SOFTWARE ENGINEERING

TRASH TRACKER

Group 5

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NEXT

Background

Trash Tracker Apps

- Trash is a byproduct of human life, generated through daily activities in homes, workplaces, and public spaces.
- Urban population growth has increased daily waste output.
- People often unaware of the large amount of waste they produce.
- There's a growing need for effective waste management solutions.
- Technology can improves efficiency in many sectors, including waste management.
- Trash Tracker seeks to turn waste into a manageable resource.
- Supports community cleanliness and organized waste management.
- Contributes to environmental protection and public health through smarter waste disposal methods.

Literature Review
Trash Tracker Apps

- Growing waste production leads to environmental issues.
- Smart bins use IoT to automate sorting, track waste, and notify when full.
- Moisture sensors separate wet/dry waste; ultrasonic sensors check bin fullness.
- AI is being researched for better sorting but is costly.
- Trash Tracker offers a simple, affordable solution with real-time monitoring and notifications to encourage better waste management.

Project’s objective
Trash Tracker Apps

- Automatically separate wet and non-wet trash using moisture sensors.
- Notify users when the trash can is full using ultrasonic sensors.
- Provide real-time data to a mobile app or website for monitoring trash levels and types.
- Encourage better waste management and environmental awareness by simplifying the waste separation process.

Similar Competitor

Trash Tracker Apps

In the University of Indonesia (UI) area, particularly within waste management, there are no direct solutions that focus on waste monitoring and management, creating a unique opportunity for the project.

While broader commercial solutions like SmartBin, an IoT-based system that automates waste collection and sorting using sensors, these are designed for large-scale urban settings.

- In contrast, this project focuses on UI's localized needs, using similar sensor technology.
- Emphasizes public awareness and education to encourage sustainable waste habits.
- Aims to fill the waste management gap at UI.

INTRODUCE THE APPS

Key Features

- Waste Separation
- Full Trash Detection
- Smart Notifications
- Data Display
- Control System
- Web Interface

Tools and Technologies

BACKEND

node JS

Express JS

mongoDB

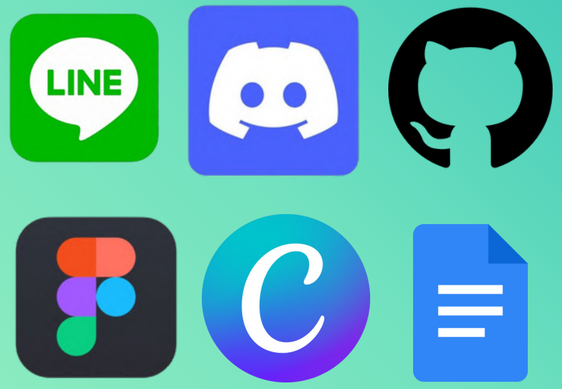
FRONTEND

React

tailwindcss

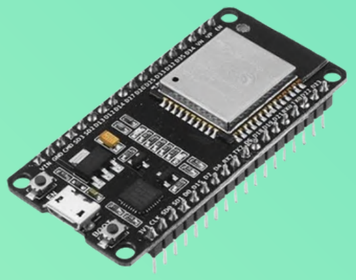
VITE

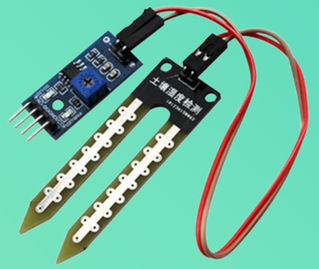
OTHERS

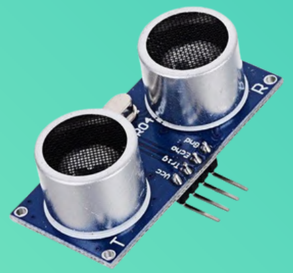


Tools and Technologies

HARDWARE







Budget Cost

Component	Estimation Cost	Description
Hardware	IDR 150.000,00	The hardware cost estimation for building one Trash Tracker device includes essential components such as ESP32, Arduino, moisture sensor, ultrasonic sensor, and servo motor. -ESP32: IDR 50.000,00 -Arduino: IDR 150.000,00 -Moisture Sensor: IDR 15.000,00 -Ultrasonic Sensor: IDR 15.000,00 -Servo Motor: IDR 20.000,00
Software and Database	IDR 0,00	The software and databases used for the Trash Tracker project are obtained at no direct cost, as the project utilizes free development tools such as: - Visual Studio Code (Free) - MongoDB (Free) - GitHub (Free)
Design	IDR 0,00	No direct cost for design and modeling, as the project uses free software tools like: - Figma (Free) - Canva (Free)

