SMART BIN

PROBLEMS

- GARBAGE OVERFLOW
- UNOPTIMIZED GARBAGE COLLECTION

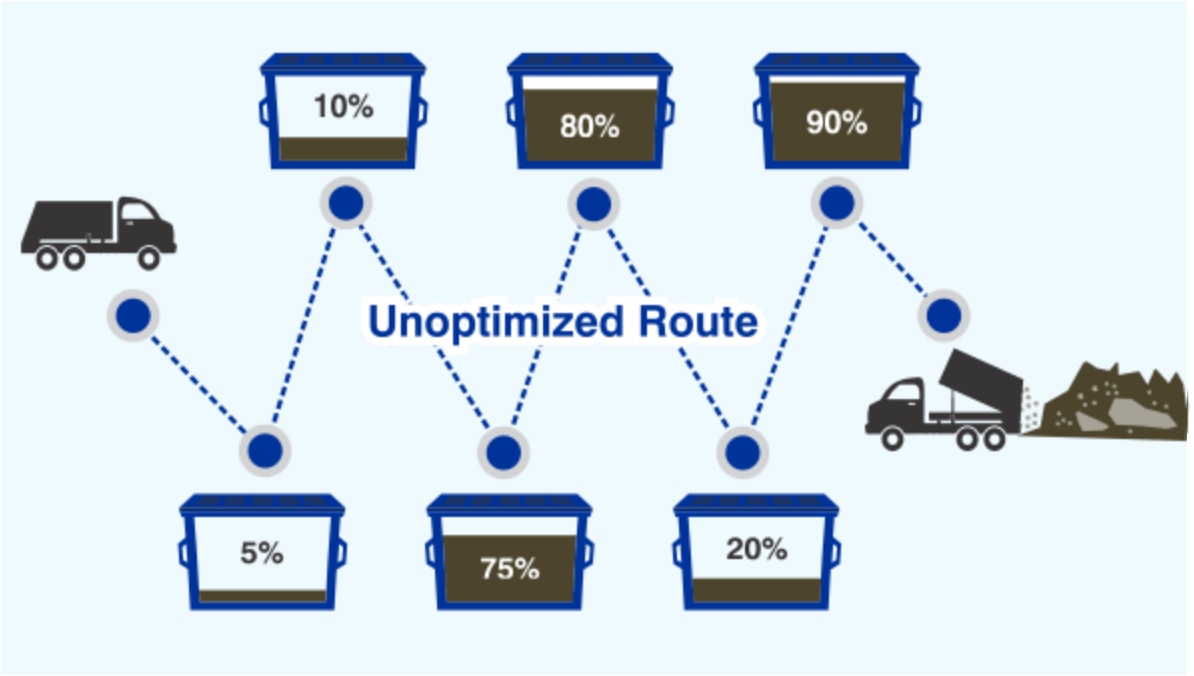
GARBAGE OVERFLOW

Overflowing garbage bin is a common sight for us. The sluggish clearance of garbage is leading to potentially hazardous health situations. Garbage trucks collect waste using fixed schedules every week and people are forced to bear with the stench.

PROBLEMS

- GARBAGE OVERFLOW
- UNOPTIMIZED GARBAGE COLLECTION

UNOPTIMIZED GARBAGE COLLECTION



The traditional way of garbage collection, regardless they are full or not, leads to:

- Un-optimized route
- Higher transportation cost
- Loss of fossil fuel(petrol/diesel)
- Loss of time

KEY FEATURES

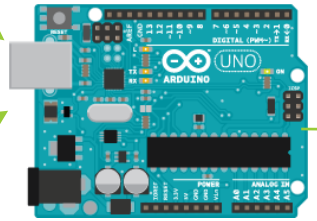
- Automate the solid waste monitoring and collection process using Internet of Things(IOT).
- Detect the waste level by using Ultrasonic Sensor interfaced with Arduino.
- Send the bin data to the application by using GSM module.
- Displays the relevant details of the bin in an application.
- Shows the location of the bin in a Map.
- Notify the admin to eliminate overfilling when the bin is almost full.
- Cut the service costs by up to 50%.

