International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 05 | May 2020 www.irjet.net p-ISSN: 2395-0072

Detection and Identification of Vehicle's No-Parking Area using IoT and Cloud

Vaibhav B. Mandlik[1], Vaishnavi M. Kulkarni[2], Aakash L. Rathod[3], Kalyani H. Dhake[4]

[1]*Student, Dept. of Information Technology, Sandip Institute of Technology and Research Center, Affiliated by Savitribai Phule Pune University, Maharashtra, India*
[2]*Student, Dept. of Information Technology, Sandip Institute of Technology and Research Center, Affiliated by Savitribai Phule Pune University, Maharashtra, India*
[3]*Student, Dept. of Information Technology, Sandip Institute of Technology and Research Center, Affiliated by Savitribai Phule Pune University, Maharashtra, India*
[4]*Student, Dept. of Information Technology, Sandip Institute of Technology and Research Center, Affiliated by Savitribai Phule Pune University, Maharashtra, India*

Abstract - *Smart parking systems generally get data concerning accessible parking fields in a very explicit geographical region. From the main problems that smart cities face one is traffic management systems and parking facilities. Due to vehicles in the no-parking field, many problems arise to confront traffic problems. The planned system is combined with the applications of cloud and IoT. The target of this planned system is to design, style and implement "Detection and Identification of Vehicle's No Parking Area", that helps the motive force to simply sight the current parked area is no parking area or not. With the help of a real-time cloud server and the vehicle's geo-location, the no-parking zone of the vehicle is identified. This system not only reduces congestions; however, it is cost-efficient and provides user authentication. This system uses geo-location, a microprocessor for real-time data assortment, real-time cloud server and no-parking detection mobile application. This system will save time which needs to search for a parking lot.*

***Key Words*: Android, Cloud Server, IoT, No- parking, Parking, Real time parking, etc.**

1. INTRODUCTION

Our proposed work is going to change the lifestyle of each driver. This system will not only prevent the driver to park a vehicle anywhere but also it will help them to save their time in searching for a parking lot.

In the congested area of the city, finding a place for parking is very difficult. This is why most people park their vehicles anywhere which then causes a big traffic issue. Using this system, the vehicle owner will immediately let know that his vehicle is in the parking area or not. We are using a GPS sensor to recognize vehicle status. If the vehicle is parked in the no-parking area then first he will get alert and if the driver selects, our system will drive him safely to the nearest parking area. There is also a utility, that user can add their own parking area or no-parking area through a mobile application of our system.

This will help the driver to recognize the NO-parking area. Every user will have to register their vehicle to our system. Users can register on our system through our android application or a web application by just following a few steps.

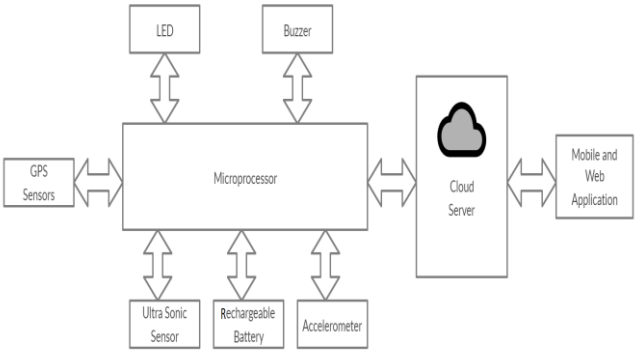

Fig -1: System Block Diagram

2. SYSTEM WORK

2.1 No-Parking Detection

We are using a Ublox Neo-6M GPS sensor to recognize the vehicle's geo-location. This GPS sensor needs at least 3 satellites to give the accurate geo-location of the vehicle if it has a clear vision to the satellites then the accuracy is of 2.5 meters. Our device will recognize the geo-location of the vehicle after a period of every 30 seconds. Each geo-location will be compared with the last geo-location by calculating its distance and if we got the distance less than 5 meters for at least 3 or more times then our device will send that geo-location to the server with the request to check the status of that vehicle. If the vehicle has similar geo-location for 3 or more times it will consider as the vehicle has stopped moving and will send the request to check the status.