Risk Analysis

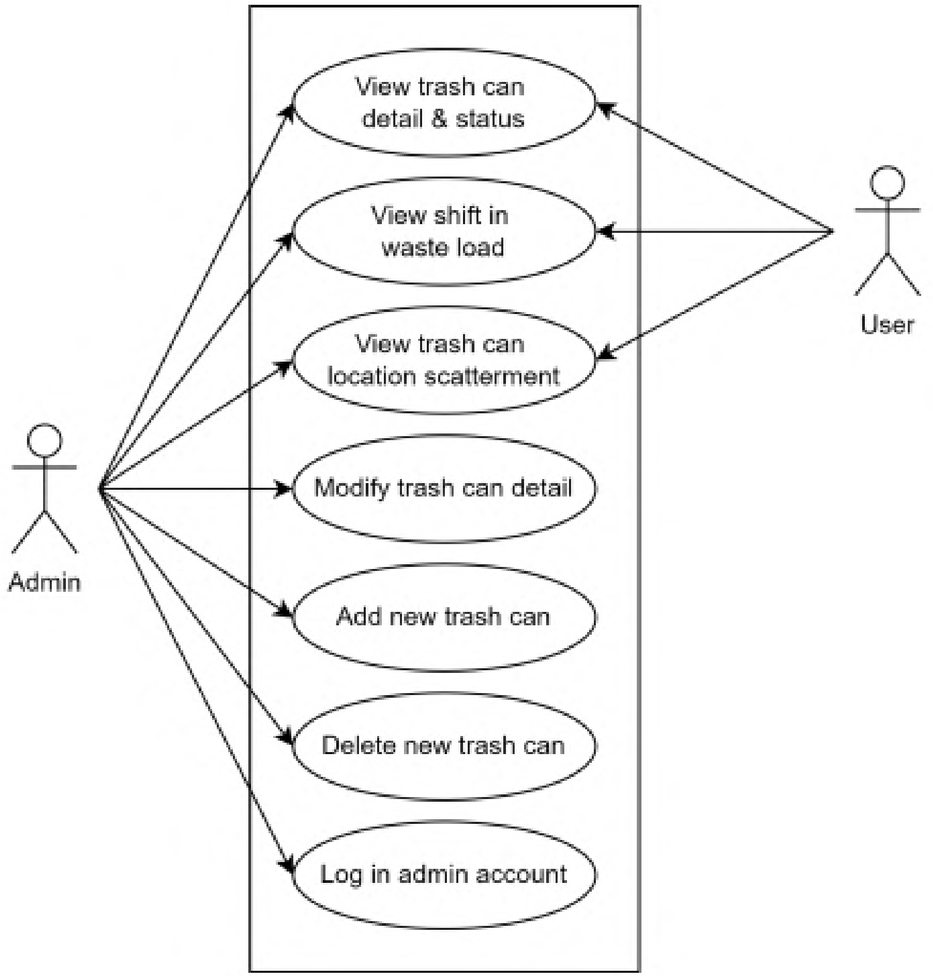
Potential Risk	Likelihood	Potential Impact	Contingency
Sensor Accuracy	Moderate	Inaccurate waste separation, resulting in mixed trash categories.	Regular calibration and testing of sensors. Implement manual override for mixed materials or ambiguous readings.
Hardware Failures	High	Failure in sorting mechanism or missed notifications.	Design redundancy with backup sensors, regular hardware checks, and include manual controls for override if needed.
Network Connectivity Issues	Moderate	Loss of real-time data transmission and delayed notifications.	Implement offline data storage and use redundant network options; introduce automated reconnection protocols.
Security Breach	High	Unauthorized access, data breaches, or privacy violations.	Use encryption, conduct regular security audits, and ensure strong authentication methods are in place.
Server Downtime	Moderate	Inability to access the web interface or process new data.	Implement scheduled maintenance during off-peak hours and use backup servers; have rapid response protocols for downtimes.
User Interface Issues	Moderate	Confusion or misinterpretation of trash bin status and data.	Conduct frequent user testing, gather feedback, and follow an iterative design process to ensure ease of use.
Insufficient Power Supply	Moderate	System failure due to low power or incomplete trash sorting.	Incorporate backup power solutions, monitor battery levels, and optimize the system for low-power operation.
User Engagement Issues	High	Low user interaction with the web interface and disengagement.	Provide relevant notifications, offer insights on waste management, and integrate features that enhance user engagement.
Cost vs. Efficiency	Moderate	High costs could make the system less feasible for adoption.	Balance cost-efficient hardware with performance, explore affordable alternatives without compromising functionality.

Timeline

	September				Oktober				November				Desember			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project Initialization																
Project Scope and Objectives																
Defining project idea and objectives																
Consultation with Lecturer																
Creation of Project Plan and Timeline																
Team Information and Setup																
Assemble the Development Team																
Finalizing the Idea																
Assign Roles and Responsibilities																
Design and Prototyping																
Database Design																
Create Database Scheme																
Define Database Tables and Relationships																
Create API for Integration with Frontend																
Frontend Development																
Create UI/UX Design																
Create Wireframe and App Pages Prototype																
Integrate the Frontend Design with Database																
IoT Device Design																
Gather the Components																
Make Program																
Development																
Authentication and User Management																
Integration of IoT Device and Website Application																
Real-Time Device Monitoring from Website Application																
Deployment																
Final Testing with Client Included																
Deploy the Website and Device																