SYSTEM ARCHITECHTURE

Hardware Specification

Ultrasonic Sensor

GSM Module



Arduino

Bindata

Back-end specification

Database Server

API

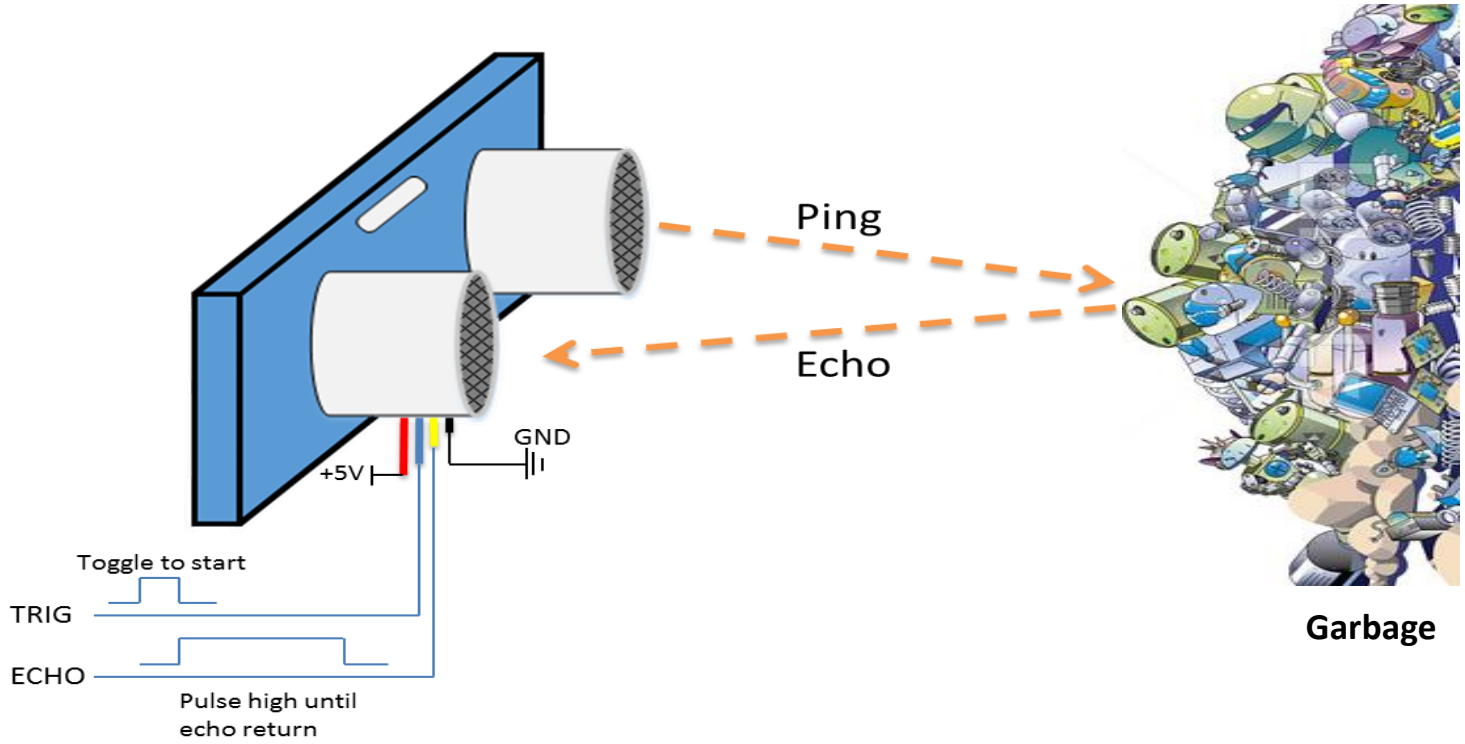
Front-end specification

Mobile Application

HARDWARE IMPLEMENTATION

- ULTRASONIC SENSOR
- GSM MODULE
- ARDUINO UNO

ULTRASONIC SENSOR

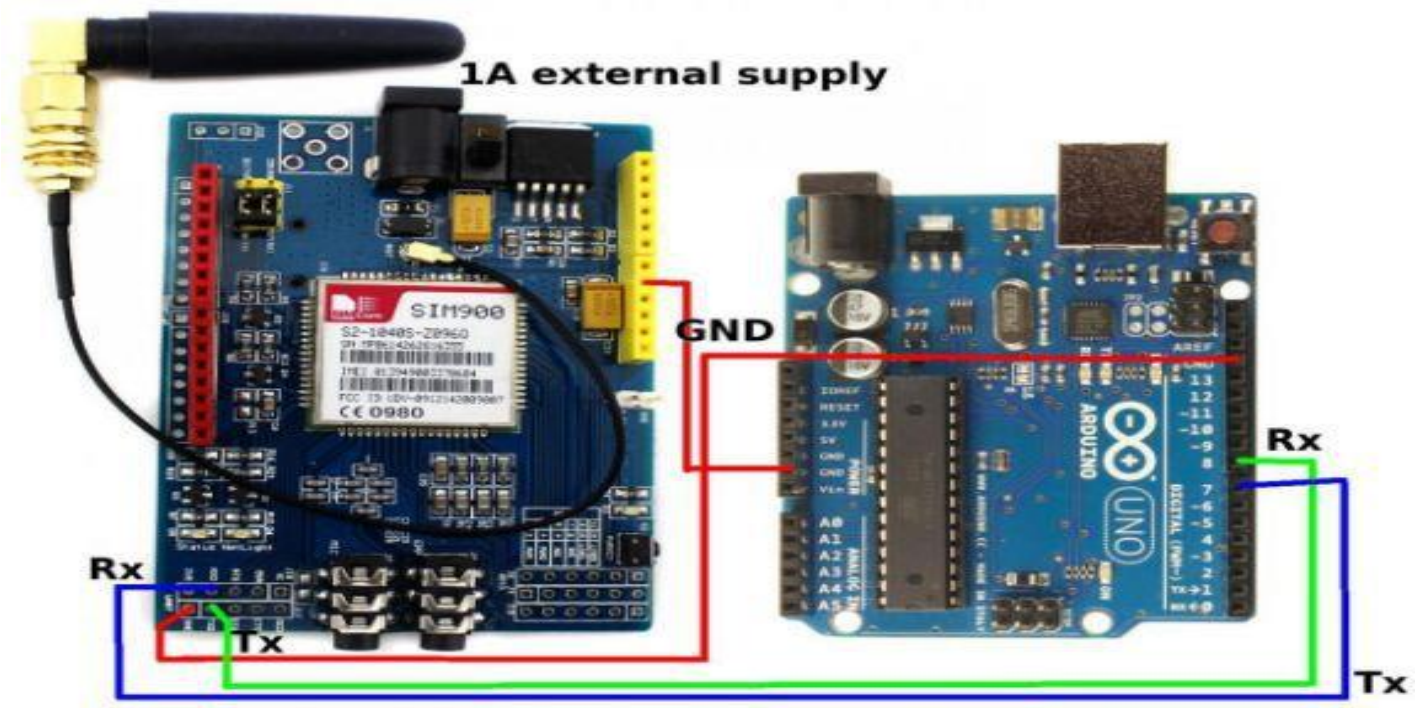


- Ultrasonic Sensor sends out a high-frequency sound pulse, and then times how long it takes for the echo of the sound to reflect back.
- The length of the returning pulse is proportional to the distance of the garbage from the sensor.
- The travel time and, the speed of sound is taken into account to calculate the distance.

