Parkme: IoT based Parking Availability Prediction in Neural Network

Mr. Sayed Shiraj
Department of Information Technology
Al-Ameen college of engineering Koregaon-Bhima, Tal-shirur Dist. Pune-412216

Mr. Zaid Shirgaonkar
Department of Information Technology
Al-Ameen college of engineering Koregaon-Bhima, Tal-shirur Dist.Pune-412216

Mr. Sujeet Kumar
Department of Information Technology
Al-Ameen college of engineering Koregaon-Bhima, Tal-shirur Dist.Pune-412216

Abstract

Movement stream, allotment and accessibility of parking spot inside of the avenues of Metropolitans urban areas are a noteworthy worry to each driver. The quantity of individual vehicles use is in-wrinkling complex. Individuals lean toward individual vehicles to drive than depend on open transportation. Finding a parking spot in most metropolitan regions, particularly amid the surge hours, is troublesome for drivers. Because of this there is a need to give adequate stopping places combined with a lot of openings to offer assistance the client stops his vehicle securely, likewise to guarantee the client does not wind up stopping on non-stopping region and cause distress to person on foot. The thought behind our Android Application-ParkMe is to offer the client some assistance with analysing zone's the place stopping is accessible and number of spaces free around there. Furthermore, four hours former to his normal entry, the client can pre-book an opening in the zone he wants in the event that it is accessible. This will decrease the heap on the chairman as his physical work decreases definitely and client can seek the stopping space through Android Application. Administrations are made accessible utilizing Google Wallet, so the client is required to claim a Visa or charge card. ParkMe Application diminishes the client from the bother of physically scanning and sitting tight for void openings to park the vehicle.
Keywords: Dalvik Virtual Machine (DVM); Google Wallet; International Mobile Station Equipment Identity (IMEI), Smart Parking System, Internet of Thing (IoT)

I. INTRODUCTION

Scanning for road stopping in swarmed urban ranges makes numerous issues and dissatisfactions for drivers. It has been demonstrated that more than 40% of the aggregate movement volume in urban ranges is made out of vehicles cruising for stopping. A long line of cruising vehicles can bring about genuine blockage with the hindering of just a couple of avenues. With the quick multiplication of vehicle accessibility and utilization lately, finding an empty auto parking spot is turning out to be more troublesome and tedious. This outcome in various handy clashes. Stopping issues are getting to be omnipresent and always developing at a disturbing rate in each significant city. The utilization of android innovation consolidated with the late advances in remote applications could be the way to illuminate rising stopping issues.

The primary thought behind the Robotized to Stopping Framework is to offer the client some assistance with analysing zone's the place stopping is accessible and number of openings free around there. The client can pre-book an opening in the zone he seeks in the event that it is accessible a few hours preceding his normal entry. This will diminish the heap on the director as his physical work lessens definitely. The client can seek the stopping opening through Android Application and pre-book the space. Instalment administrations are made accessible utilizing Google Along these lines the application proposed in this paper makes the client help free as it decreases the time required for physically looking and sitting tight for unfilled spaces to stop the vehicle.

II. RELATED WORK

A. Existing Scenario:

1) Wireless Sensor Network Parking (WSN):
In these system Infrared (IR) sensor nodes senses the status of the car space and transfers the information to a controller. It thereby displays the information on a LED screen with which the user can check for empty vehicle slots, in turn reducing his time. As infrared cannot penetrate walls, therefore it cannot be used in closed parking areas due to low wavelength. (E.g. shopping malls or residential area where parking is done in enclosed area).6.3[6], 6.3[7].

2) Multi-Storey Parking:

A multi-storey car-park is a building designed for car parking and where there are a number of floors or levels on which parking takes place. It is essentially a stacked car park. The earliest known multi-storey car park was built in 1918 for the Hotel La Salle at 215 West Washington Street in the West Loop area of downtown Chicago, Illinois. 6.3[8].