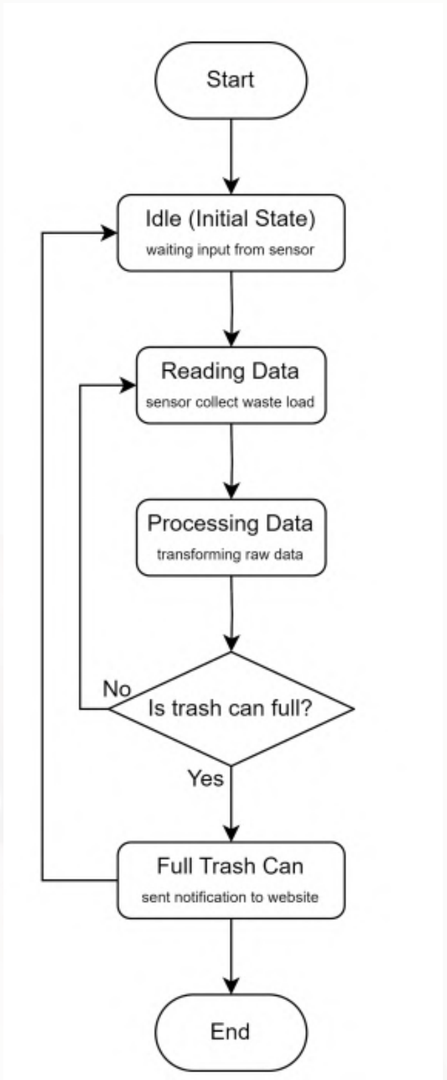
UML Diagram

Use Case Diagram



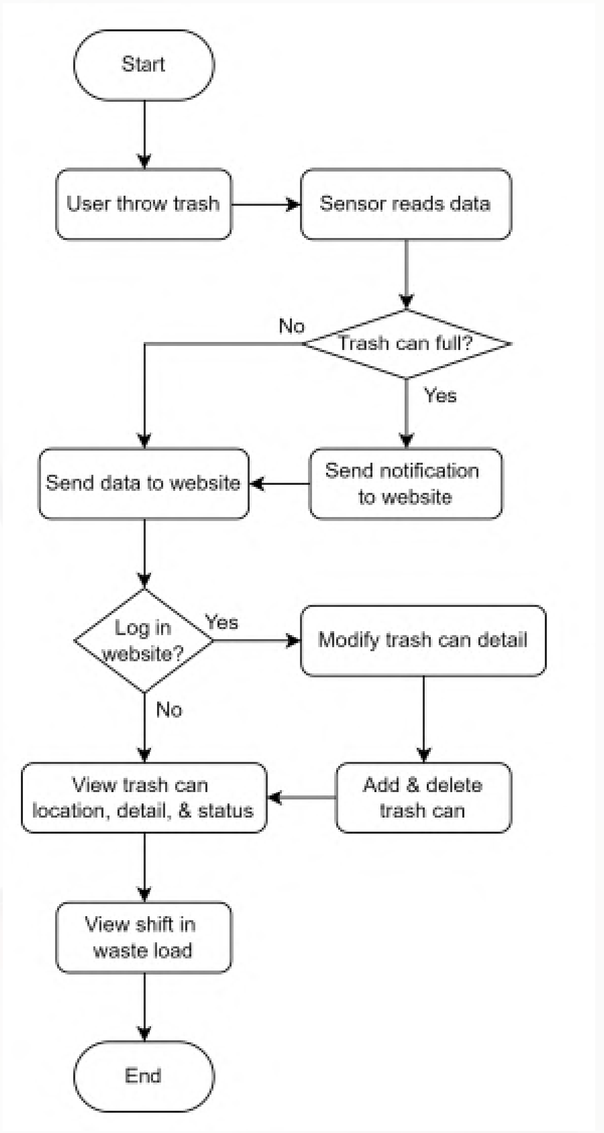
UML Diagram

State Diagram



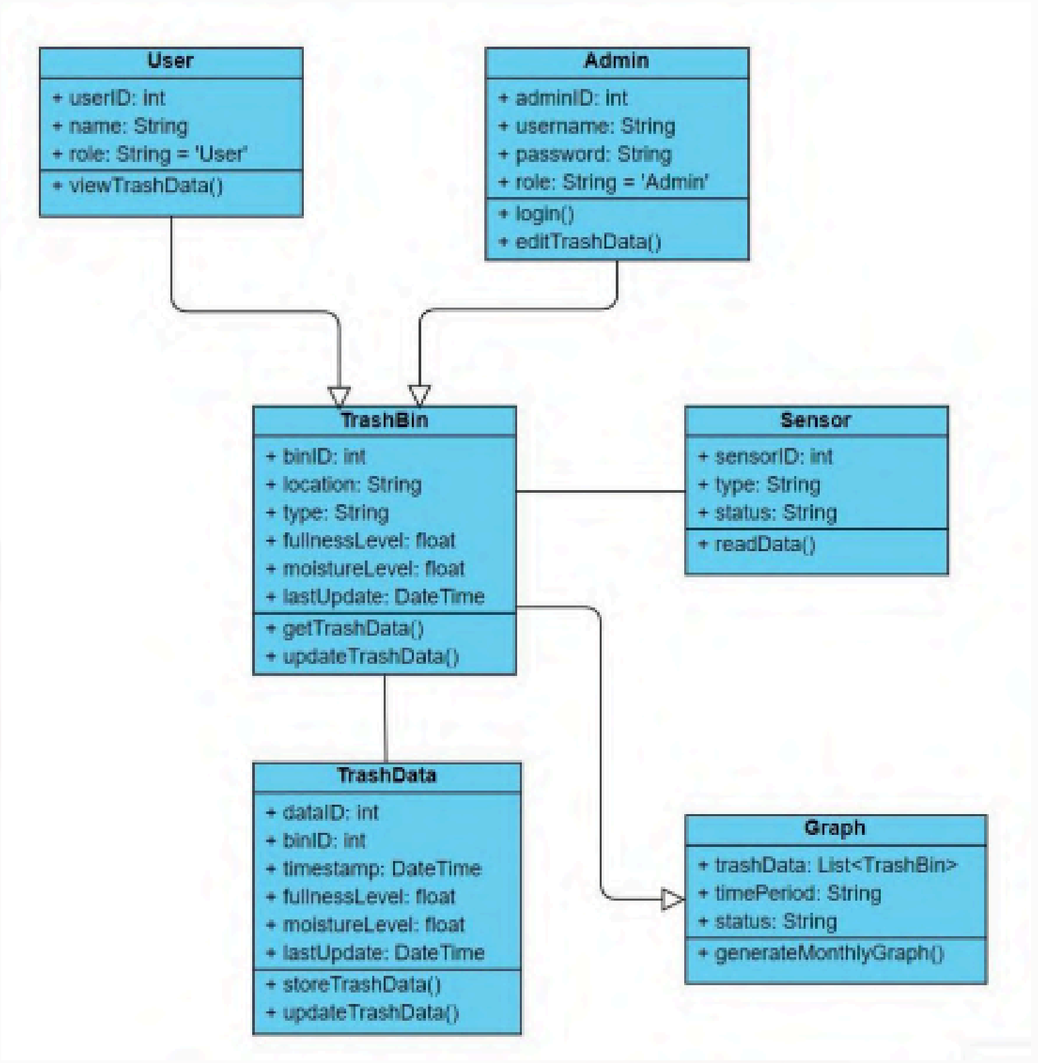
UML Diagram

Activity Diagram



UML Diagram

Class Diagram