HARDWARE IMPLEMENTATION

- ULTRASONIC SENSOR
- GSM MODULE
- ARDUINO UNO

GSM MODULE

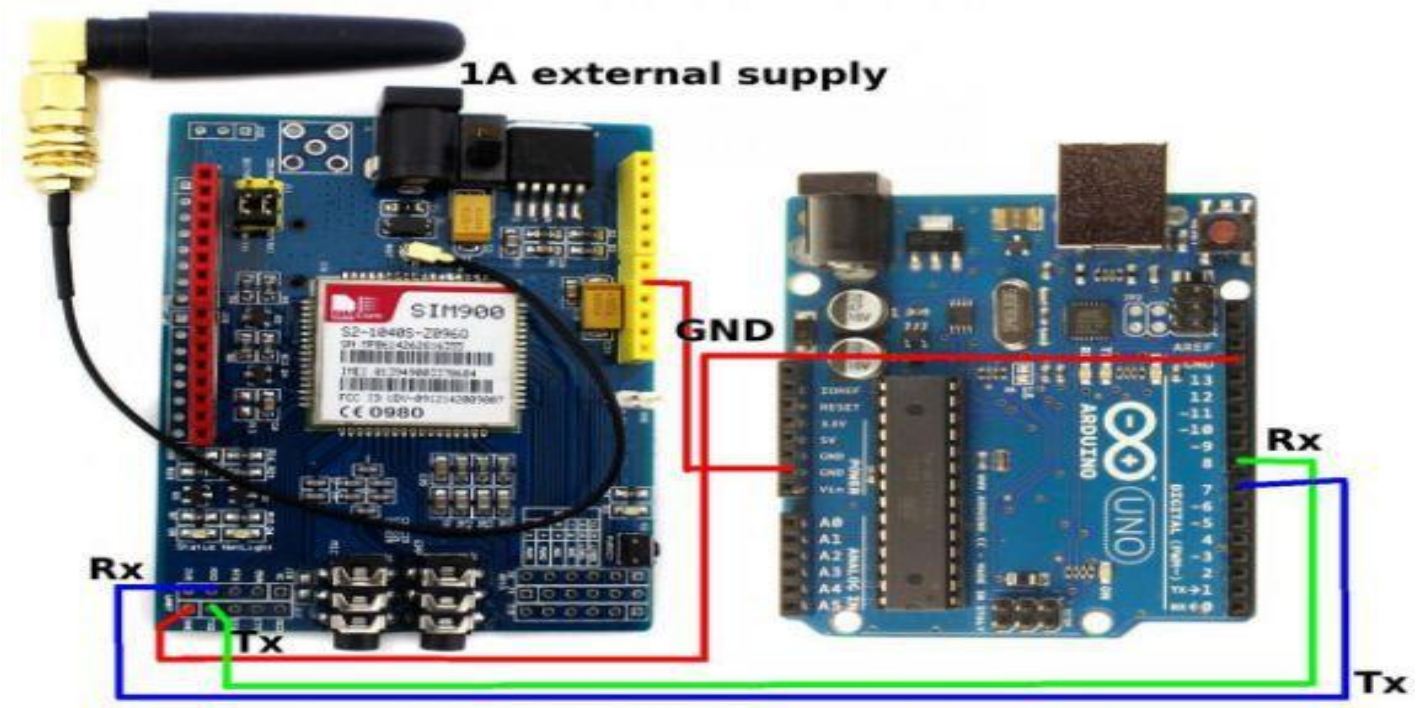


- GSM Sim 900 module is an ultra-compact, and reliable Quad-band modem.
- It provides an internet connection, and transfers the data to the server.
- The unique IMEI no. of the Sim is used to distinguish each bin from the other bins.

HARDWARE IMPLEMENTATION

- ULTRASONIC SENSOR
- GSM MODULE
- ARDUINO UNO

ARDUINO UNO

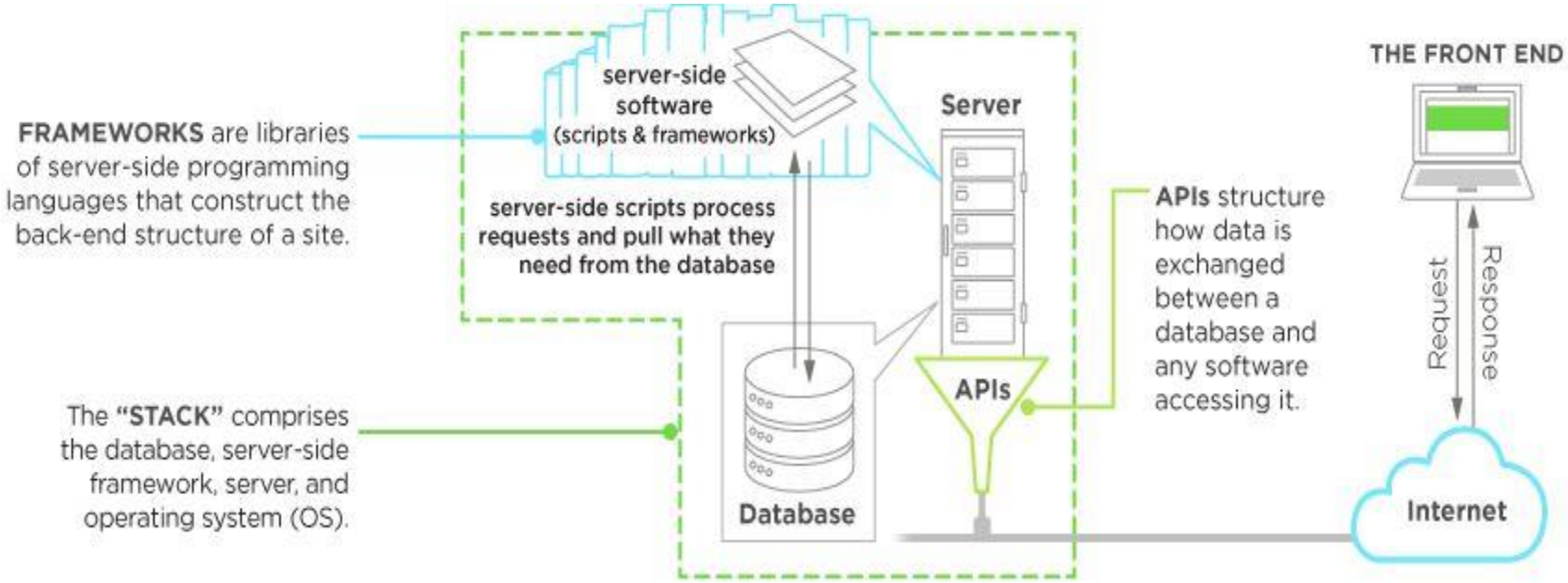


- Arduino Uno is the key component of this project. It is a micro-controller board that provides both Hardware and Software platform.
- Both, Ultrasonic Sensor and GSM module, is interfaced with the Arduino.
- The code is written in Arduino IDE software, where the data is analysed, calculated, and transferred successfully to the server.