III. PROPOSED ALGORITHM

A. Neural Network:

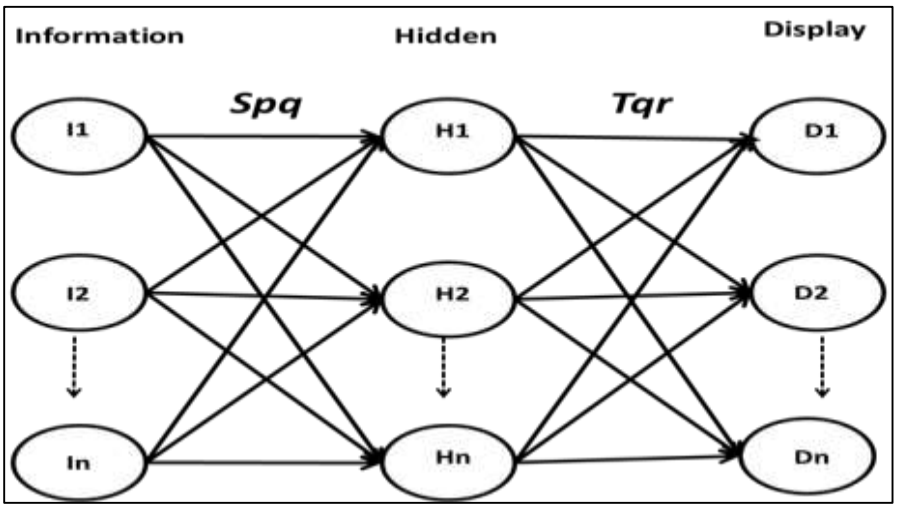


Fig. 1: Neural Network

NN [10] is a machine learning algorithm that imitates the behavior of biological neural networks. There are three layers in the network system: input layer, hidden layer and output layer. The number of input and output layers are always one, while the number of hidden layers can be more than one. Normally the number of hidden layers is less than two, which is enough to model and solve most types of problems. Usually there is only one hidden layer used for most NNs [10].

B. Regression Tree (RT):

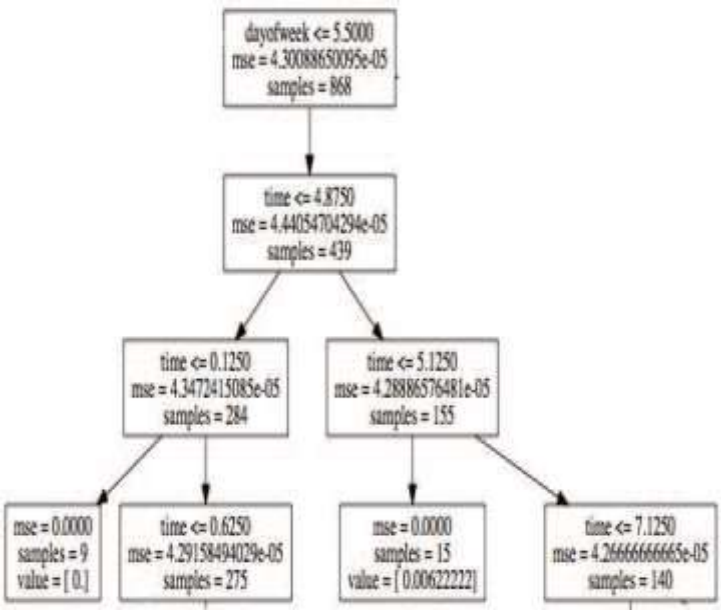


Fig. 2: Regression tree

RT [11] is similar to classification trees; the only difference is that the endpoint is a constant value rather than a class. The criterion for splitting a node is mean square error rather than entropy. RT is easy to build and fast to train. The model is easy to interpret after fitting the data, which can be seen from the layout of the tree. It is easy to see which features are important based on the feature in the upper node, which is more important since it gives the smallest mean square error for regression or entropy for

classification. It also handles parameters with nonlinear relationships. For data with missing values, instead of filling the missing values, we can average all the leaves in the sub tree to do prediction although we are not able to reach a leaf at the bottom.