When the vehicle will stop moving, the server will check whether the vehicle is in the parking zone or in the no-parking zone or in an unknown zone. The server will compare the current location with each saved parking & no-

parking location stored on the cloud database by measuring the distance between the current location & saved location. The location of the parking or no-parking area radius of that slot is also stored on the cloud database. The status of the vehicle will be defined by comparing this radius and the calculated distance between the current location and the saved location. If that distance is less than or equal to the radius stored on the cloud database thereon the status of the vehicle will be set according to the saved location type (Parking/No-Parking). If the gap between both of the locations is greater than the radius stored then the position will be set to an unknown zone. This status will be sent to the device in the form of a response to the request sent by the device.

Distance Formula: -

```
fun deg2rad(deg):

return deg * (math.pi / 100)

R = 6371

dLat = deg2rad (lat - vlat)
dLng = deg2rad (lng - vlng)

a = math.sin(dLat / 2) * math.sin( dLat / 2 ) + math.cos( deg2rad( vlat ) ) * m
ath.cos( deg2rad( lat ) ) * math.sin( dLng /2 ) * math.sin( dLng / 2 )

c = 2 * math.atan2(math.sqrt( a ), math.sqrt( 1 - a ) )

d = ( R * c ) * 1000
```

Where,

lat = Current latitude of vehicle
lng = Current longitude of vehicle
vlat = Latitude at the time of virtual lock
vlng = Longitude at the time of virtual lock
dlat = Distance between both latitude
dlng = Distance between both longitude
fun deg2rad(deg) = Converts the degree of latitude/longitude to radius

Fig -2: Distance Calculation Formula [6]

If the response from the server is positive then the device will again start from the beginning and will follow the defined flow of detection else the response is negative then the device will start beeping until the server sends the "Turn of beeping" request to the device. Also, if the device is in the no-parking zone then the server will send alert to the owner of the vehicle that his vehicle is parked in the no-parking area and the device is beeping. If the user wishes to turn off the beeping then he can do it by using the mobile application.

2.2 Virtual Lock

If the user wishes to enable the virtual lock, the user will turn it on by using the mobile application. After enabling the virtual lock, an entry will be added in the database which will be fetched by the device. Our device will constantly recognize that whether the vehicle has changed its location or not by measuring the distance between location inserted at the time of virtual lock and recent location. If the distance is more than 10 meters thereon the status will be set to change. If the vehicle has changed its location then the buzzer of the device will turn on and the device will request the server to send alert to the user on the mobile application. Users will be able to turn off the buzzer as well as the virtual lock through the mobile application.

2.3 Road Health

To detect the pothole on the road we have used HC-SR04 Ultrasonic Sensor. One channel of ultrasonic sensor sends an ultrasonic beam when it hits the road it reflects to HC-SR04. Another channel of ultrasonic sensor catches the reflected beam. Then our device calculates the distance between vehicle's bottom surface and surface of the road using the time taken by beam to travel from one channel to another channel. This process is repeated after every particular time-span. If the distance between surface of base and road is more than 20cm (normal ground clearance of the vehicle) then it reports the server for pothole on the road with deepness of pothole and geo-location of the pothole using GPS sensor. The number of counts for a particular location will be marked as hurdle.

3. SYSTEM OVERVIEW

Our device will start sending geo-location of the vehicle to server for processing. When our device will sense that vehicle has stopped moving, then server will compare the last location sent by our device with various stored parking and no-parking locations. Server will compare last location with the existing locations stored onto the cloud database and it will send a response to device. If the response from server is positive, device will send a request to server for information of that geo-location area. Server will send area information to device and that area information will be displayed to user.

If the response is negative, server will send one response to device and one response to device. Our mobile application will alert the user that vehicle is parked in no-parking area.

