

Internet of Things based Intelligent Parking System Facilitated by Third Party Payment Platform

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Abstract— The ratio of vehicles are increasing day by day. Urban city are facing a problem of traffic congestion and insufficient parking space. All problems overcome with the help of intelligent parking system. Propose system developed with an objective to obtain information about available parking space in a specific geographical area and implement it in real time to facilitate vehicles parking at available position. This system is an integration of internet of things technology, cloud server and Android application. User not only pre-book a parking slot but also cancel-booking from remote location with the help of Android application and payment is done by third party payment platform. This system is implemented using ultrasonic sensor, Raspberry Pi model B +, cloud server, real time data collection and Android application. Mobile application is developed using Android studio 3.2.

Index Terms— AES Algorithm; Android application, IoT, Raspberry pi.

I. INTRODUCTION

Today's major problem of tier 1 and tier 2 cities is a parking. Majority of the people live in urban area there is an acute problem of parking arose. Particular during a peak hour number of vehicles are on the road get started n number of problem from morning, one of them is parking. According to the Indian survey per year 10,000 vehicles are increasing and 30% of a traffic jam is occur due to the people Park their vehicles in a scattered way. To find a suitable and safe parking is a headache or it can say waste of time, energy, fuel, money and also increase air pollution. To get rid of parking problem here this work come with intelligent parking system. There are n number of ways to implement parking system like image processing, cloud computing, embedded system, different technologies. The hybrid one is a best approach for securing internet of things (IoT) environment "Table I". It is a combination of software and hardware. IoT work as an intermediary between people and environment they connected by different sensor to perform task remotely.

Most of the existing system work on different technologies like ZigBee, NFC, Bluetooth and RFID. This technology is used for particular zone only. The proposed work is based on generic as well as even odd system, is implemented for open space parking. This system is an emerging of raspberry pi mode B+, ultrasonic sensor (HC-SR04 Sensor), Firebase, Android application. We can detect a multiple parking slot using single ultrasonic sensor and raspberry pi mode B+ is act as a local server. Firebase is used for real time database and stored real-time information. Android application is used for providing a real-time parking status to User from remote location.

II. LITERATURE SURVEY

People cannot find a place to park their vehicles especially in large companies. System developed with the help of microcontroller (Beagle Bone Black) and image processing. Optical character reorganization image processing algorithm are used to check valid employee and extract a number of vehicles number plate from capture image and sent over the server. User and parking location details are extracted by Android application with the help of sensor at any time on demand. This technology helped the large company and Park their vehicle without wastage of time and less space too [1].

A smart parking system based on NB-IoT are used to solve the problem of high power consumption of sensor node and high deployment cost of wireless network. NB-IoT are used to transmit a data through sensor node. The parking slot sensor is combination of NB-IOT, STM32 and Geomagnetic vehicle Detection. This is a new cellular technology include for low power wide area application. Cloud server are used for managing an information [2].

Radio frequency identification based system provide a solution for not only managing a parking slot in zone area but also online payment mode. RFID reader used three component with two combination. First used as RFID reader and second used for RFID tag. The RFID reader installed on check-in and check-out parking gate for check the valid user registration number. Each valid user have RFID tag to enter in parking zone and done payment. User information is send over the cloud server to check a valid registration user. RFID system is secure, fast and easy but not cost effective [3].

Cloud based smart parking system provide a solution for average waiting time. There are three different parking zone and each one have 4 parking slots. If we go with a greedy method then it require lots of time as compared to three parking lot method. In this method they first identify a free parking slot with the help of RFID. After that calculate the distance between all the free parking slot and then take a nearest distance parking slot. Greedy method fails here [4].

This system develop for automated parking system using Bluetooth technology. The authentication and verification is done by Bluetooth reader. Unique identification number is fetched by Bluetooth reader after that send information to database. When user enter into the parking zone entrance he /she have to turn on Bluetooth to retry parking slot. File access protocol are used to retrieve unique registration number from mobile device cheap and sent over microcontroller (ARM Context m3). It is act as a database, compare the registration number with database. If it match then user can reserve a slot [5].

The system is implemented using low cost IR sensors, Raspberry pi model 3b for real time data processing, E-parking mobile application. IR sensors detect parking slot status and push data over the Raspberry pi. Android application is used to access information. With the help of this information user can book a parking slot. Payment charges is display on mobile application but payment is not done [6].

