International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

ADVANCED RESERVED CAR PARKING SYSTEM USING IOT AND MOBILE APPLICATION

Ramesh B E

(Associate Professor, Computer Science Department, S.J.M.I.T, Chitradurga, Karnataka, INDIA,)

Manaswini A Y

(BE,8th semester, Computer Science Department, SJMIT, Chitradurga, Karnataka, INDIA, email:manaswiniay@gmail.com)

Monika V K

(BE,8th semester, Computer Science Department, SJMIT, Chitradurga, Karnataka, INDIA, email: vkmonika1505@gmail.com)

Likhitha H V

(BE,8th semester, Computer Science Department, SJMIT, Chitradurga, Karnataka, INDIA, email: likhithahv23@gmail.com)

Ananya M

(BE,8th semester, Computer Science Department, SJMIT, Chitradurga, Karnataka, INDIA, email: ananyam2202@gmail.com)

Abstract- With the growing urbanization and the increasing number of vehicles on the roads, efficient management of parking spaces has become a critical challenge in modern cities. Traditional parking systems often lead to congestion, wastage of time, and frustration among motorists. To address these issues, this paper proposes an advanced reserved car parking system leveraging Internet of Things (IoT) technology and a dedicated mobile application. The proposed system aims to revolutionize the parking experience by allowing users to reserve parking spaces in advance through a user-friendly mobile application. IoT sensors deployed at each parking slot continuously monitor the availability of spaces in real-time. When a user requests a parking reservation through the mobile app, the system instantly checks for the availability of the requested slot and confirms the reservation if space is available. Key features of the proposed system include real-time parking space availability updates, secure online payment integration, and seamless user experience through the mobile application. Additionally, the system provides flexibility for users to modify or cancel their reservations based on their changing needs. Furthermore, the utilization of IoT technology enables efficient management of parking spaces, optimizing the utilization of available resources and reducing congestion in parking areas. The system also offers insights into parking patterns and trends, facilitating data-driven decision-making for urban planners and parking lot managers. In conclusion, the proposed advanced reserved car parking system offers a practical solution to the challenges associated with traditional parking systems. By harnessing the power of IoT and mobile technology, the system enhances convenience for motorists, improves traffic flow, and contributes to the overall efficiency of urban transportation systems.

Keywords: Reserved Car Parking, IoT, Mobile Application, Real-time Updates, Urban Traffic Management, Parking Resource Optimization.

1. INTRODUCTION:

As urbanization is moving forward, most of the world are using software and focus more on technological side. Every industry is trying to implement technological factors in their business. As well as parking system, a parking system that would help with the constant issue of unable to reach the parking ticket booth or having technical difficulties on the machine and customers are unable to back out due to cars behind. An advanced technological system will be implemented in this topic, car plate recognition and QR code. Car plate recognition works as a tool to detect incoming cars which already booked the parking spot, this minimizes the time taken for the car to search a parking spot. Car plate recognition acts as a medium for the car to enter the parking spot, with a condition of having a parking spot booked. The device will recognize the registered car plate and opens the gate whenever the car is trying to enter the parking spot. The booking system works hand in hand with the car plate recognition. The booking system acts as a medium between the consumer and the parking authorities. The consumer will book a parking spot using the system and register their car plate during the process. The aim of the research is to develop a mobile application in order to help the users to decrease their waiting time on searching for parking.

2. PROBLEM CONTEXT

Parking in general is always an issue around the world. As urbanization takes places and modernization has conquered human races. Each family would have a vehicle to commute anywhere and everywhere. The problem is with the increasing number of cars daily, but that number of car park allocated in the city is limited as spaces are limited [1]. New car park buildings are built to overcome the issue, but it is futile. The car park spaces cannot be further added especially in the huge metropolis such as Bengaluru. Having to park a vehicle requires a huge amount of time as searching the parking spot is time consuming while hoping to get one parking spot [2]. Building more car park buildings does not solve the issue as the number of vehicles will increase day by day. With these data which is clearly stated that Indians prefer going to places with their private car compare to public transports.

3. SOLUTION

There are several methods and technologies can be used as solution to the above mentioned issues. Innovative approach such as QR code, Mobile Applications, Sensors, RFID, and IoT are used to improve the efficiency and effectiveness of transportation or parking system. The proposed system presents a smart parking system which uses two domain QR code and Mobile Applications that helps to regulate a number of vehicles to the nearest parking space at any given time based on the parking space availability.