BACK-END TECHNOLIGIES

- PHP
- DATABASE

PHP



- PHP (Hypertext Pre-processor) is a server-side back-end programming language.
- It facilitates the transfer of data from Arduino to the Database server.
- It is designed to interact with the database, and process information from the server to access the database.
- It is use to build Application Programming Interfaces (APIs), which controls what data and software a site shares with other apps.

BACK-END TECHNOLIGIES

- PHP
- DATABASE

DATABASE

bin_info table

#	Name	Type
1	bin_id	int(20)
2	bin_code	varchar(20)
3	bin_name	varchar(20)
4	imei_no	varchar(20)
5	type	varchar(10)
6	latitude	decimal(12,9)
7	longitude	decimal(12,9)
8	location	varchar(500)
9	address	varchar(5000)

bin_level_data table

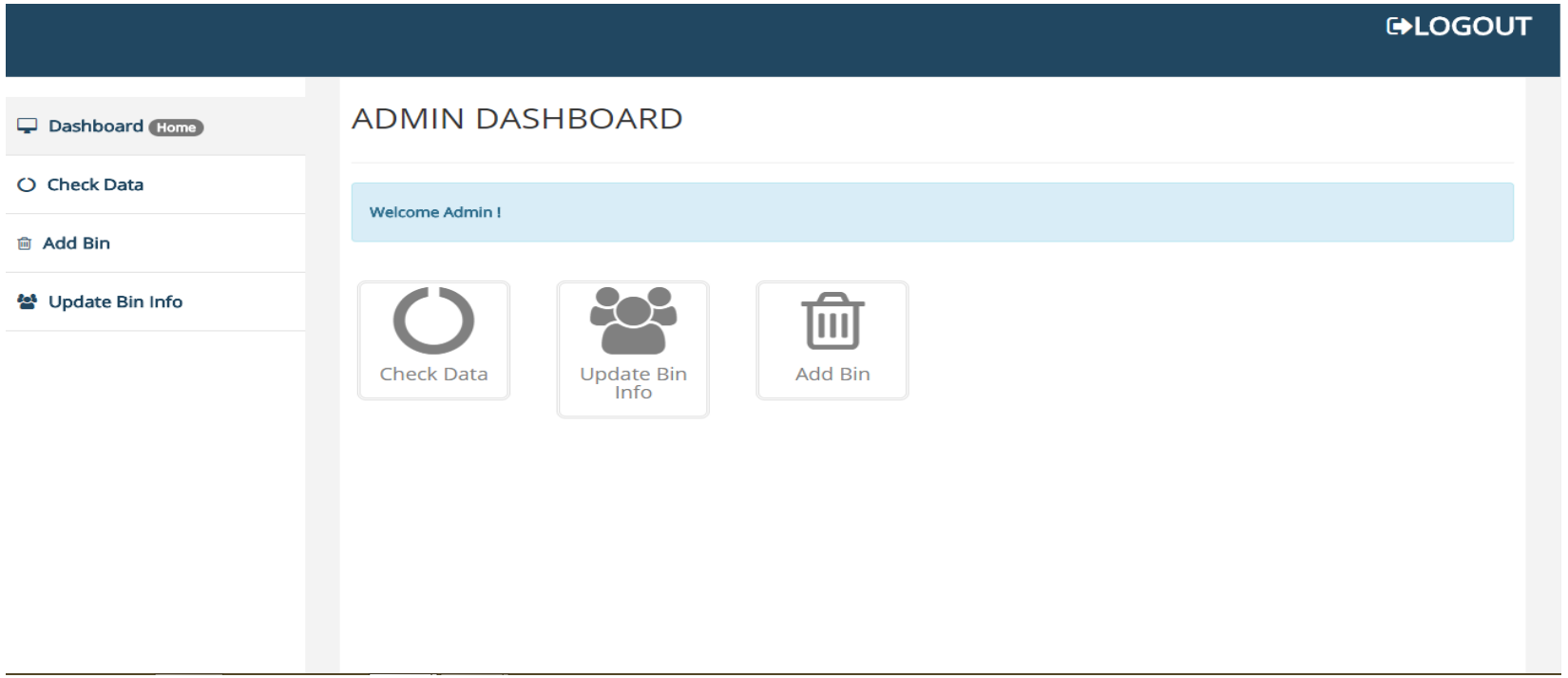
#	Name	Type
1	bin_code	varchar(20)
2	bin_view_count	int(11)
3	bin_level_count	int(11)

- The database is responsible for accepting the query, fetching the data, and returning it to the website and the application.
- It accepts new, and edited data when Arduino interacts with then using PHP.
- The relevant details of each Bin is stored in the bin_info table.
- The details are imported in MYSQL Database from the Excel Sheet using PHP.
- The level of the bin is stored in the bin_level_data table.

FRONT - END IMPLEMENTATION

- WEB PAGES
  - Login
  - Check Data
  - Add Bin
  - Update Bin Info
- MOBILE APPLICATION
  - Login
  - Location
  - Bin Details
  - Map

WEB PAGES



Webpages are used by the admin for the following purpose:-

- To check the Bin Data of a particular bin.
- To update the location, address and other bin information.
- To add new bin's detail whenever a new bin is installed.