III. IMPLEMENTATION

A. Sensor Node

There are n numbers of sensor are used to detect the real time parking slot information. Ultrasonic Sensor (HC-SR04) gives better performance as compared to IR sensor with respect to range, frequency and cost. It detected a parking slot and access multiple parking slot information. This data are passed over the local server.

B. Raspberry-Pi-3-Model-B+

It is act like a local server. Local server fetch a real-time parking slot information from ultrasonic sensor (HC-SR04) and push over the cloud server. When changes occur in input, First local server updated then push updated information over the cloud. Intelligent parking system, one indicates parking is full and zero indicates the parking is empty.

C. Cloud Server

There are n number of cloud server are available like thing-speak, firebase etc. The firebase is more compatible with Android software development kit (SDK) as compared to thing-speak. We can access real time firebase database from mobile device. The use of firebase cloud to maintain a database information. The database server is updated both terminal local server and another from client server.

D. Mobile Application

Android application is developed using Android studio3.2. It's running on mobile user device and help the user to check parking status, profile information, booking status and payment status, cancel booking status and

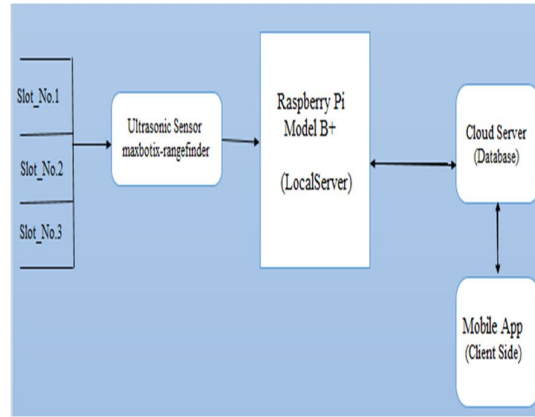


Figure 1. Proposed system block diagram

feedback. Authentication is done by email to check a user valid or not. Framework of proposed system is shown in “Fig.1”. Proposed System Block Diagram.

E. Proposed System Flow Diagram

User open a mobile application, this Proposed System display buttons for login or sign up. If user login application first time user needs to complete a registration steps by entering required information. After the successful registration, user will automatically back to the login page. User have to enter valid user email id and strong password for successful login. Fragment used here, its show multiple choices to user like profile, booking, cancel Booking, Feedback. If valid user selects profile option, user details will be displayed, given at the time of registration. If Authenticate user select booking option, User have select one particular slot. The proposed work is based on generic as well as even-odd system. The parking position of even-odd is depend upon date of system. User booked a slot before 15 minutes only. The payment payload SDK launch, customer have to complete payment details at the time of booking only.

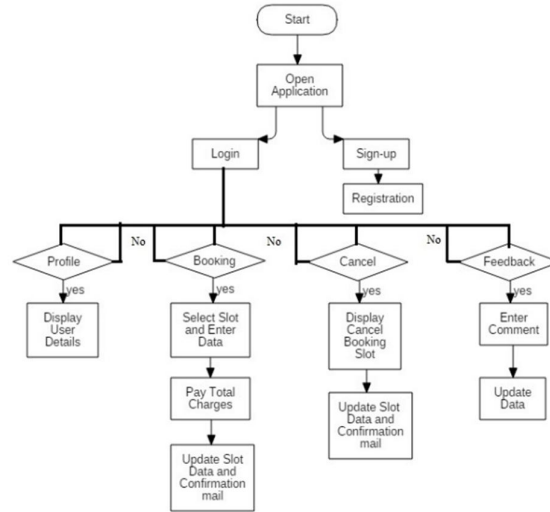


Figure 2. Proposed system flow diagram

The confirmation mail received to client and simultaneously real-time database updated. Is user want to cancel a booking, all the information will display on a cancellation page. User can cancel a booking within half an hour only. The cancel booking information update over the real-time database. The feedback is equally important, its help administrator to understand the requirement of customer as show in “fig.2”.