NAVIGATE THROUGH YOUR FINANCES EFFORTLESSLY

Home Page
Trash Tracker Apps

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Home Page

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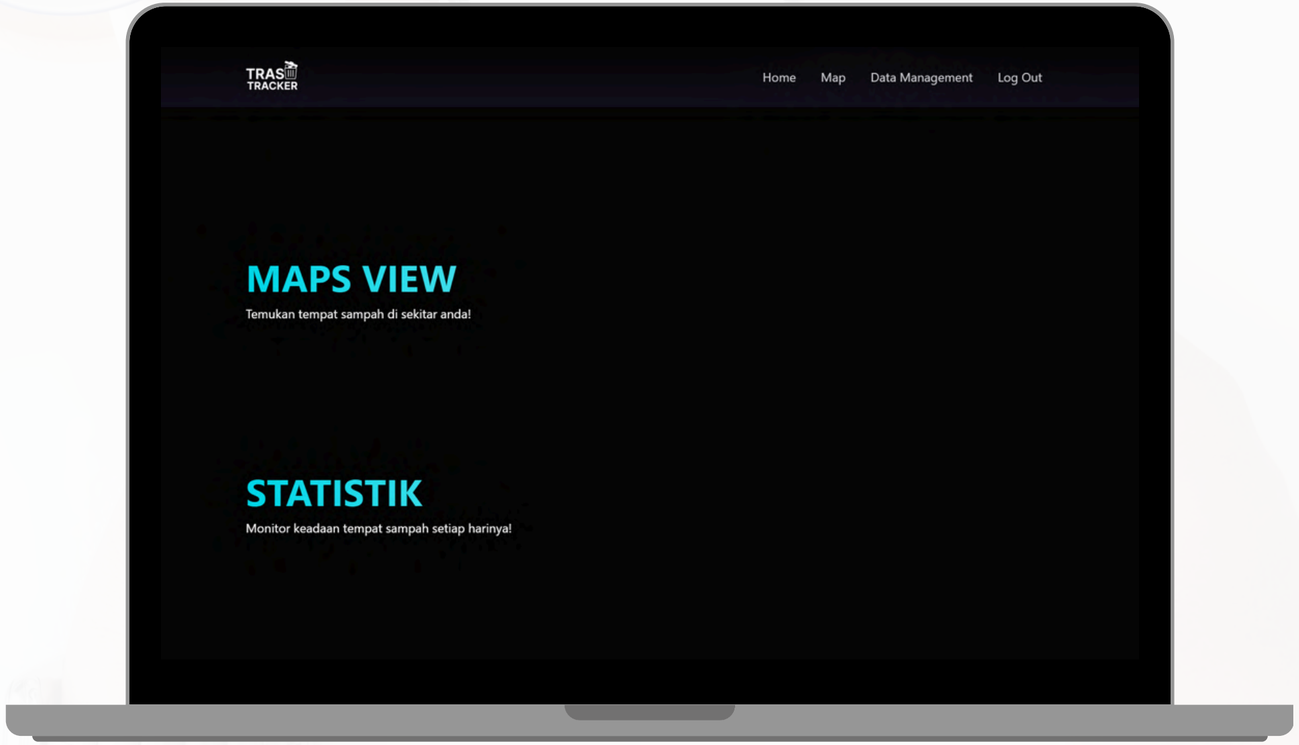