C. *Support Vector Regression (SVR):*

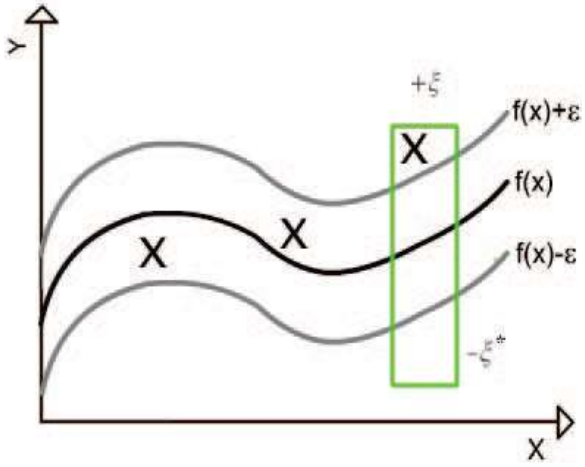


Fig. 3: Support vector regression

SVR [12] is an implementation of a Support Vector Machine (SVM) with a slight difference in that it is used to predict real values rather than classes. For the non-linear problem, we can map the input data into a higher dimensional space using a kernel function, which makes the problem linearizable.

IV. IMPLEMENTATION

The proposed design for the parking guidance and information system consists of mainly three modules.

1) Web server and database.
2) Web client.
3) Android client.

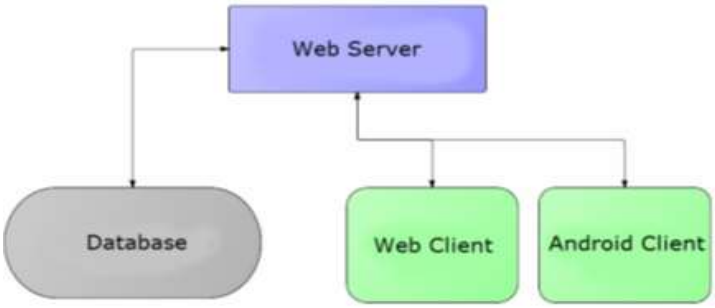


Fig. 4: High Level Design

A. *Module 1: Web Server:*

The first module of the parking guidance and information system is the web server. This can be either a windows server or apache web server. The database of the various parking layouts and structures are maintained here. For simplicity in implementation for the Web client and Android to interact easily, we can preferably use REST based architecture for the web service. The advantages of this is that is easier to implement and scalability is a positive factor. Also, additional functionalities can be added without affecting the existing ones. The database will contain all the information related to each parking layout and also its corresponding structures and levels. Using this central-server based architecture we achieve integrity of real time information and consistent data is reflected to all clients across platforms accessing them. All the computation involved in the system is shifted on to the server because of its high computational capability and also with the motive of keeping the client systems very light and minimal in computational aspect. The server performs two very important computations. Firstly, on receiving the current GPS position from the android client, the server calculates the distance between the current GPS position and the GPS positions of all the layouts present in the database. Then it sends back the layout information of those layouts which are within a convenient distance or radius, as configured during deployment of the system. Secondly, it also is involved with the computation of the parking rate for each user who checks out or unregisters. This is done by calculating the difference between the check in time with the checkout time and applying the suitable parking rate on this difference time to get the total parking rate. The rate per time is decided by the administrator at the time of creation of the layout.

B. Module 2: Web Client:

A web based client is provided by the system for two purposes. The first one being that it provides an administrative portal for managements of organizations and institutions to create, modify and monitor their parking systems and layouts. The web based approach is easier to handle and operate. The second purpose of the web based client is to provide a portal for non-Android users to use the system. And driver with an internet enabled phone, which is not android powered can still make use of the system by visiting the web client over his phone to identify free slots near him as well as make registrations on parking. Thus, for he mentioned two purposes of the web client module, there are two types of accesses provided. The first one being the administrator access, which is the role of the parking layout manager enabling him/her to perform all administrative tasks such as create a new layout, modify an existing layout or even a specific layer of a layout, restrict a specific user from accessing the system etc. the second type of access is the user access or driver access. This is limited to viewing the layout in which the car was parked, unregistering from a parked slot etc. The approach suggested in implementing the web client could preferably be PHP as in can interact very well with the REST APIs of the server.