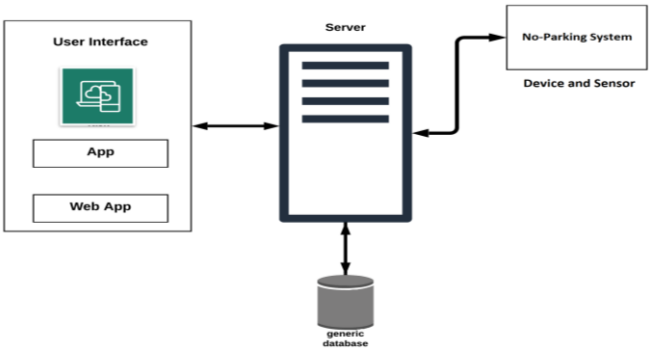

Fig -3: System Architecture

Also, after a particular time-span the device will start giving a beep. User will be conveyed regarding the beep and user will be able to turn off the beep through our mobile application. User will have an option to lock his vehicle virtually. If vehicle changes its location after enabling the virtual lock, then user will be alerted on his mobile application. Also, the user will be able to access the dashboard on the mobile application. On that dashboard, user will get the data about overall distance travelled by vehicle in km, travel path a user had done in/on vehicle(with all statistics of particular travelling), health of the road at the time of travelling, speed of vehicle during travel, user's average driving speed, last parking and no-parking location of vehicle. Also, user will have a button to lock his vehicle virtually.

