Smart Waste Management

Group Members

Mohith Adiboina(S20170020188)

Sumanth Minupala(S20170020221)

Venkata Sai Girish M(S20170020226)

Nehul Rangappa(S20170020241)

Motivation

Waste management is one of the primary problems that the world is facing from the past years. Many times, in our city or our surroundings we see that the garbage bins or dustbins placed at public places are overloaded. It brings out a bad smell and an unhygienic condition for the people living in that area. The proposed idea of Smart Bin helps in overcoming all those problems related to waste management.
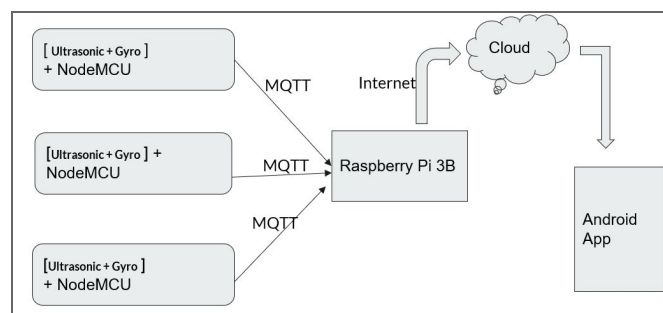
Description

This project displays an end-to-end application (focusing on the software part due to lack of availability of hardware parts)which tracks the level of trash in the smart bin and notifies the concerned authority regarding the status of the bin along with its location. The notification allows the concerned trash collector to come and collect the trash from the bin.

A mobile application is developed as a part of this project which connects to the cloud and displays all the necessary information of the bins in the application to the concerned administrator.

Novelty

The novelty of this project is to develop an intelligent alerting system for proper management of garbage.This idea can also be implemented in Sri City or in our college which also helps in keeping the college or city clean.This idea of smart bin can be a major change in the domain of waste management.

System Model

Model Description:

- Smart trash bins located at various places will be continuously monitored by the sensors (i.e Ultrasonic , Gyro).
- The collected data will be hierarchically sent from all the nearby trash bins (NodeMCU) to a gateway(Raspberry Pi) node which uploads the data into a cloud database.
- Based on the updates of the bins (status) received from the cloud, a trigger will be initiated which alerts the concerned admin for an allotment of driver to a particular bin.
- The live updates of all the bins and driver details can be monitored on a mobile application by the concerned admin.
- The mobile application gives global access of data to the concerned admin.

Tech Stack (Mobile App):

- Python
- Flutter
- Google Firestore
- Google cloud services
- Google cloud functions
- Google Maps Services
- SyncFusion Charts
- Map box

Hardware Requirements:

Due to the lack of hardware components, the hardware module is not yet completed

- Ultrasonic sensor
- Gyroscope sensor
- NodeMCU
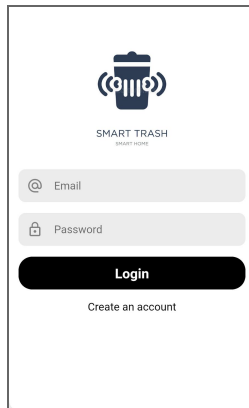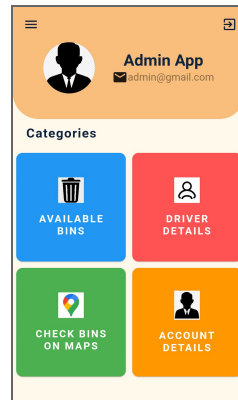- Raspberry Pi

App View

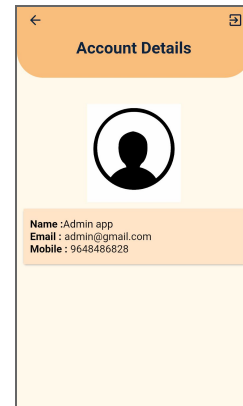*Fig. Login Page*

Fig. Home Page

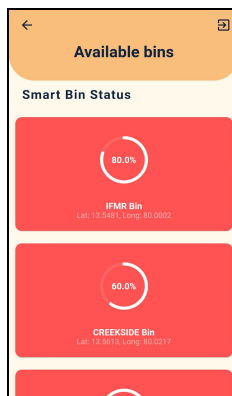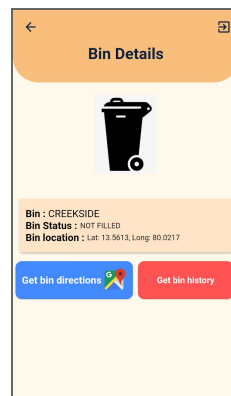*Fig. Account Details*