FRONT - END IMPLEMENTATION

- WEB PAGES
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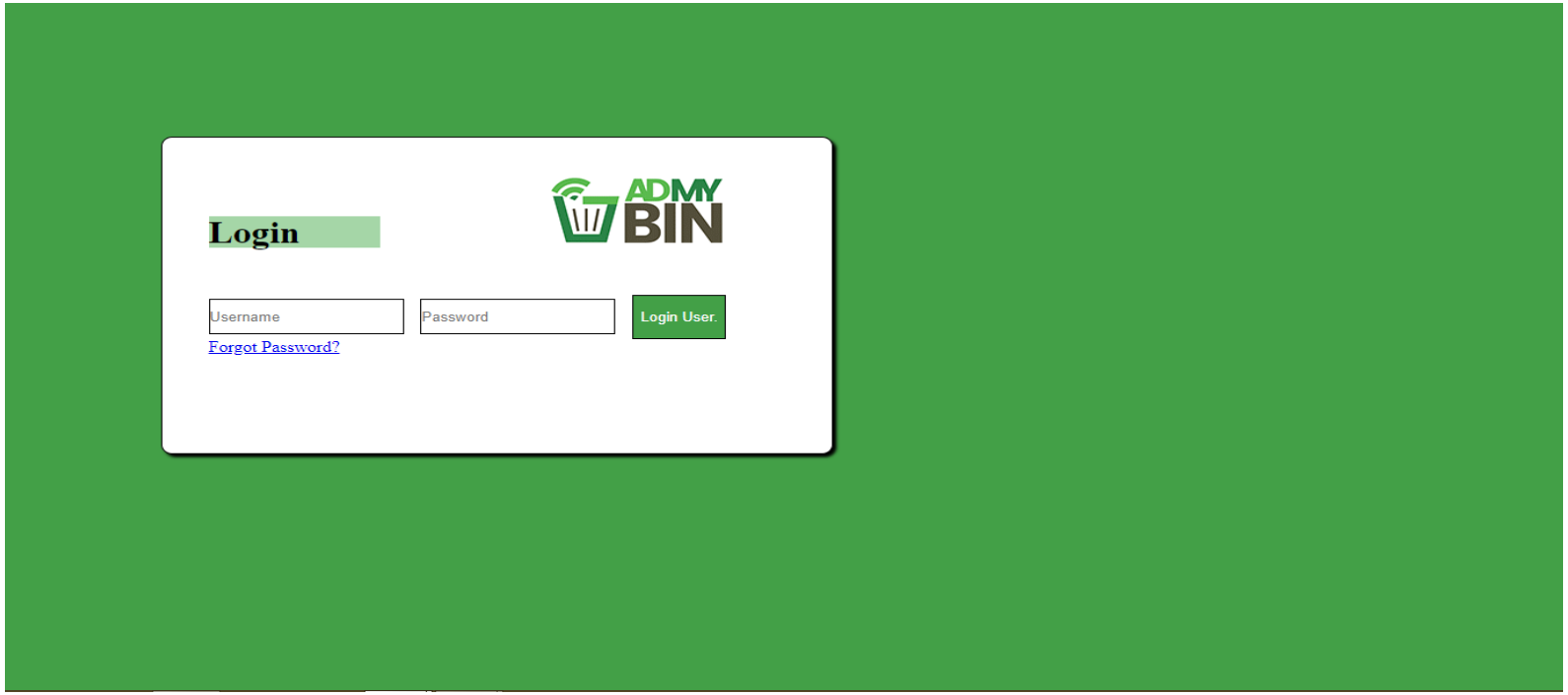
Webpage - Login



Admin Login by using username and password

FRONT - END IMPLEMENTATION

- WEB PAGES
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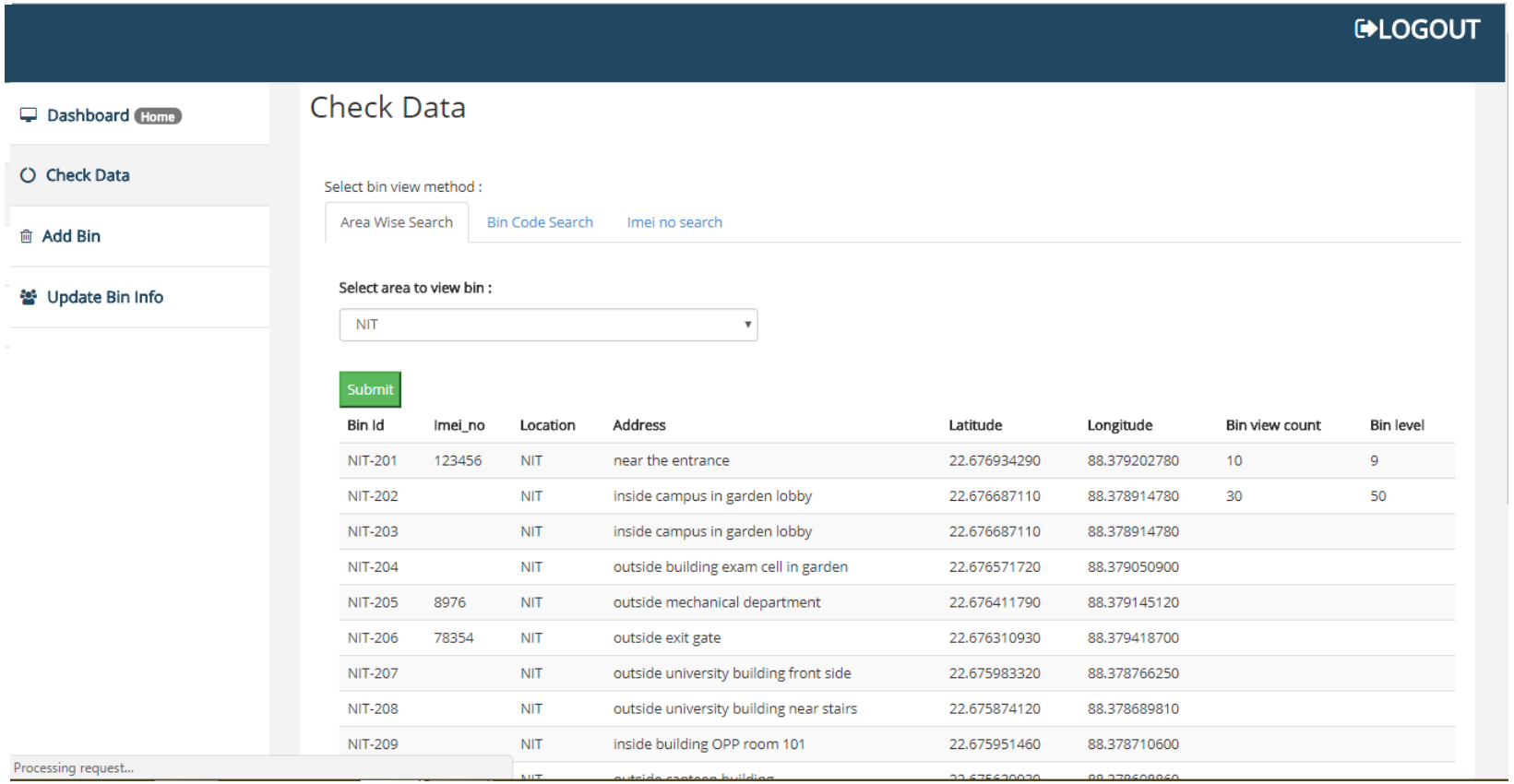
Webpage - Check Data



