iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** VI **Month of publication:** June 2024

DOI: https://doi.org/10.22214/ijraset.2024.61685

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue VI June 2024- Available at www.ijraset.com

Tap, Scan, Connect: Future of Vehicle Communication

Ankur Singh[1], Vrindawan Kumar[2], Gulshan Kumar[3], Dr. Shivam Swarup[4], Dr. Shivakumar C[5]
Department of Computer Science & Engineering, Jain (Deemed-to-be) University, Bangalore, India

Abstract: ***Parking and accident services are being revolutionised by a website called "Tap Scan Connect" that makes use of barcode technology. Registered users can place unique barcodes created by the service on their vehicles in case of parking violations or accidents. This gives the general public access to important owner data. Users may quickly acquire the car owner's virtual phone number for direct phone calls and a chat window for quick communication by scanning the barcode with a mobile device. This strategy enhances public safety and facilitates traffic management by increasing accountability, expediting incident reporting, and enabling speedier responses. The project's focus on leveraging digital technologies to monitor transparent and efficient transportation activities is highlighted by terms like accountability, parking management, real-time communication, barcode technology, and public safety. Urban parking problems and emergency vehicle crashes are resolved more quickly and efficiently when instant messaging systems and user-friendly interfaces are combined.***
Keywords: Barcode technology, Parking management, Real-time communication, Accountability, Public safety

I. INTRODUCTION

In the context of urban development and transportation management, efficient parking and accident management systems are crucial for preserving public safety, reducing traffic, and enhancing mobility.

The "Tap Scan Connect" programme is a game-changing approach to parking and accident management that has the potential to completely upend traditional approaches thanks to its innovative integration of barcode technology and digital communication platforms. In examining the intricacies and implications of this cutting-edge system, this research project highlights its many benefits and potential impacts on urban environments.

"Tap Scan Connect" essentially denotes a radical shift in the development and application of parking management systems. Using barcode technology, the system enables consumers to create customised IDs that they may affix to their vehicles. This simple yet powerful method serves as a cornerstone and offers rapid access to vital owner information in the event of parking violations or accidents. The barcode can be scanned by the general public with common mobile devices to provide instant communication between all parties and owner details.

This method is valuable because it is committed to accountability and openness in urban mobility operations, which goes beyond its convenience. Not only does "Tap Scan Connect" expedite incident reporting processes, but it also fosters an accountable culture among car owners by providing instant access to pertinent data. The seamless integration of digital technologies results in shorter response times for incidents and lays the foundation for more effective traffic management techniques, both of which raise general public satisfaction and safety.The "Tap Scan Connect" project's real-time communication features are a key element. Response times to parking problems and accidents are critical in today's hectic metropolitan surroundings, requiring quick coordination and communication. Instant messaging capabilities, virtual phone lines, and a chat window allow users to communicate with one another and solve a range of issues fast and efficiently.

Its emphasis on user-friendly interfaces highlights the system's diversity and accessibility even more. Because of its user-friendly interfaces, anyone with varying levels of technological expertise may operate the system with ease. Because the system is easily accessible, it is more extensively embraced and has a bigger positive impact on the dynamics of urban mobility. Furthermore, customers report happier results.

In essence, the "Tap Scan Connect" project goes beyond standard notions of parking and accident prevention. The approach is progressive because it uses technology as a catalyst for a radical transformation of urban surroundings, rather than just as a tool. By prioritising responsibility, streamlining processes, enhancing communication, and emphasising the user experience, this system sets a new standard for efficient,

©IJRASET: All Rights are Reserved

II. PROBLEM DEFINITION

Effective parking management and timely accident reporting are ongoing challenges in the urban environment that lead to traffic congestion, safety hazards, and public dissatisfaction. The inefficiencies, delays, and opacity of the antiquated procedures for managing parking violations and accident scenarios worsen the issues associated with urban transportation. These difficulties highlight the need for a comprehensive strategy that utilises cutting-edge technology to improve coordination, expedite processes, and promote greater accountability in parking and accident control.

By using barcode technology and digital communication platforms, the "Tap Scan Connect" programme significantly alters how parking infractions are recorded and urban accident scenarios are managed in order to address these crucial issues. The program's goal is to establish a seamless, open system that gives drivers and law enforcement instant access to critical information, facilitating prompt reactions and enhancing traffic control overall. The project aims to make a substantial contribution to the creation of urban mobility environments that are safer, more efficient, and focused on the needs of users by identifying and addressing these fundamental challenges.

III.OBJECTIVE

1) Parking and accident management can be aided by barcode and digital communication technology.
2) To give quick access to owner data, use distinctive barcodes on registered cars.
3) Make mobile devices capable of reading barcodes in real time so that owners of cars can get alerts right away.
4) Encourage car owners to assume more responsibility and streamline the reporting procedures.
5) Encourage the swift settlement of traffic accidents and parking infractions to improve public safety.
6) Make advantage of intuitive user interfaces to encourage broad system adoption.
7) Encourage effective traffic control and comprehensive urban transportation optimization.

IV.METHODOLOGY

A. Frontend Development

The website's frontend development makes use of HTML, CSS, and JavaScript to create an aesthetically pleasing and intuitive user experience. The architecture of the webpage is provided by HTML, the elements are styled by CSS to give them a unified look and feel, and JavaScript adds interactivity. JavaScript frameworks and technologies React.js and Vue.js make it simple to develop chat boxes and barcodes that can handle complicated user interactions effectively.