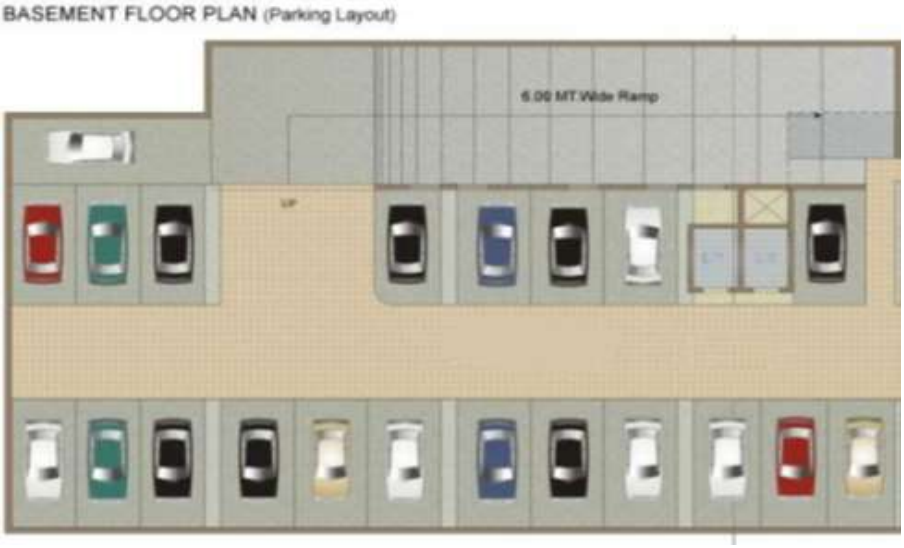


Fig. 5: Virtual mapping of parking layouts.

C. Module 3: Android Client:

The third module of this parking guidance and information system is the android client. This module is intended for the end level users or the drivers. The android client locates available parking slots in nearby parking layouts based on the current GPS position of the driver's device location. Based on a localized radius based search he can scan through a list of available parking slots in nearby parking layouts of establishments and organizations.

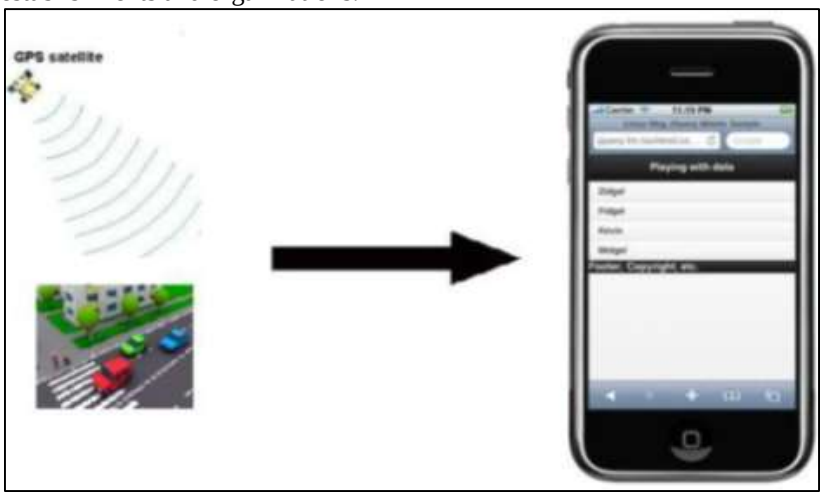


Fig. 6: List of available slots- GPS search

Fig. 7: Parking maps as viewed by the android user.

Another advantage being that he has a list of parked spaces on his phone which can be extremely helpful in locating where he has parked in car. While un-parking or un-registering, the driver just needs to tap his phone against the same tag and the bill receipt will be transmitted over his phone instantaneously. This amount can then be paid at the exit or be accounted against his name for periodic billing.

V. SIMULATION RESULTS

Customer Side

A. Starting The Application:

Fig. 8: Starting The Application

The client needs to introduce the "Brilliant Park" application on his Android based gadget. After establishment, the symbol of the application will highlight on the Home Screen of the client's gadget.

B. Enrollment:

Fig. 9: Enrollment

At first, the client needs to enroll his points of interest with the application surprisingly. This is a one-time enrollment. The client needs to enter subtle elements like username, sex, telephone number and email-id. This information will be put away on server. Reserving for spaces obligatorily must be done four hours preceding entry.

