind that no matter how efficiently each unit is running, if they properly integrated, it will affect the functionality of the software program. In order to run these types of tests, individuals can make use of various testing methods, but the specific method that will be used to get the job done will depend greatly on the way in which the units are defined.

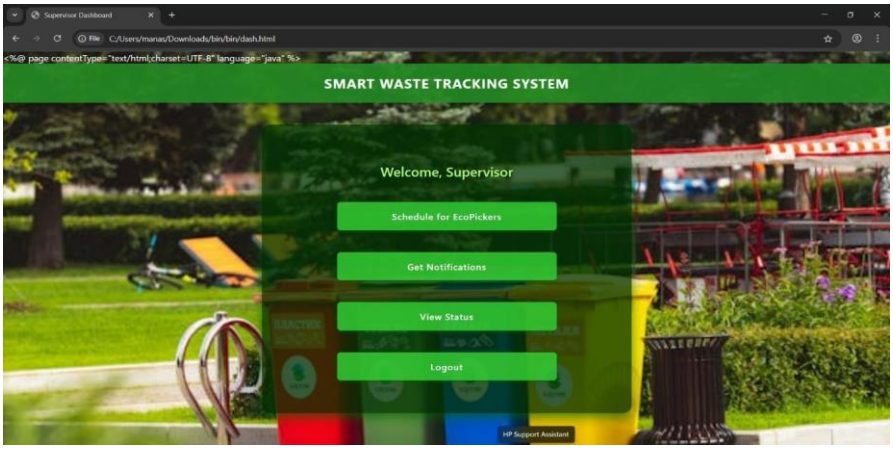
System Testing

System testing is the first level in which the complete application is tested as a whole. The goal at this level is to evaluate whether the system has complied with all of the outlined requirements and to see that it meets Quality Standards. System testing is undertaken by independent testers who haven't played a role in developing the program. This testing is performed in an environment that closely mirrors production. System Testing is very important because it verifies that the application meets the technical, functional, and business requirements that were set by the customer.

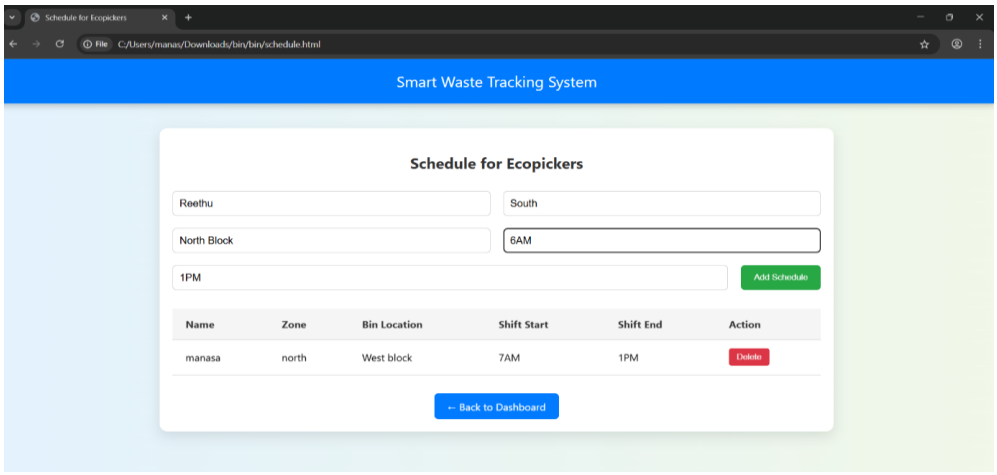
5-SCREENSHOTS

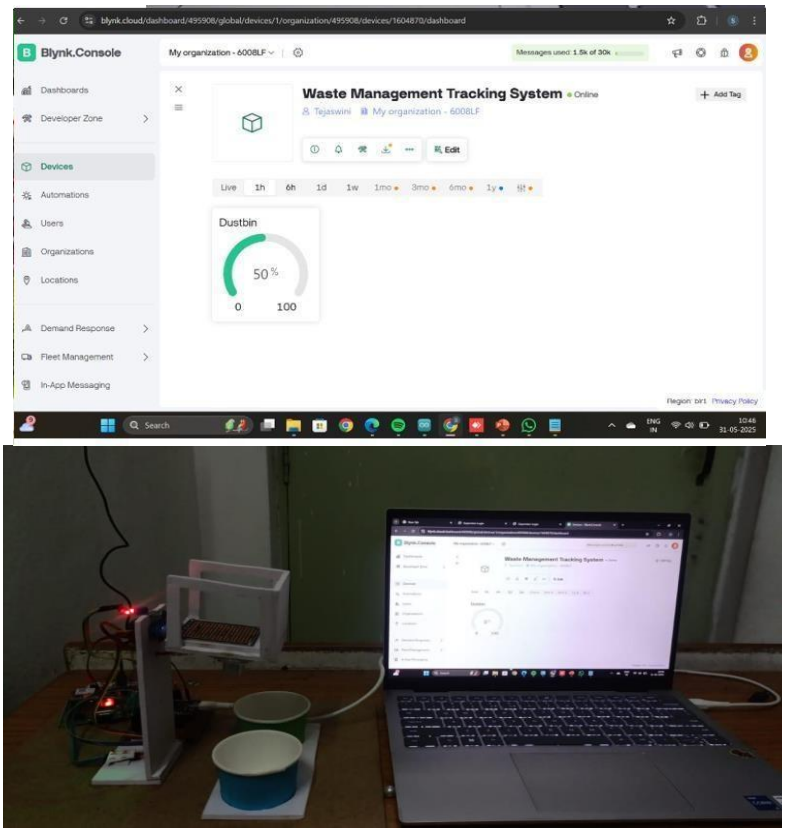


Screenshot 1: Supervisor Login



Screenshot 2: Dashboard





Screenshot 6.5: Hardware Kit

Screenshot 6: Mobile Notification

6-CONCLUSION

A Waste Management Tracking System enhances waste collection efficiency, reduces operational costs, and promotes environmental sustainability. Implementing such a system contributes to a cleaner and a more sustainable environment.

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