Bin Id	Imei_no	Location	Address	Latitude	Longitude	Bin view count	Bin level
NIT-201	123456	NIT	near the entrance	22.676934290	88.379202780	10	9
NIT-202		NIT	inside campus in garden lobby	22.676687110	88.378914780	30	50
NIT-203		NIT	inside campus in garden lobby	22.676687110	88.378914780		
NIT-204		NIT	outside building exam cell in garden	22.676571720	88.379050900		
NIT-205	8976	NIT	outside mechanical department	22.676411790	88.379145120		
NIT-206	78354	NIT	outside exit gate	22.676310930	88.379418700		
NIT-207		NIT	outside university building front side	22.675983320	88.378766250		
NIT-208		NIT	outside university building near stairs	22.675874120	88.378689810		
NIT-209		NIT	inside building OPP room 101	22.675951460	88.378710600		

Data can be checked using three parameters.

FRONT - END IMPLEMENTATION

- WEB PAGES
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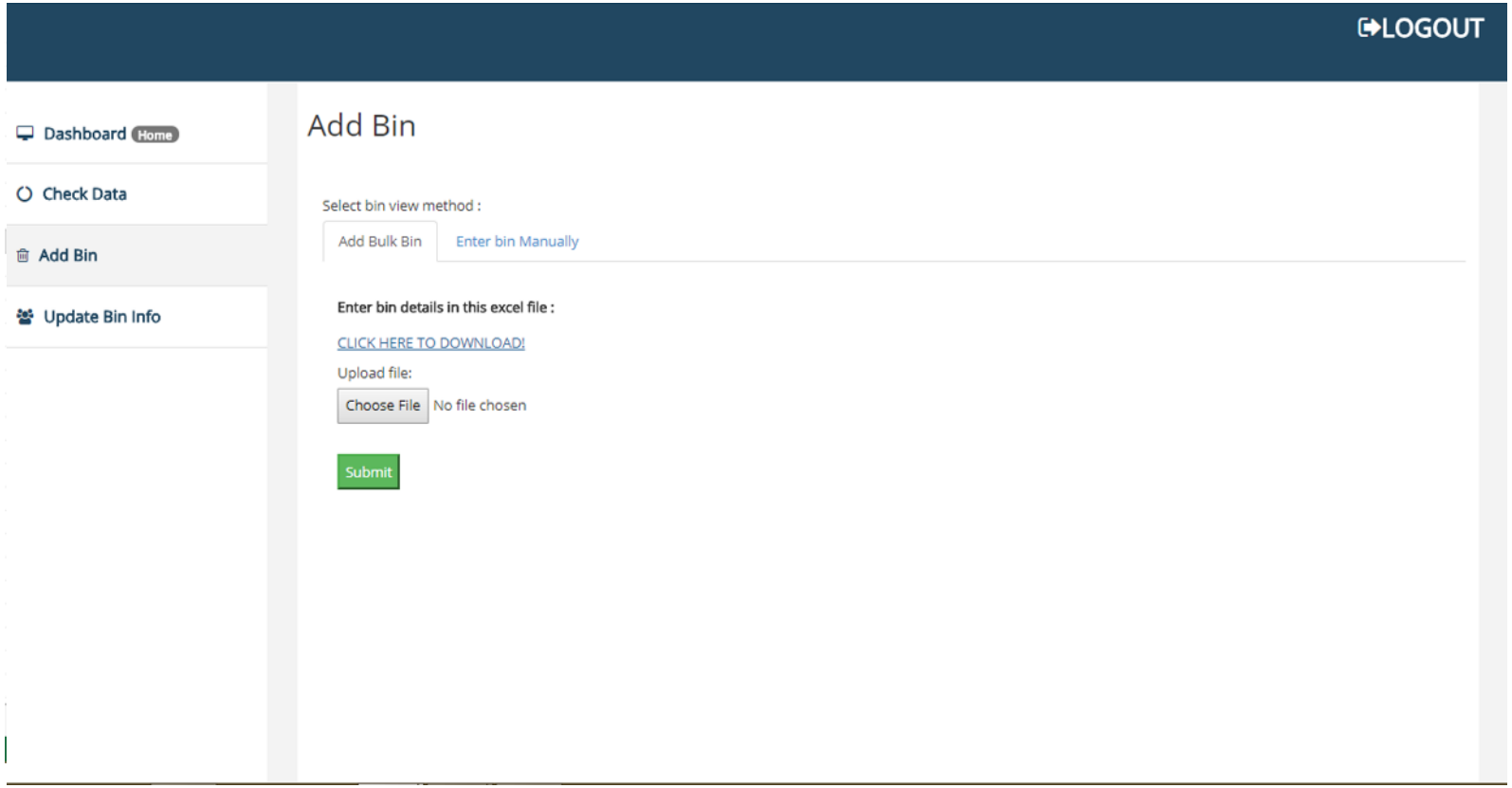
Webpage – Add bin



Adding multiple bins of same location using an excel file.