A. QR Code

QR codes are almost like bar codes which often used by the retailers at both point of sale to track access inventor and the price products. The major differences between QR Codes and barcode scanners are the amount of QR Codes which can hold and access the information. QR Code provides information in both horizontal and vertical directions, while a bar code uses information in just one direction. Since the QR Code contains a much greater amount of information than that of a bar code. This is called QR Codes along with its ability to allow high speed decoding of contents. QR Code is like a 2-D (two dimensional), also known as a matrix bar code which shown in the Fig. 2 is designed by Denso Wave and been introduced in 1994 with the not only as a barcode reader devices but for an identification methods that ensures the reliable and timely support for the sophisticated management software to the required information. Denso upholds copyright of QR Codes which means that the patent can be created easily for both consumer and corporate purposes [4].

Fig 1 : QR Code and Barcode[4]

Most of the smartphones build in with this QR codes and the QR Codes easily can be downloaded freely from the internet. QR code not only used widely in smartphones but also been used in other electronic devices. The QR Codes rapidly became popular in Asia and Europe yet was slowly to be accepted in America as well as the rest of the world. Its required smartphones to encode the text and this process will connected automatically to the internet to display the information [4]. QR codes have features that makes it's a simple but effective marketing tool to engage with consumers. QR codes have high encoding of data, small printout size, resistance to dirt and damage, readable flexibility, structured appending and high level of creativity [5]. QR code is still considered a relatively new tool still gaining popularity in commercial markets thus scholarly articles of QR codes in the area of marketing are few [6].

B. Mobile Application

Mobile application technology refers to the application system development for portable devices such as smartphones and also Personal Digital Assistants. The user will be provided with numerous features through the use of mobile apps that will allow the user to accomplish all of requirements. Mobile apps should have friendly features which can be downloaded from different platforms such as Google Play Store and also IOS App Store. Some application are freely can be used and some are paid version. The limitations and functionality of mobile devices need to be considered when designing applications. For example, smartphones devices has smaller processing power, which operates on a battery and also location tracker. There is a broad variety of screen sizes and hardware requirements to be considered. Specialized integrated development environments like Android Studio or Eclipse are needed for developing apps. The app is first validated through communication devices emulators which would be a software emulation of the specific hardware system and then field testing is ultimately carried out.

4. PROPOSED SMART PARKING RESERVATION MOBILE APPLICATION

A. Context Diagram

Parking Reservation System App is an application targeted for android users on mobile devices. The solution comprises of three components, parking lots, users and the QR Code scanner. A. Context Diagram In this Context Diagram (Fig. 2), it shows the interaction between User, Admin and the QR Code Scanner. This shows how the users and the application will react and how the application will respond to each function.

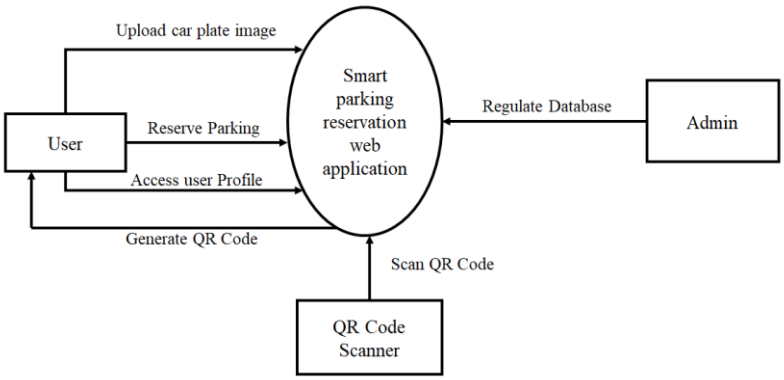

Fig 2 : Context Diagram

B. Data Flow Diagram Level 0

In this diagram, every action that performed by every user are elaborated by showing the input and the output of every actions. The user will perform a registration on the start of the stage, after registration the user will then receive an email verification of the account. Once done, the user can now login to the application. The user is also allowed to do bookings, then the details will be sent to the system and the system will then show the booking status. The QR code section, the customer is able to generate QR code and the QR scanner will scan the details in the QR code.

In the Fig.3, From Action Login in DFD Level 0, DFD Level 1 - Login is derived to elaborate more about Login Action where the actions are expanded to a few sub-actions which are; Check Email Verification, Check Password, Main Menu and Forgot Password. The arrangement of the sub-actions is arranged according to the process flow, which one comes first. If the sub-action is succeeding in the process for example, Check Password where if the password entered by the user is correct, the process will continue with another sub-action which is Main Menu. If the password is entered wrongly, the sub-action will turn back to main action. As per presented in the Fig. 4.