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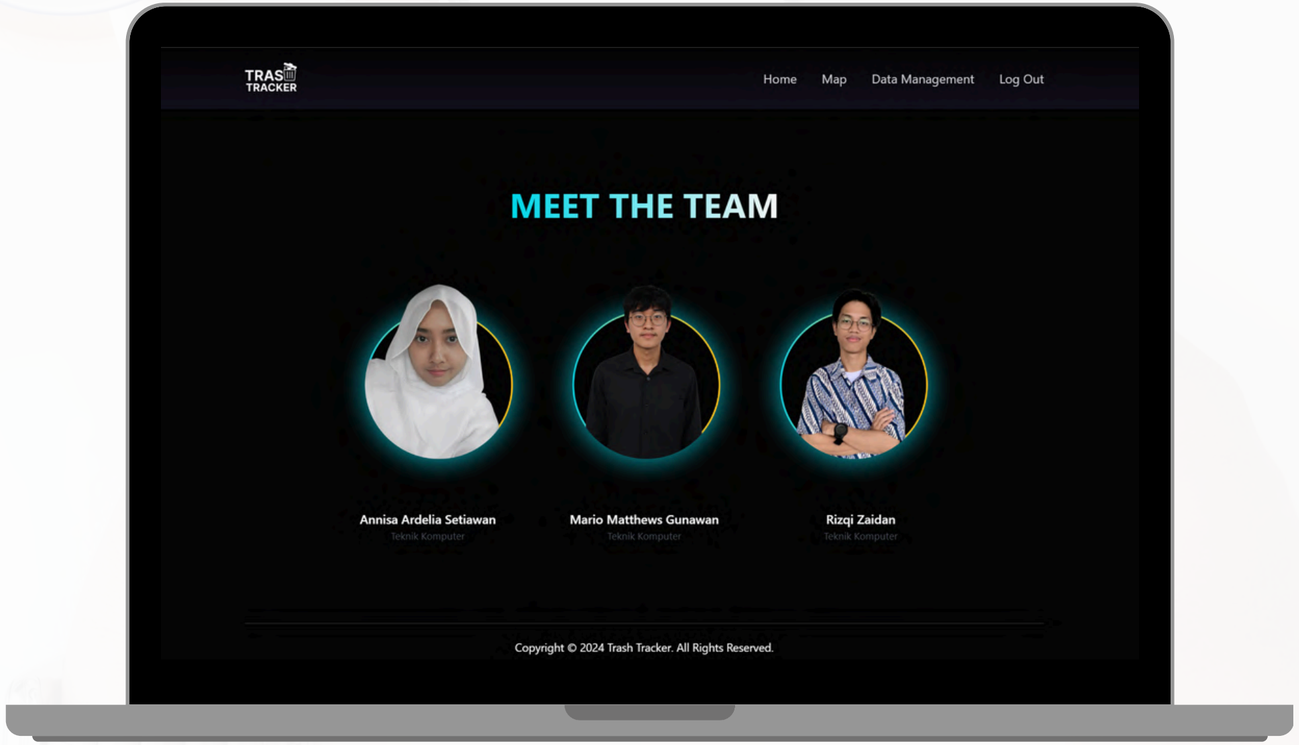
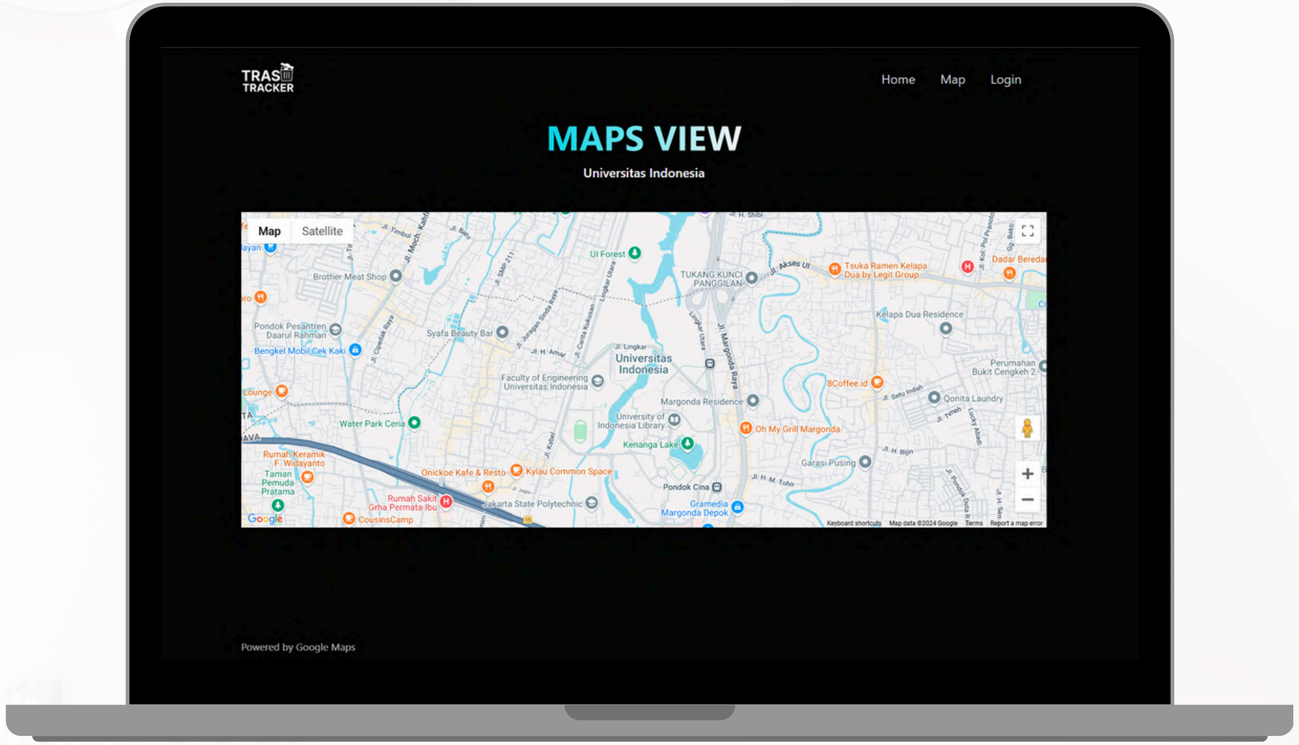
Home Page
Trash Tracker Apps