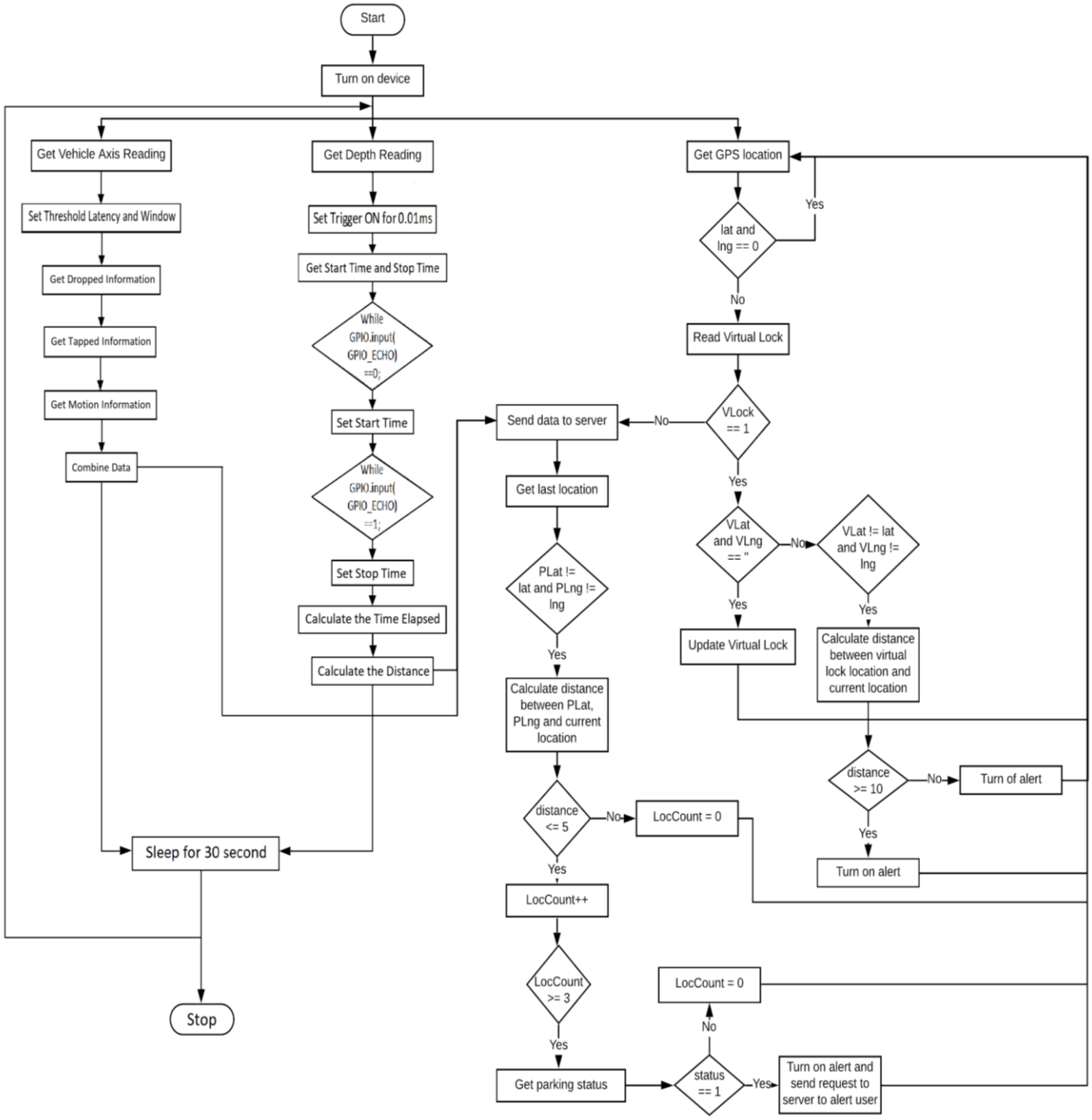

Fig -4: Workflow of System

4. RESULTS

4.1 Working of Mobile Application

The operation of mobile application is to track the vehicle's actual location, search parking place, alert no-parking place also help to find the parking places near you.

4.1.1 Login or Registration Screen

On this screen user will login with their credentials to authenticate or they will register themselves on our platform.

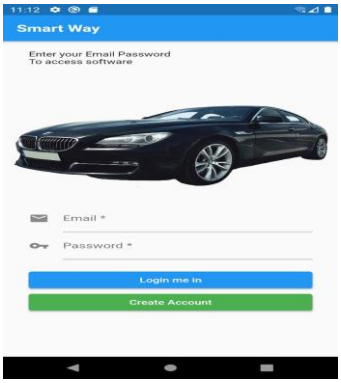

Fig -5: Login/Registration Page

4.1.2 Map Menu Screen

This page indicates operations like get your location which display your current location, live tracking toggle which shows moving vehicle's location and save parking in which user can add parking slots using some details of them to authenticate user information.

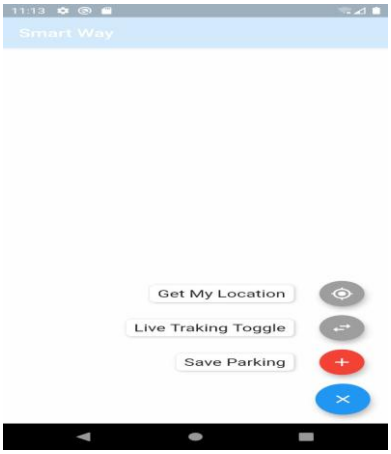

Fig -6: Map Menu

4.1.3 Add Parking Details

On this screen user will add their parking/no-parking area.

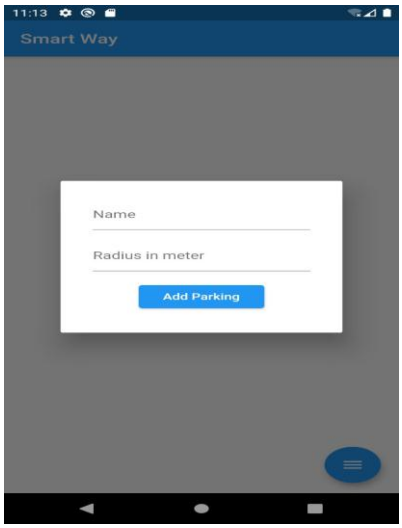

Fig -7: Add Parking

4.2 Working of Web Application

On the web application all users can see the parking and no-parking slots around them. Each location is fetched from the cloud database and pinned on the map. Also, user can see closest parking lot.