C. Determination of Area For Stopping:

Fig. 10: Determination of Area For Stopping

The customer is given different stopping areas. Customer needs to choose one of the areas gave where he yearnings to stop the vehicle.

D. Accessibility Status of The Openings:

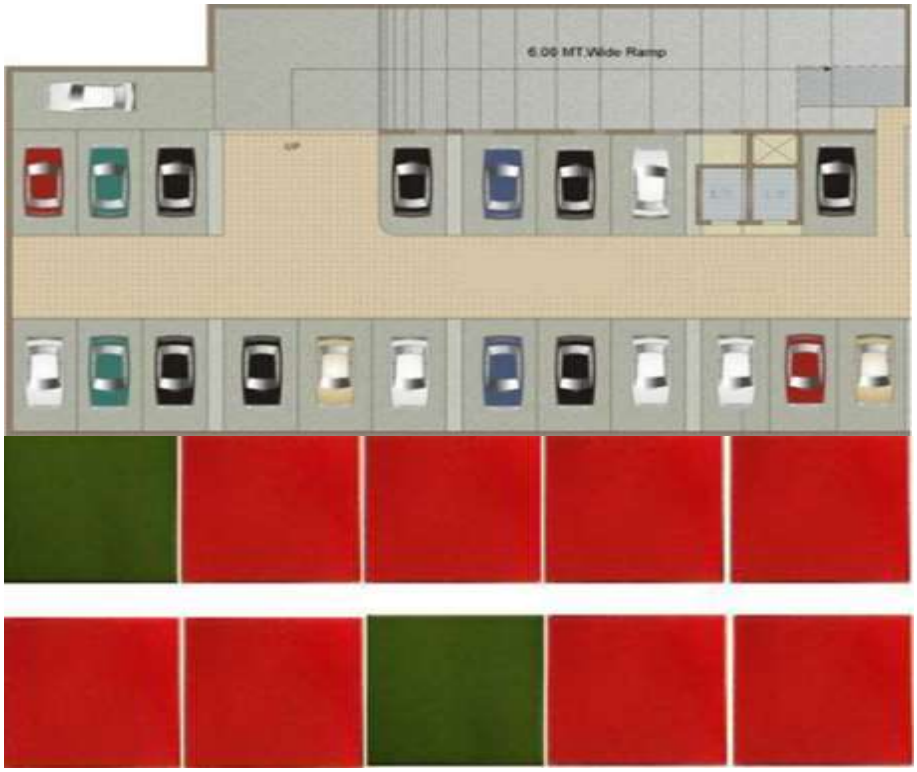


Fig. 11: Accessibility Status of the Openings

Taking into account the area chose accessibility of the vacant openings will be shown on customer's gadget. Shading coding is utilized to show vacant v/s held spaces.

E. Enter Customer's Subtle Elements For Space Reservation:

Fig. 12: Enter Customer's Subtle Elements For Space Reservation

On the off chance that the space required by customer is accessible, the customer can continue encourage with the reservation process or else he can backpedal to change the area or else can end the whole process.