FRONT - END IMPLEMENTATION

- WEB PAGES
  - Login
  - Check Data
  - Add Bin
  - Update Bin Info
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  - Login
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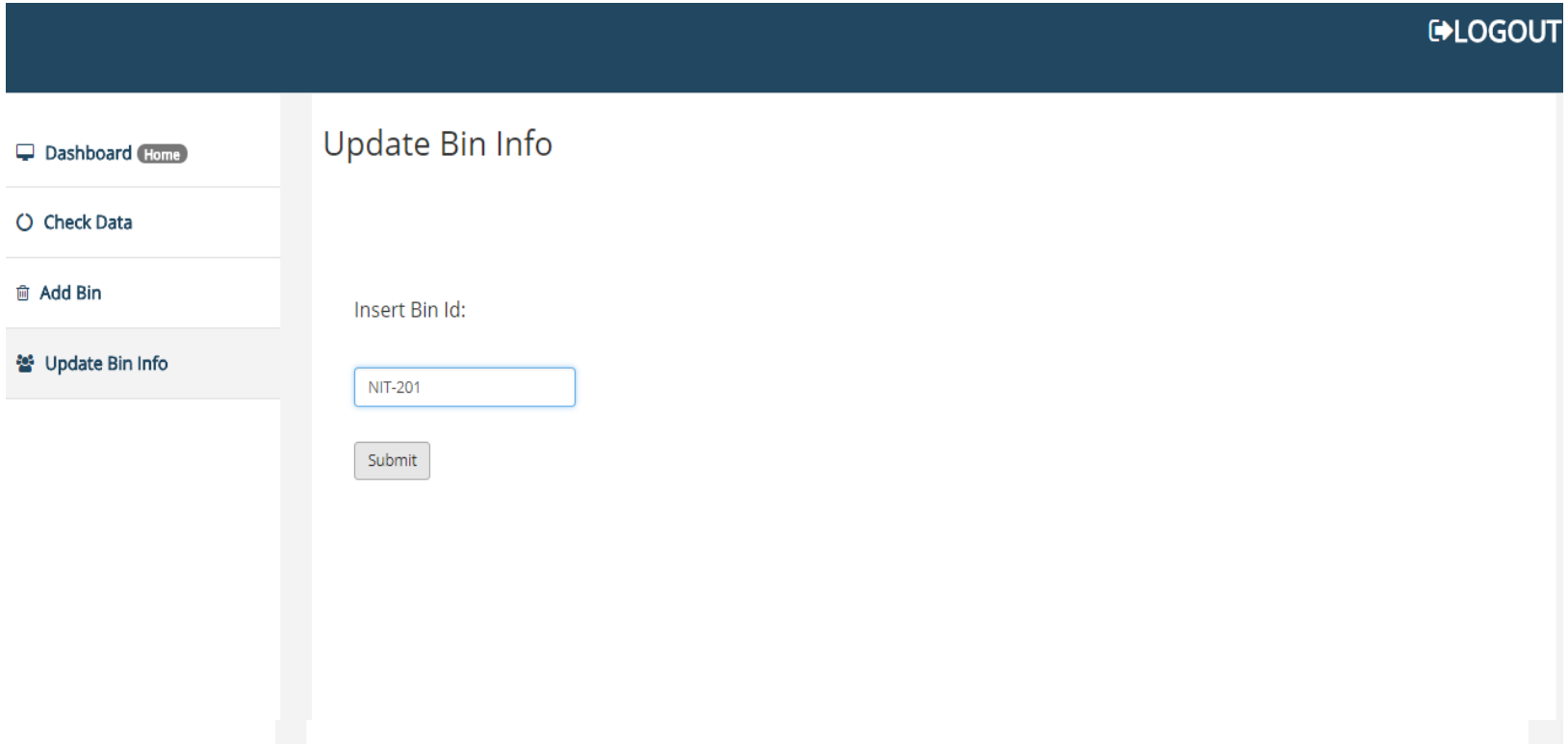
Webpage - Update Bin Info



The basic bin information can be edited if a bin is shifted to another location by entering the unique bin id.

FRONT - END IMPLEMENTATION

- WEB PAGES
  - Login
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MOBILE APPLICATION

- Mobile application displays the location of the bin.
- It also shows the level of waste and count of people using the bin.
- The location of the bin is also displayed in a map.

FRONT - END IMPLEMENTATION

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  - Login
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MOBILE APPLICATION - Login

Login using username and password.

FRONT - END IMPLEMENTATION

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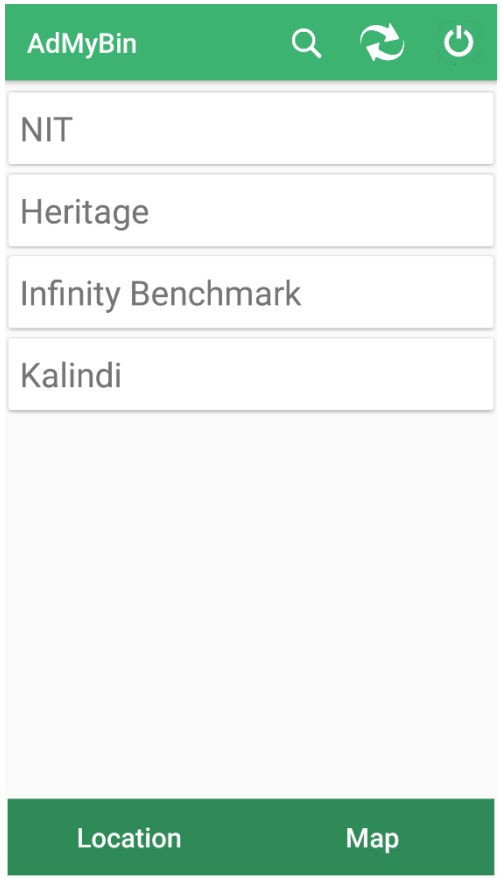
MOBILE APPLICATION - Location



The list of location/area is present which on clicking gives the list of bin (along with details) present in that area.