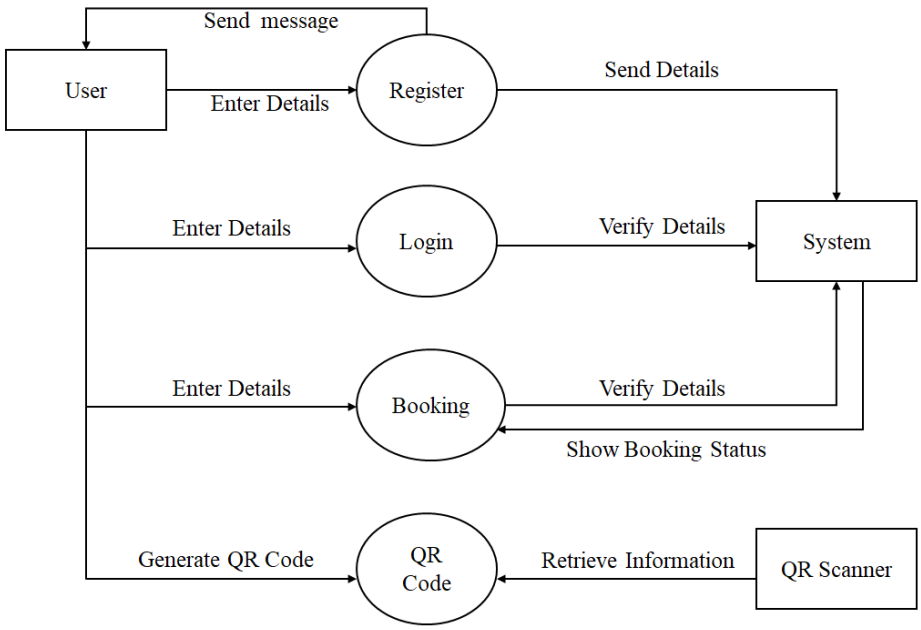

Fig 3 : Data Flow Diagram Level 0

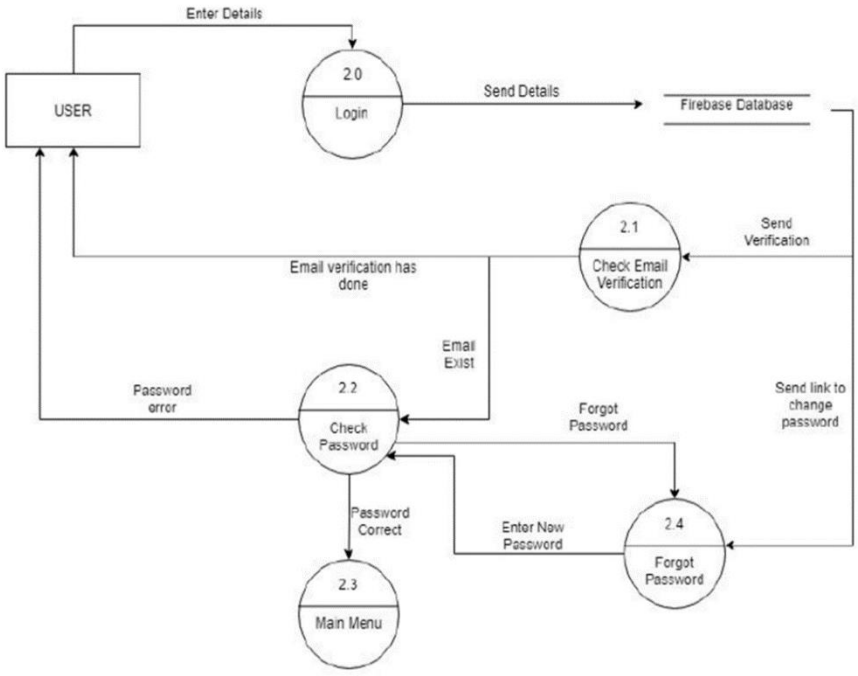

Fig 4 : Data Flow Diagram Level 1

5. SYSTEM DESIGN

Design goals:

• Work on Arduino software.
• Write a program

• Make a Hardware
• Low cost
• Connect the sensors and led display
• Simple and uncomplicated enough for anyone without professional electrical skills to use.