F. The Third-Party Payment Platform

The payment request occurred by mobile client. User have to pay a money at the time of booking only, paytm merchant account SDK is integrated in Android SDK because it is an India most trustable payment platform. Mobile client send a request to domain server for generate a checksum hash using advanced encryption standard (AES-128) Algorithm. Domain server generated checksum hash and send back response to mobile client. SDK have receive a request from mobile client to pass the payload with multiple payment options and checksum hash. User have to fill all the details and click on pay, two step authentication is done over the bank site using one-time password (OTP) pin and Automated Teller Machine (ATM) pin.

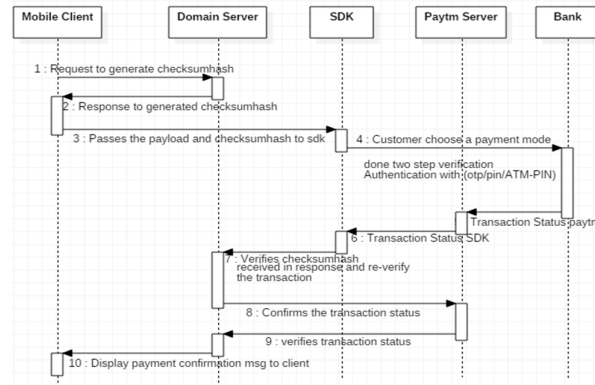


Figure 3. Third-party payment platform

A transaction status is verified by paytm server and SDK. Domain server verify the checksum has received in a response and also re-verify the transaction. Paytm server confirms the transaction status and send response to domain server. The payment confirmation message display over Mobile client “Fig.3”.

IV. RESULTS AND ANALYSIS

SPS5

E-mail Id

Password

SEND MAIL

Name

Phone

Address

REGISTER

Figure 4.Registration booking

P

pooja.vc@somaiya.edu

LOGIN

CREATE NEW ACCOUNT

RESET

Figure 5.Login page

10:50

Pooja college
pooja.vc@somaiya.edu

Profile

Booking

Cancel_Booking

Feedback

Communicate

Share

Send

Figure 6. Fragment

A. Create New Account

This layout facilitates user to registration. During registration user has to mention email-id, password, name, phone no, address. Shown in “fig.4”.

B. User Login

This layout facilitates user to login. During login user have to enter username and password. This information get user at the time of registration only “Fig.5”.

C. Fragment

After successful login there will be a drawer window at the left most corner Main window “Fig.6”.

D. View Profile

By clicking on profile button in drawer window of application, user can view Information given at the time of registration Such as user name, email ID, address and phone.

E. Booking

User can book a parking slot from remote location with the help of mobile application. Available parking slot choice by user with the help of Dashboard “fig.7”. Its shows arrangement of parking area and this System is even-odd based and User can pre-book a slot before +15 min of current system time only “Fig8”.

F. Payment

Payment charges display on paytm SDK integration page user have to choose payment mode like debit card, net banking, credit card and payment wallet. “Fig.9” and “Fig.10” After the successful payment user get confirmation email and parking slot is reserved for particular user.

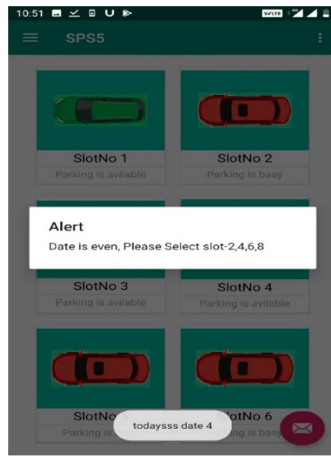


Figure 7. Even –odd system

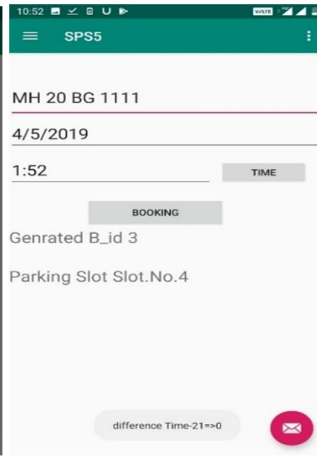


Figure 8. Booking page

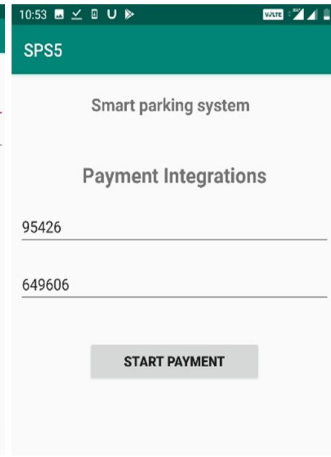


Figure 9. Payment

G. Cancel-Booking

User can cancel a booking within half an hour only (Scenes Booking time). Cancel booking Information display on “Fig.11”. If user can cancel a booking with in time the user get refund amount. (Deducting of 40%).

