PROJECT PROPOSAL

Smart Garbage Management System

For Smart City

ICT 305 2.0 Embedded System

Mullevidana M.C.D.

AS2019941

Introduction

Many nations are switching from traditional city concepts to smart city concepts in the modern era. Mostly because of these ideas, daily life is made simpler. The massive amounts of rubbish that have accumulated in cities as a result of an increase in human demands and wants is a prevalent and current concern. The current method of garbage collection involves gathering rubbish into distinct plastic bins and delivering the gathered garbage to the trash truck on a specific day of the week. Following are the problems identified in the current method:

Problems

- Number of dustbins in the city are barely adequate to cope with the amount of waste generated.
- Because the garbage cans are overflowing, animals like dogs, ravens, and mice frequently remove the trash out of them and dump it in the environment.
- There is no system in place to alert the collectors when the trash cans are full and ready to be picked up.
- Lack of knowledge regarding the volume of trash picked up each week or month.

Solutions

The smart garbage management system for a smart city is introduced as a result of the predetermined defaults. The answers to the problems mentioned below are:

- locating the venues where more trash cans are needed by analyzing the data gathered.
- Introducing trash cans with automatic lids to prevent animal access to the garbage that has been collected.
- The automated lid will lock after the bins are 90% full, and only the trash collector may unlock the lid using a mobile app. The overstuffed trash cans will be removed using this technique.

- A mobile application can look at the trash cans remotely.
- The trash collector will receive a text message with the location of the trash can once it is full and prepared for collection.
- Trash collectors will be notified on the optimal route of the locations of bins that are completely full and nearly full.
- For each municipality, a weekly/monthly report will be provided to give an indication of the waste that has been collected.

Benefits of a smart garbage system

- Garbage pollution can be reduced to a minimum.
- lessen the amount of trash that animals ingest.
- The foul smell is lessened because the rubbish is picked up on time.
- Enhanced effectiveness.
- Fuel efficiency since each trash collection truck is given the most efficient route.
- The amount of trash collected by each place can be reduced by evaluating monthly or weekly statistics.

Methodology

- use a nodeMCU microcontroller board for each bin.
- Since the nodeMCU board has an inbuilt WIFI module, we can connect it to a WIFI router and upload the data to a cloud database.
- The ultrasonic sensor is used to read the filled percentage of the garbage bin.
- The servo motor is used to operate the automated lid.
- PIR sensor is used to identify whether a person is getting near the bin.
- LCD display is used to display the filled status of the bin. (E.g.- “Bin is full”, “Bin is 50% full”)
- GSM module is used to send text messages on when to pick up the trash.
- Cloud is uploaded with all the data (filled percentage, location of the dustbin, alert messages) using the WIFI module. Garbage collectors can access the mobile application to receive the alerts.

- Collectors are able to access the optimal route to collect trash more efficiently. If the bin has been locked, only the trash collector can go to the location and unlock the bin via the mobile application.
- System is able to generate weekly or monthly reports according to the collections made through that period. Only admins can see the reports using the mobile application.

Components

1. NodeMCU ESP8266
2. Power Supply
3. Ultrasonic Sensor
4. GSM Module
5. PIR Motion sensor
6. LCD display with I2C module
7. Servo motor
8. Bread Board
9. Jumper Wires