FRONT - END IMPLEMENTATION

- WEB PAGES
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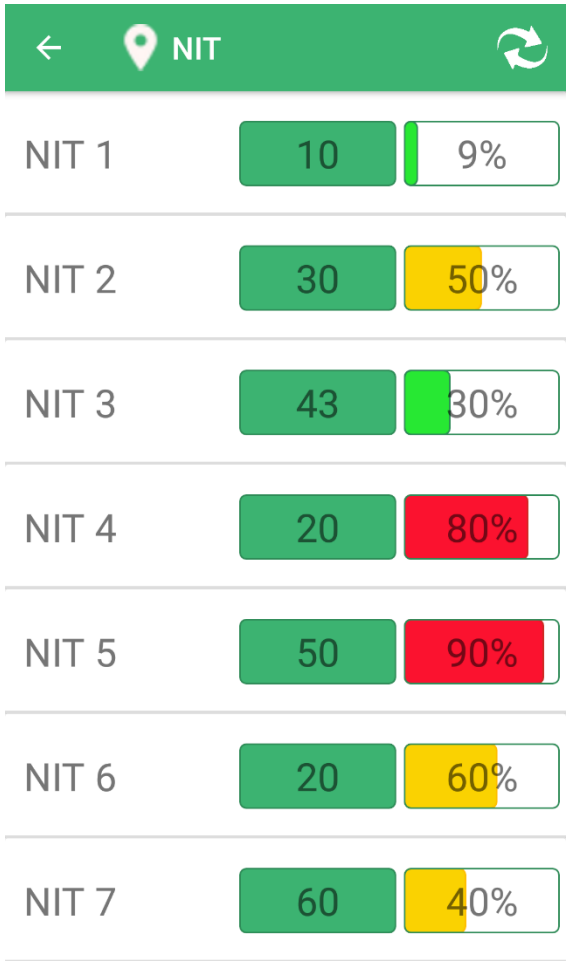
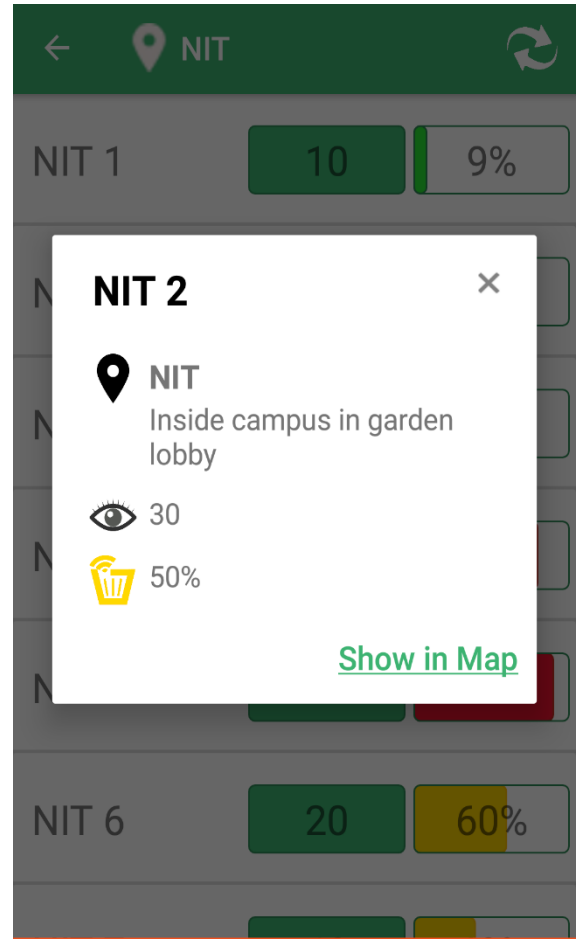
MOBILE APPLICATION – Bin Details





The list of bins in an area is displayed along with the count of people who have used the bin and % waste level. A notification will be sent when the bin is more than 70% filled so that the drivers can go to collect the waste.

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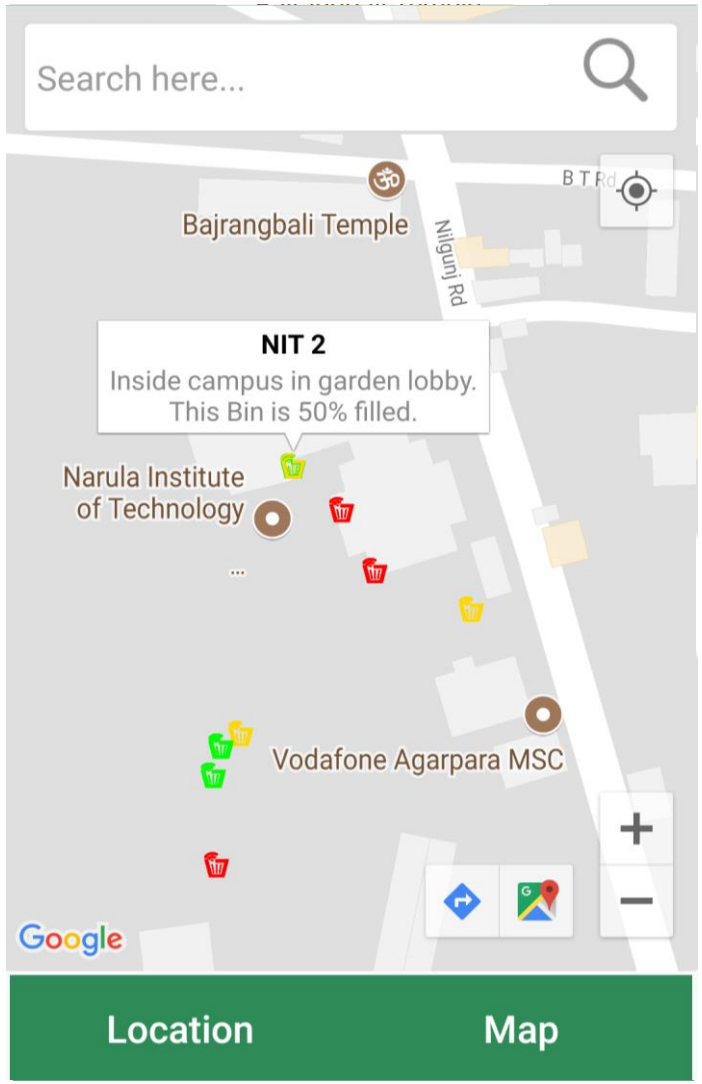
MOBILE APPLICATION - Map



On clicking ‘Show in Map’ in the dialog box, the respective bin location is shown in the map.

REVENUE RECOGNITION

- The count of number of people is recorded to make the project economical to the admin.
- There will be an advertisement installed above each bin at a certain height.
- The number of people using the bin will be equal to the number of people viewing the advertisement.

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- The company whose advertisement is installed above bin will be given the bin id and location.
- The company can keep the track of no. of people viewing the advertisement.
- Hence, the admin will be paid by the company according to the count of people data.

LIMITATIONS

- Trial and testing of the project requires specific environment and labs equipped with proper facilities.
- The project can be implemented only in the metropolitan cities and some tier II cities.
- Skilled and trained people are required to operate the whole mechanism.
- Installing the hardware tools on the cap of the bin is not very secure. Tools can be robbed.

FUTURE SCOPE

- Separate type of waste collection put in difference bins by using other sensor.
- Install LCD screen in front of bins which displays the level of the bin to public.
- Generate a voice message whenever people throw the waste outside the bin.
- Generate an alarm system when someone tries to dismantle the hardware installed in the bin.

THANK YOU