Hardware: The Arduino microcontroller board is composed of several hardware components, each of which performs a specific purpose. The following are quick descriptions of the essential hardware components of an Arduino board:
i. Microcontroller: The Arduino board's brain is located here. It is a tiny computer chip with input/output pins, memory, and a CPU. The program instructions that are uploaded to the board must be carried out by the microcontroller.
ii. Power source: Either an external power source or a USB cable can be used to power the Arduino board. The microprocessor and other parts of the board receive electricity from the power supply. Ii. **iii. Input/output pins:** These are the pins on the circuit board that enable communication with other components including sensors, LEDs, and motors. Depending on the particular board type, the input/output pins may be digital or analogue.
iv. Voltage regulator: The board runs within its safe voltage range thanks to this component's regulation of the voltage provided to the board.
v. Crystal oscillator: This part gives the microcontroller a reliable clock signal so that it may carry out program instructions at the appropriate speed.
vi. Reset button: It may reset the board with this button, which is helpful if your program isn't working properly or if you need to restart it.
vii. LED lights: The majority of Arduino boards have integrated LED lights that may be used for debugging and to show the board's state.

A board for an Arduino contains these as its main hardware elements. Arduino boards may be utilized for a variety of applications by pairing these parts with software, from straightforward projects to complex ones.

Fig 5: Hardware parts of Arduino (javaTpoint 2021)

CONCLUSION

The implementation of QR code booking system for parking which able to resolves the issue involving car parking problems that daily individuals faced. Every individual contains a private transport and requires a spot to park their vehicle safely without any worries. With this idea in mind, there are a lot of risk that need to be taken care and plenty rooms of improvement in this in the service because even though students are satisfied or dissatisfied with the service due to several factors which can affect their perception, the score of perceived quality of the service does

not meet the expected quality score even though the value is positive and above average, for majority of the research conducted in different universities. Therefore, it is important to not overlook these issues to encourage students to continue utilizing the service for the benefit of the university and students. With daily increasing of private transportation in the country with limited parking spaces available. This booking system eliminates the need of the student searching for empty parking spot every time and worrying for no parking spaces. The smart parking reservation is for consumers that enable them to book a parking spot beforehand and making sure they able to instantly park the booked spot. In order to enter the parking compound, the car plate will be scanned and recognized by the system as the booking is already done. Therefore, the gate will be opened for the respective car and not allowing other random cars to enter. If recognition of the car plate is failed, as under different circumstances such as foggy weathers, rainy weathers, broken car plate, wrong user info and much more. QR code is provided to the customer and they can scan their QR code to enter the compound and park their respective spots. The QR code can be more useful and integrate it into the system. By having the parking spaces freely parked for the people that booked. Since the whole compound is required to book in order to go in. Once booked, the QR code is generated and needed to scan in order to enter the car park. If late, after thirty minutes of initial booking time, the QR code will expire and the Driver is unable to enter. Once booked, the time of the driver inside the car park will be recorded using the QR code and calculated accordingly per hour. So basically, the drivers are given freely to park if they bought the entry pass.

FUTURE SCOPE

The possible applications of Arduino smart parking technology are numerous, and their future potential is likewise attractive. Here are a few instances:

Integration with other smart city technologies: Other smart city technologies, including as traffic control systems and public transit networks, can be linked with Arduino smart vehicle parking technology. This may contribute to the development of a linked and effective urban environment.

Use of AI and machine learning: The detection and allocation of parking spots by Arduino smart vehicle parking systems may be made more precise and effective by using AI and machine learning methods. In order to estimate parking demand and change parking prices appropriately, these algorithms can also be utilised.

Expansion to autonomous vehicles: Arduino smart car parking systems may be modified to accommodate these vehicles as it become more prevalent. This involves utilising communication and sensor technology to enable autonomous cars to park themselves effectively and safely.

Integration with payment systems: Payment systems may be combined with Arduino smart parking systems to provide smooth invoicing and payment operations. This can apply to the usage of contactless payment systems like RFID and mobile payments (Mudaliar et al. 2019)

REFERENCES

[1]. IoT based Smart Car Parking System with the Help of Sensors Networks, Third International Conference on Artificial Intelligence and Smart Energy (ICAIS 2023).

[2]. Solving Parking Problems with Arduino Smart Car Parking Systems, 5th International Conference on Inventive Research in Computing Applications (ICIRCA 2023).

[3]. Smart Parking Using IOT, 2023 4th International Conference for Emerging Technology (INCET).

[4]. IoT based Smart Parking System, International Conference on Internet of Things and Applications (IOTA).

[5]. An Intelligent Parking Lot Management System Based on Real-Time License Plate Recognition, 2023 2nd International Conference on Edge Computing and Applications (ICECAA).

[6]. YOLOV5 Based A Real Time Automatic Number Plate And Helmet Recognition System, 2022 13th International Conference on Computing Communication and Networking Technologies (ICCCNT)