Fig. Available bins
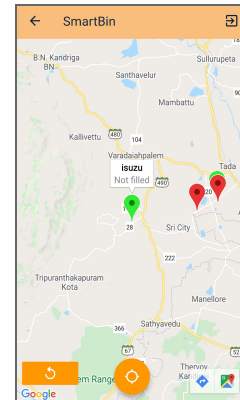

Fig. Bin details page

Fig. Bins on Maps
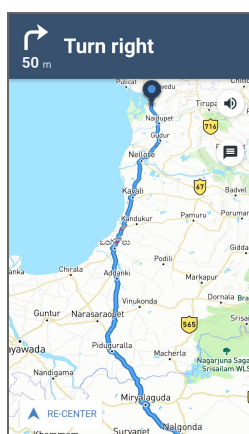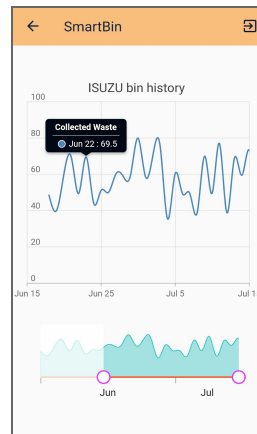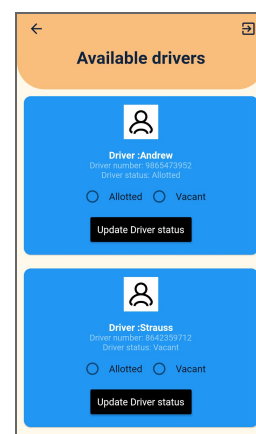

Fig. Directions

Fig. Graphs

Fig. Drivers Page
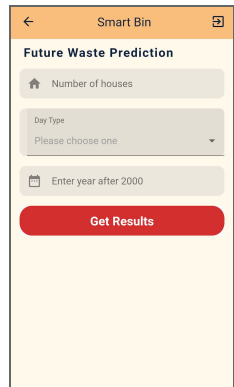
Future Wastage Predictions
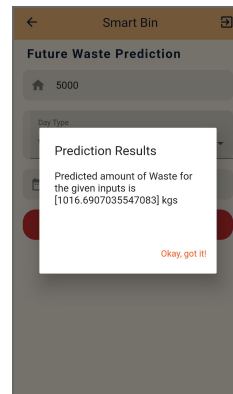

Fig. Predictions Page

Fig. Prediction Results

- The Machine learning model is deployed in the google cloud.
- The deployed model is integrated with the mobile app.
- The predictions are displayed on the app based on the inputs of the user.
- From the predicted wastage, amount of electricity generated is calculated using

   Electricity produced = Waste generated in Kgs x 550 Wh/Kg
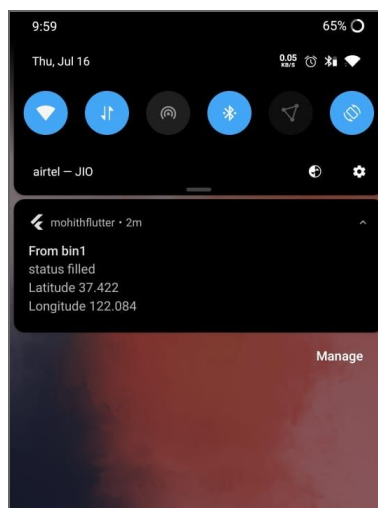
Alert Notification

Fig. Alert Notification

- An alert notification is sent to the admin's device, on any change in the status of a particular bin.
- The notification is triggered by the google cloud function interactive to the change in the status of bin in database

Overview of Mobile Application

- The sensor data is randomly generated from a python code and uploaded to database along with timestamp
- All the uploaded data is stored in a cloud firestore database.
- An interactive mobile application is developed which interacts with the cloud database on demand of the user
- User Authentication is completed and credentials are stored securely in the firebase.
- Google cloud functions are used for the live triggering of notifications to the concerned administrator on a particular update of the bin.
- The live updates of all the bins are displayed in the mobile application.
- The entire bin history can be visualized in graphical way in an user friendly manner.
- A Linear Regression based machine learning model is deployed on google cloud and connected with the mobile application.
- Future power predictions are displayed in the app based on the inputs given by the user.

Challenges faced

- Model deployment
- Google Maps Directions API