NAVIGATE THROUGH YOUR FINANCES EFFORTLESSLY

Map View Page
Trash Tracker Apps



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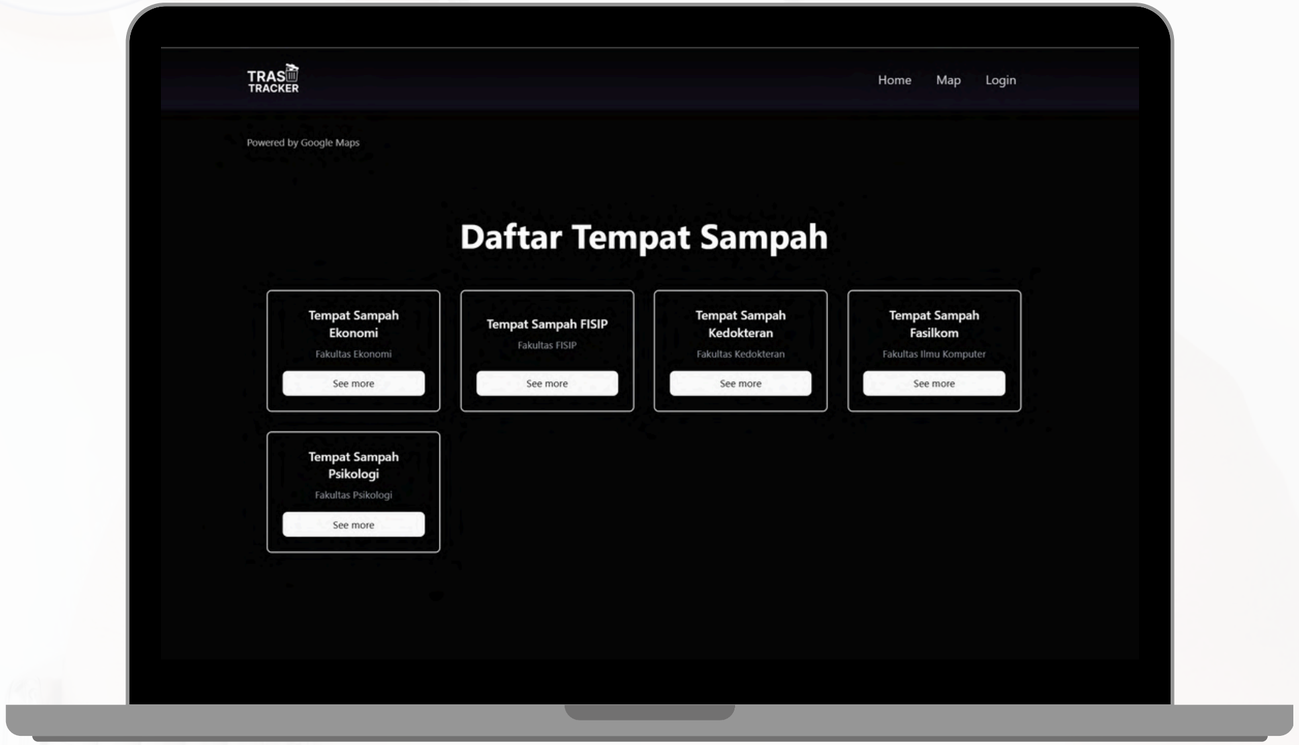
Map View Page