H. Feedback

Feedback is optional for user, user have to enter rating and comment. Feedback information is sent over cloud in feedback table “Fig.12”.

TABLE I. COMPARISON BETWEEN DIFFERENT APPROACHES

Parameters	cost	Flexibility	Energy	Constrains Time	Security Achieved
Software	Low	High	No	No	Low-Medium
Hardware	High	Low	Yes	Yes	Low-Medium
Hybrid	Medium	Low	No	No	Low-High

“Table II” shows comparison between base paper[6] Existing System and Proposed System. The Proposed System gives better performance in Computational power and functionality.



Figure 10. Payment mode

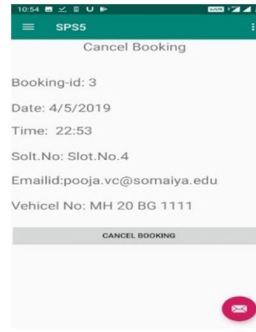


Figure 11. Cancel booking

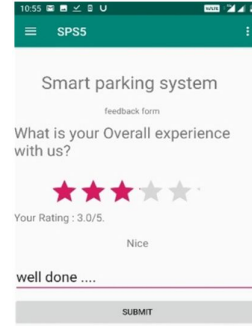


Figure 12. feedback form

TABLE II. ANALYSIS OF PROPOSED SYSTEM

Parameter	Existing System	Proposed System
Sensor	IR Sensor	Ultrasonic Sensor-HC-SR04 Range ,Beam ,Unit cost
Cloud(Database)	Amazon web server	Firebase(More Compatible with Android, free)
Parking strategy	Generic	Generic + even-odd parking
Access parking data	Per slot one Sensor is required	Access Multiple parking data using single sensor
payment	Display parking charges only	Payment is done by third party payment platform.(Paytm)
Cancel booking	NA	User can cancel a booking form remote location.
feedback	NA	Analysis of user requirements

V. CONCLUSIONS

The developed system provides real time information about availability of parking slots in geographical area and allows users to book parking slot from remote locations by using mobile application. Payment is done by third party payment platform. The hybrid one and encryption is a best approach for securing IOT environment. Proposed work not only reduces the traffic congestion, it is also providing authentication of the user, save time, fuel and helps in reducing carbon footprint. Proposed work is capable of giving 100% performance for 3 slots then count of slot can increases as a part of future scope.

ACKNOWLEDGMENT

The authors wish to thank IDES and Association of Computer Electrical Electronics and Communication Engineers (ACEECOM). This work was supported in part by a grant from Prof. Mansi Kambli.

REFERENCES

- [1] Sagar Rane, Aman Dubey, "Design of IoT based intelligent parking system using image processing Algorithms," IEEE 2017.
- [2] Jiong Shi, Zhaoxi Fang, "A smart parking system based on NB-IoT and third-party payment platform," 17th International Symposium on Communications and Information Technologies (ISCIT-IEEE 2017).
- [3] Muneeb Hasan Khan, M. Sarosh Umar, "Smart parking system using RFID and GSM technology", IMMPACT-IEEE 2017.
- [4] Shubham, Vidhyadhar B. Dharmadhikari, "Cloud based smart car parking system using internet of things", Proceedings of the Second International Conference on Intelligent Computing and Control Systems. (ICICCS-IEEE 2018).
- [5] Harmeet Singh, Ankit Sharma, "Automated parking system with Bluetooth access", International Journal Of Engineering And Computer Science ISSN: 2319-7242, Volume 3 Issue 5, May 2014.
- [6] Dr.Savita Sonoli Nagaraj Bhat, "IoT based sensor enabled smart car parking for advanced driver assistance system," IEEE (RTEICT), May 19-20, 2017, India.
- [7] Yuki Hirakata, Kohei Ohno, Makoto Itami, "Navigation system using ZigBee wireless sensor network for parking", 978-1-4673-3070-1/12/\$31.00 ©2012 IEEE 60.