F. Affirmation:

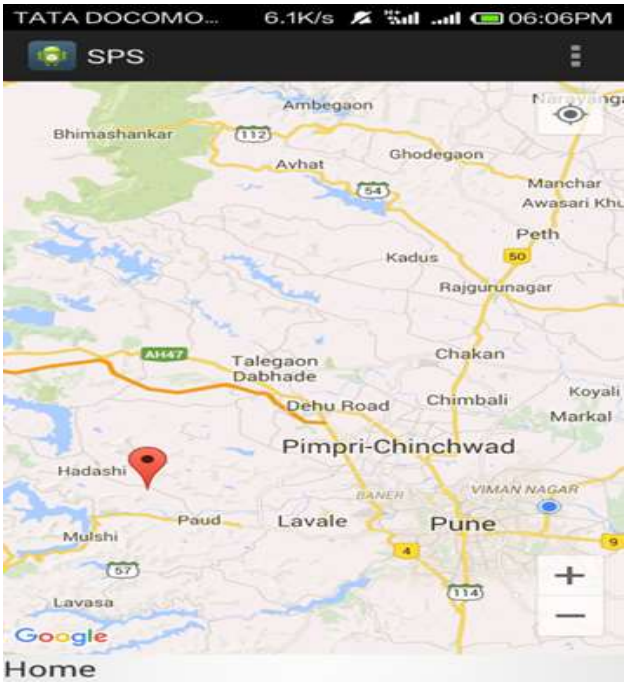
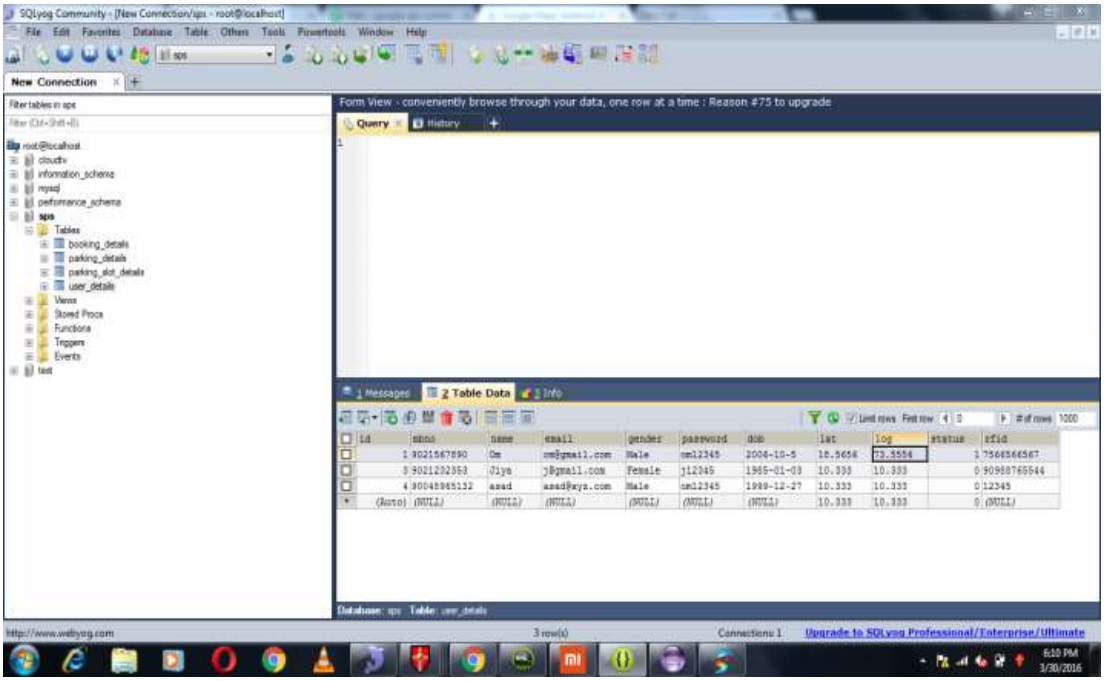


Fig. 13: Affirmation

On effective reservation, an affirmation page with client points of interest and stopping area is appeared on customer's gadget.

1) Server Side:



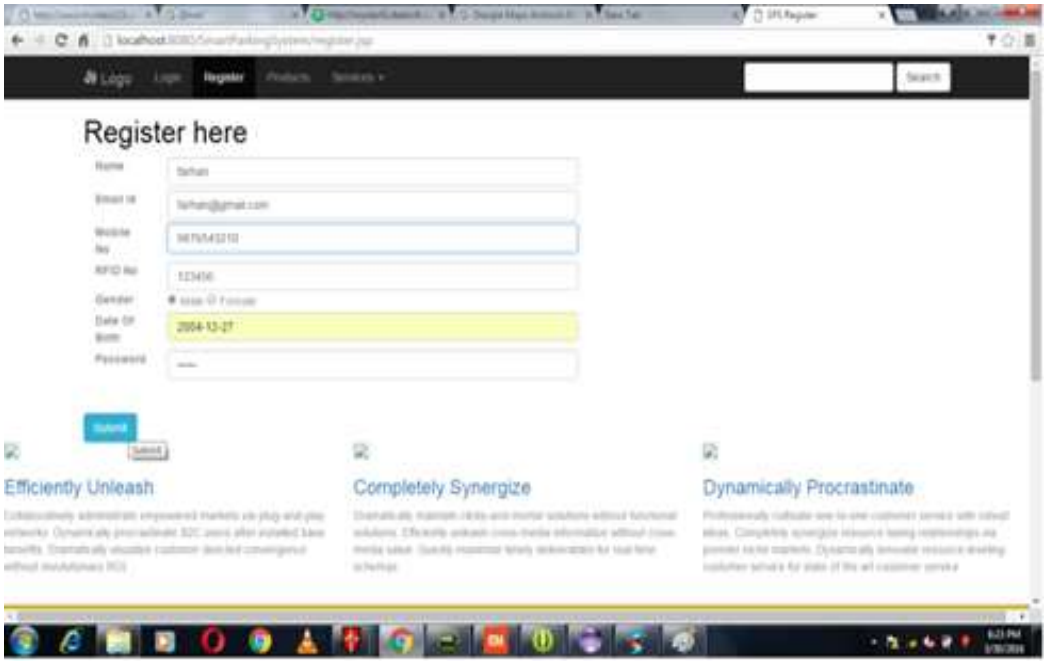


Fig. 14: Server Side

The server side preparing will be created utilizing Java and MySQL. The executive needs to enroll his points of interest with the server side application. This is likewise one-time enlistment. At whatever point another client registers with the application, the record will be put away in the server side database. At the point when the enrolled client chooses the area, instantly server gets the customer's solicitation. In the wake of getting the solicitation for the craved area, server forms the related data and reacts appropriately.

VI. CONCLUSION

Analyzing large data collected by smart city deployments is an important task to enable intelligent management of the infrastructure that has been monitored using IoT devices. In this work, we would try to employed various prediction mechanisms for the parking occupancy rate using three different feature combinations. In the future, we would like to incorporate additional factors into the model that may affect the parking availability predictions, such as events and the effect of nearby parking lots.

REFERENCES

[1] M. Fengsheng Yang, Android Application Development Revelation, China Machine, Press,2011.
[2] M. Zhengguo Hu, Jian Wu, Zhenggong Deng,Programming Methodology, National Defence Industry Press, 2008
[3] M. Junmin Ye, Software Engineering, Tsinghua University Press J. Dongjiu Geng, Yue Suo, Yu Chen, Jun Wen, Yongqing Lu, Remote Access and Control System.
[4] J. Dongjiu Geng, Yue Suo, Yu Chen, Jun Wen, Yongqing Lu, Remote Access and Control System Based on Android Mobil Phone, vol.2. Journal of Computer Appli- cations, 2011, pp. 560-562
[5] J. Li Lin, Changwei Zou, Research on Cloud Computing Based on Android Platform, vol.11. Software Guide, 2010, pp.137-139
[6] J. Wolff, T. Heuer, H. Gao, M. Weinmann, S. Voit and U. Hartmann, "Parking monitor system based on magnetic _eld sensors," in Proc. IEEE Conf. Intelligent Transportation Systems, Toronto, 2006, pp. 1275-1279.
[7] Kurogo, H., K.Takada and H.Akiyama, 1995. Proceedings of Vehicle navigation and System Information Conference 1995. In conjunction with the paci_c Rim TransTech Conference.
[8] C.Laugier and F.Thierry, "Sensor-based control architecture for a car-like vehicle." Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems, Volume 1, pages 216-222, 1998.
[9] Sargento, R. L. Aguiar, N. Baker, M. Zafar, and A. Ikram, Comput. Netw., vol. 52, pp. 228247, Jan. 2008.
[10] M. T. Hagan, H. B. Demuth, M. H. Beale et al. Neural network design. Pws Boston, 1996, vol. 1.
[11] L. Breiman, J. Friedman, C. J. Stone, and R. A. Olshen, Classification and regression trees. CRC press, 1984.
[12] A. J. Smola and B. Sch¨olkopf, “A tutorial on support vector regression,” Statistics and computing, vol. 14, no. 3, pp. 199–222, 2004.