Trash Tracker Apps



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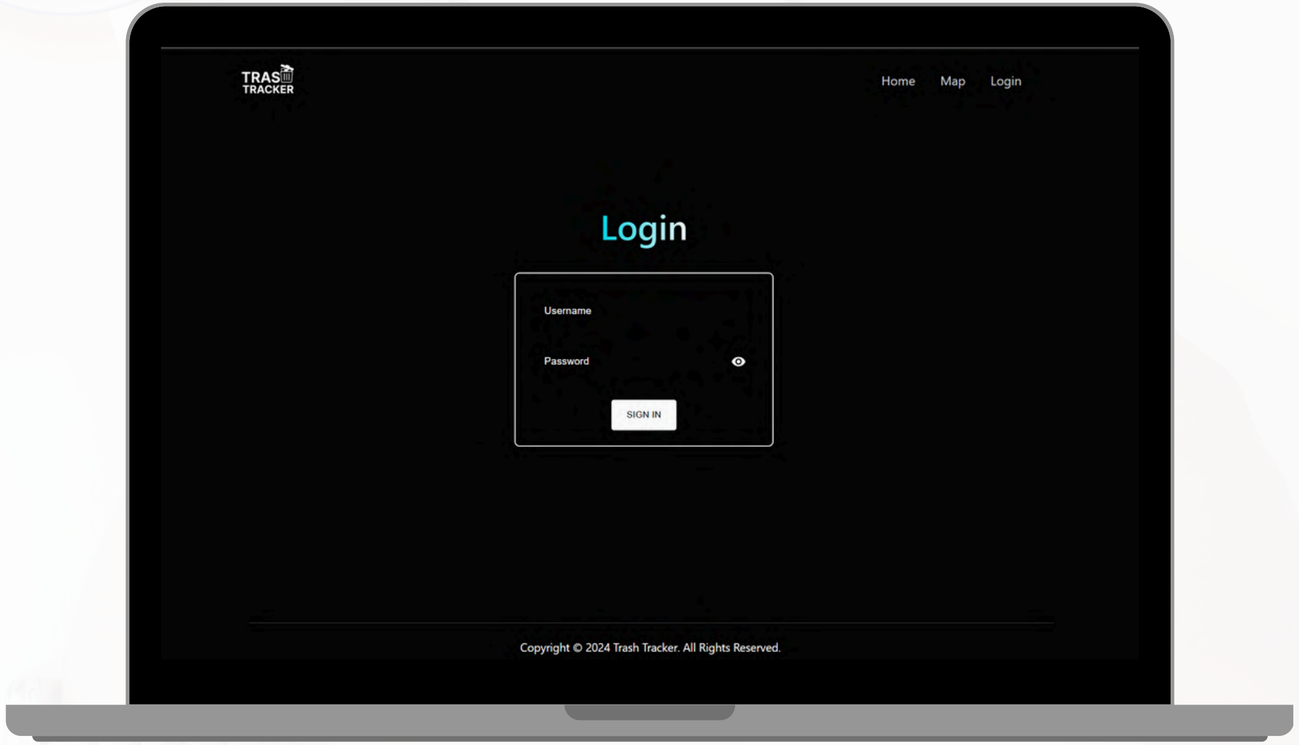
Login Page

Trash Tracker Apps



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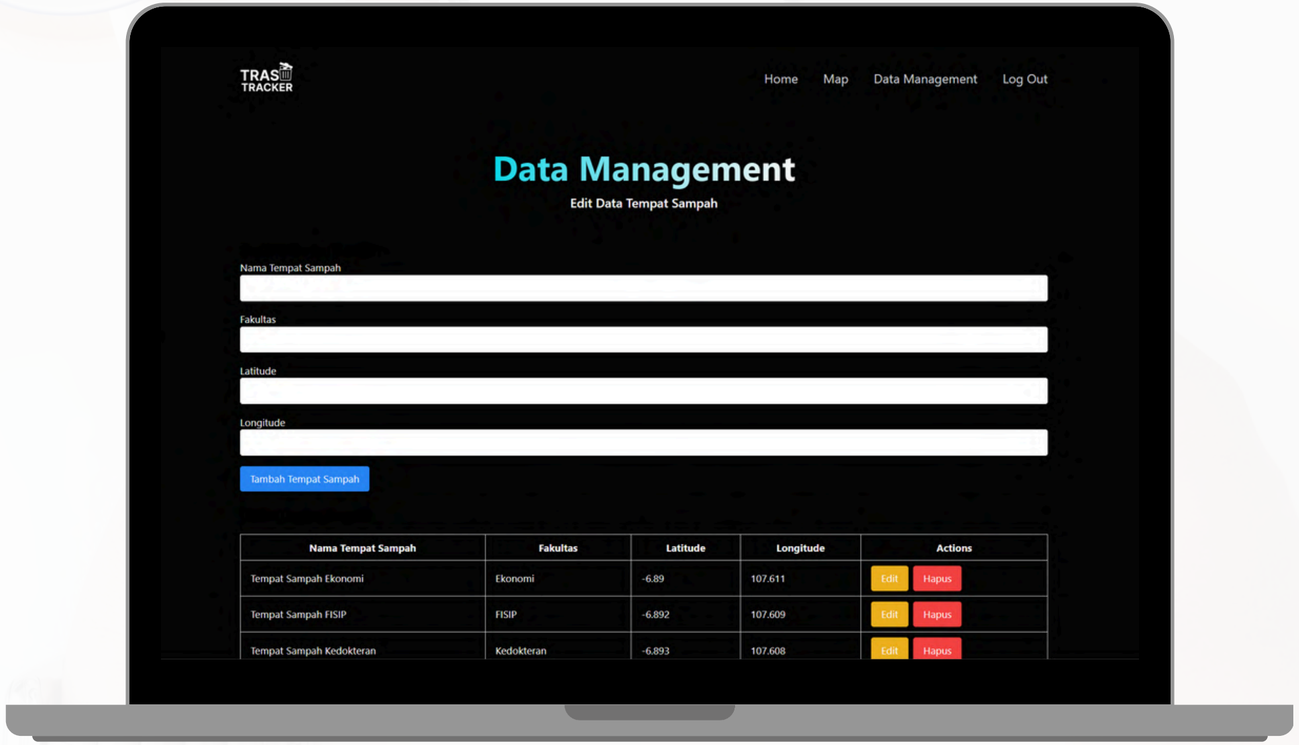
Data Management Page