Technology stack

Language

- Arduino
- C / C++
- Java

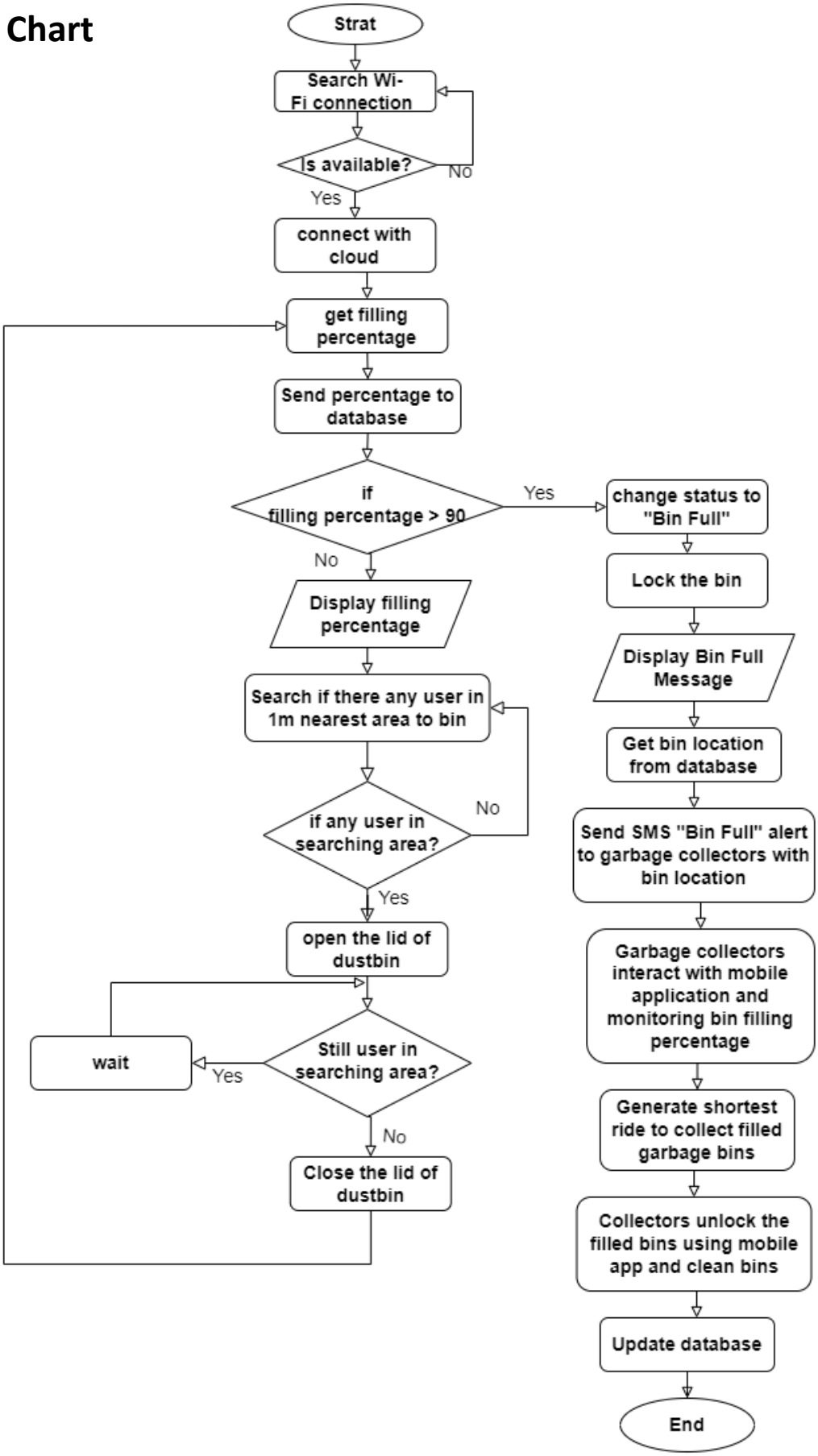
Databases and servers

- Firebase Database

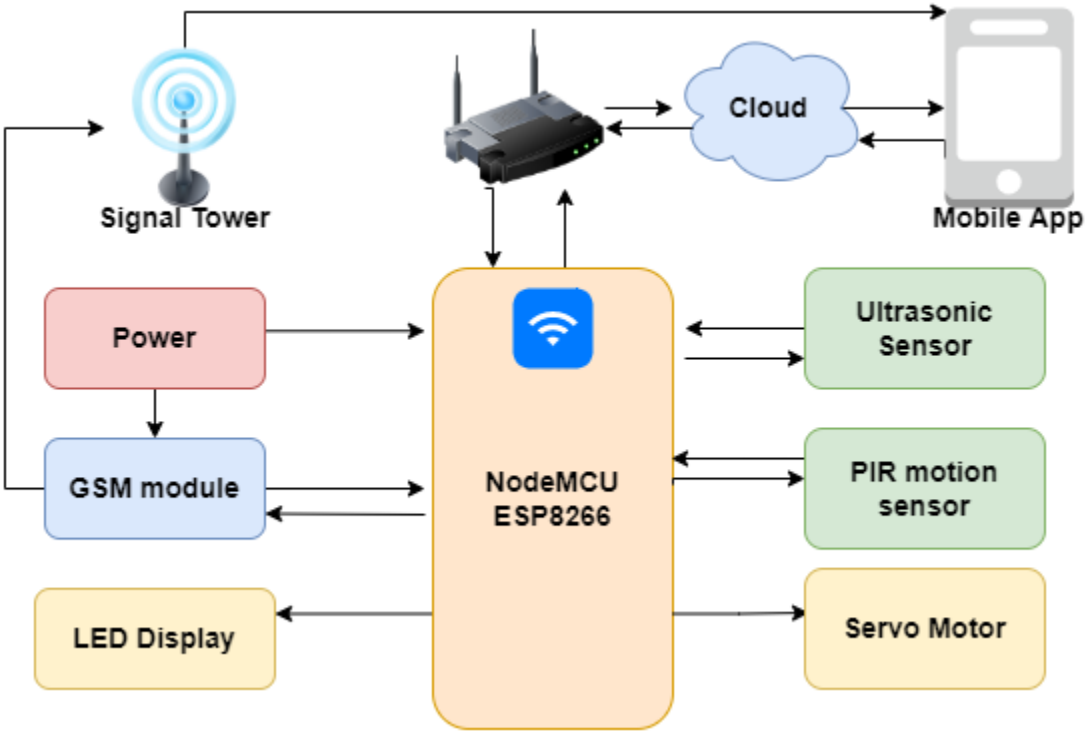
Tools and Technologies

- Arduino IDE
- Android Studio

Flow Chart


Strat
Search Wi-Fi connection
Is available?
No
Yes
connect with cloud
get filling percentage
Send percentage to database
if filling percentage > 90
Yes
change status to "Bin Full"
No
Display filling percentage
Lock the bin
Display Bin Full Message
Search if there any user in 1m nearest area to bin
Get bin location from database
if any user in searching area?
No
Send SMS "Bin Full" alert to garbage collectors with bin location
Yes
open the lid of dustbin
Garbage collectors interact with mobile application and monitoring bin filling percentage
wait
Still user in searching area?
Yes
Generate shortest ride to collect filled garbage bins
No
Close the lid of dustbin
Collectors unlock the filled bins using mobile app and clean bins
Update database
End

Block Diagram



Components of Smart Bin