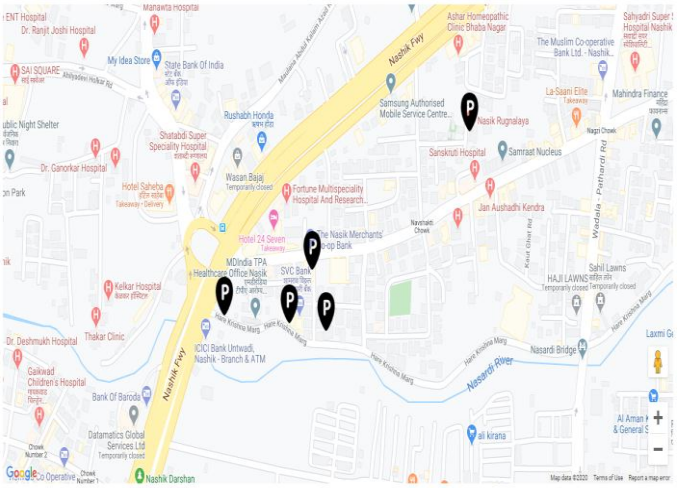

Fig -8: Parking/No-Parking Map

5. CONCLUSIONS

Requirement of the smart parking system will increase drastically in the upcoming years. However, the smart parking systems already exists in many cities, our system is targeted at making this system more cost-effective and user-friendly. This system was successfully tested and had 90% accuracy. The web application is user friendly. Future works will extend the system to work with other different technologies. We conclude there are some categories such as parking zone, NO parking zone and unknown place. For that we build a hardware which executes operations so the system give alert only when vehicle is in NO parking area. This system is of two parts, one is mobile application which is used to alert the user and user can lock their vehicle virtually. So, if vehicle move from that place it will alert on android application. Second is web application which used to mark the parking zone anywhere in the map. This will also save the time of user searching for a parking zone where user park their vehicle and the traffic congestion problem is reduced.

ACKNOWLEDGEMENT

"This work is supported by the Department of Information Technology, Sandip Institute of Technology and Research Centre, Sandip Foundation Nashik. We take this opportunity to express gratitude to all department faculty members and our well-wishers for their help & support. I also thank my parents for unceasing encouragement and support."

REFERENCES

[1] Pampa Sadhukhan, "An IoT-based E-Parking System for Smart Cities", 978-1-5090-63673/17/31.00 - 2017 IEEE.

[2] Sanjith M.Gowda, Sushanth G., Dr.Sujatha S., "IoT - based No Parking Notifier System", 978-1-5386-1442-6/18/31.00 - IEEE 2018.

[3] Rami Alkhawaji, Mohamed Sedky, Abdel- Hamid Soliman, "Illegal Parking Detection Using Gaussian Mixture Model and Kalman Filter", 2161-5330/17 31.00 - IEEE 2017.

[4] Saifa Khantasak, Nattha Jindapetch, Pakpoom Hoyingcharoen, Kanadit Chetpattananondh,

[5] Prashant S. Gawande, Amol Deshmukh, Aakash L. Rathod, Vaishnavi M. Kulkarni, Vaibhav B. Mandlik, Kalyani H. Dhake, "Detection and Identification of Vehicles No Parking Area Using IOT and Cloud", JREAS, Vol. 05, Issue 01, Jan 2020.

[6] www.stackoverflow.com.

BIOGRAPHIES

Aakash L. Rathod, pursuing BE degree in Information Technology from Sandip Foundation's SITRC, Savitribai Phule Pune University Former UOP. Published a survey paper in JREAS. Volunteered the Nashik Marathon 2019 organized by Maharashtra Nashik Police Dept. Training and Placement Student Co-Ordinator in Sandip Foundation's SITRC. This paper is published as a part of the research work done for the degree of Bachelors.

Kalyani H. Dhake, pursuing BE degree in Information Technology from Sandip Foundation's SITRC, Savitribai Phule Pune University Former UOP. Published a survey paper in JREAS. 2nd topper in academic year 2019-20. Participated in various poster and painting competitions. Member of CSI. This paper is published as a part of the research work done for the degree of Bachelors.

Vaishnavi M. Kulkarni, pursuing BE degree in Information Technology from Sandip Foundation's SITRC, Savitribai Phule Pune University Former UOP. Published a survey paper in JREAS. This paper is published as a part of the research work done for the degree of Bachelors.

Vaibhav B. Mandlik, pursuing BE degree in Information Technology from Sandip Foundation's SITRC, Savitribai Phule Pune University Former UOP. Published a survey paper in JREAS. This paper is published as a part of the research work done for the degree of Bachelors.