Trash Tracker Apps



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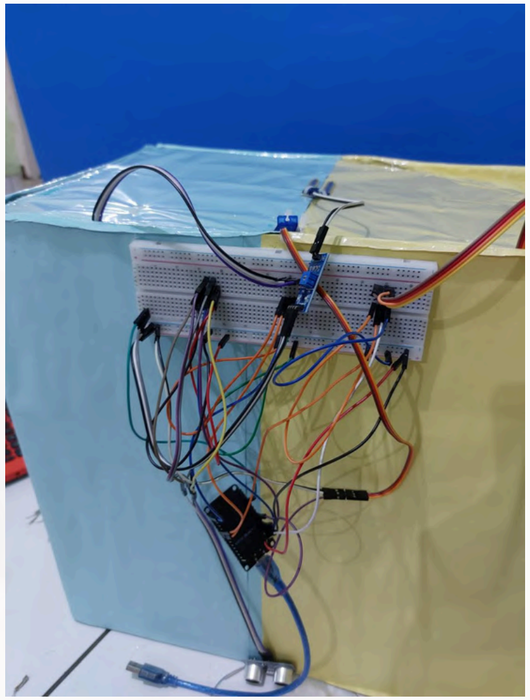
Hardware Design



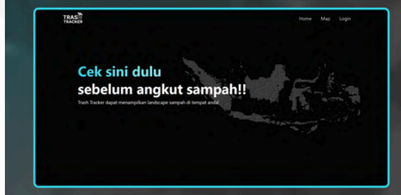
Unit Testing

No.	Test Case	Steps	Expected Result	Status(PASS/FAIL)
1	Moisture sensor detection	Connect the sensor to Arduino and input both wet and dry materials. Check the serial output.	Correct identification of trash type (wet/dry).	PASS
2	Full-bin detection	Fill the bin to capacity and check the ultrasonic sensor's output.	Notification "Bin Full" is sent to the web.	PASS
3	Servo motor sorting	Trigger sorting for wet and dry trash.	Notification "Bin Full" is sent to the web.	PASS
4	Web interface monitoring	Access the web interface and verify the displayed data.	Notification "Bin Full" is sent to the web.	PASS
5	Admin Account Registration	Register account using postman	Notification “Admin registered successfully” in postmane	PASS
6	Admin Login	Access the web and login to admin account	Admin is successfully logged in.	PASS
7	Add Trash Bin	Access the web, login into admin account, go to “Data Management” and add new trash bin	New trash bin added to trash bin list	PASS

RPL 01 | Kelompok 05

TRASH TRACKER

User Manual



1. Go to the website

Access the website using your browser.

2. Open maps page

Access the map page to see if there any trash bin around you.

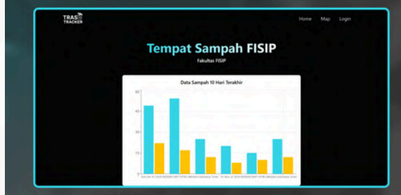
3. Find your trash bin

You can find your prefered trash bin below the map.

RPL 01 | Kelompok 05

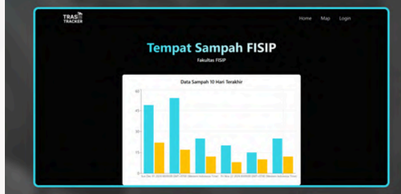
TRASH TRACKER

User Manual



4. See more

Find out the ratio between wet and dry waste in it.



5. Waste history

Get the trash load and ratio history in the last ten days from now.

6. Today's waste

Get today's waste load level and waste ratio.

User Manual

Thank You