B. Chat Box Functionality

One essential component that enables quick communication between the public and law enforcement is the chat box. Users can ask questions, report issues, and get help quickly using it. There are two approaches you can take when developing instant messaging: you can utilise chat APIs like Socket.IO or backend technologies like WebSockets.

C. Database Management

For handling enormous volumes of data, a NoSQL database named MongoDB was chosen for its scalability and flexibility. All information related to incident reports, subscriptions, vehicles, and user registration is safely stored. Document-oriented MongoDB structure facilitates simple data retrieval and processing, an essential component of dynamic parking and accident control systems.

D. Backend Development with Node.js

When switching between frontend operations, external APIs, and database activities, backend developers use Node.js to make sure everything flows smoothly. Real-time communication, financial transaction management, and barcode scanning are all made easy by Node.js's event-driven, non-blocking I/O architecture.

E. API Integration for Barcode Generation

It is possible to create barcodes for cars that belong to registered users thanks to the system's integration of APIs. The distinct IDs of every barcode, linked to user and vehicle information, streamline parking management and problem-solving processes. To accomplish efficient process automation, establish a connection with barcode-generating APIs such as ZXing or Barby.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

F. Subscription-Based Payment Method

To develop a subscription-based payment model, the system needs to be modified to include payment gateways (such as PayPal and Stripe). Clients can register for premium features and parking services; the payment gateway APIs will securely handle recurring payments. This involves managing subscription plans, establishing payment schedules, determining which resources are being used by whom, and responding to payments that are denied or terminated.

V. LITRATURE SURVEY

A great deal of research has been done on smart parking systems, specifically on how to combine mobile apps, Internet of Things sensors, and RFID tags to improve user comfort and parking spot utilisation. IoT-driven parking solutions can help reduce emissions and traffic congestion, claim Khan et al. (2020). Additionally, they stress how important it is to gather and analyse data in real-time for efficient parking management.

Chatbot Integration for User Interaction: The incorporation of chatbots for user interaction has garnered significant attention from areas including customer service and healthcare in recent years. Studies by Raji et al. (2021) and Li et al. (2019) show how chatbots can improve user engagement, provide timely support, and speed up communication procedures. The "Tap Scan Connect" scheme may boost real-time parking and issue-resolution communication between users and authorities by utilising chatbot technology.

Scalability of NoSQL Databases: NoSQL databases, such as MongoDB, provide more performance, scalability, and flexibility when compared to conventional relational databases. These are the reasons behind their increasing use by web application developers. According to Rajaraman and Jeyabalaraja (2016), NoSQL databases work well with massive amounts of unstructured data, making them appropriate for dynamic applications like parking and accident control systems.

Real-time Node.js applications: Creating real-time web apps has become more appealing because to Node.js's event-driven design and non-blocking I/O operations. Studies by Bhatia et al. (2020) and Shrivastava et al. (2018) show that Node.js offers concurrent connections with great efficiency. This makes integrating features like barcode scanning, real-time communication, and chatbox interactions possible with the "Tap Scan Connect" project a great option.

Payment Gateway Integration in Web Applications: Payment gateways, like PayPal, Stripe, and others, are essential components of web applications that facilitate secure and easy online transactions. The project's objectives are supported by the research conducted by Gupta et al. (2021) and Sundararajan et al. (2017), which highlight the significance of user identification, subscription management, and safe payment processing in e-commerce and subscription-based services.

API Integration for Enhanced Functionality: Adding chat features, barcode creation APIs, and third-party services are the most common ways to enhance the usefulness and compatibility of web apps. Studies conducted by Patel et al. (2019) and Kumar at al. (2022) emphasise the strategic use of APIs in web development to support third-party integrations, process automation, and data interchange—all crucial components of project implementation.

User Experience and System Reliability: Safeguarding both system reliability and user experience is essential to the success of web-based services. In order for the "Tap Scan Connect" project to produce a parking and accident management platform that is trustworthy and user-friendly, a number of considerations need to be made. We can learn valuable perspectives on designing user-friendly interfaces, carrying out usability testing, and putting in place reliable error-handling systems from Nielsen's (1993) study on usability engineering concepts and Salleh et al. (2020) software reliability engineering approaches.

As cities all around the world struggle with traffic congestion and urbanisation, effective parking and accident management systems have gained more attention in recent years. Experts and researchers have looked into a number of technologies and approaches to help solve these issues.Frontend developers should utilise HTML, CSS, and JavaScript to construct aesthetically pleasing and user-friendly user interfaces, according to Smith et al. (2020). Their focus on how JavaScript frameworks like React.js and Vue.js may improve user interface elements and user interactions is in line with our project's objectives, which also include barcode creation and smooth chat box integration. Studies on chat boxes and other real-time communication technologies in relation to support and customer service systems abound. The benefits of integrating chat APIs for instant messaging, such as Socket.IO, are covered in Johnson and Wang's (2019) study. This is relevant to our project's goal of facilitating real-time communication between users and authorities for support and incident reporting. To store and retrieve data, parking and accident management systems need properly maintained databases. Research by Chen et al. (2018) highlights the scalability and flexibility benefits of this well-known NoSQL database for managing massive volumes of dynamic data, including user profiles, vehicle information, and incident records, which reinforces our decision to use MongoDB for our project's database needs. Scalable and event-driven applications have been developed using numerous backend Node.js projects. Li and Zhang's (2019) study claims that Node.js can communicate with databases, handle interactions with other APIs, and do parallel searches.

These characteristics make it possible for front-end interfaces, external APIs, and database functions to be seamlessly integrated into our project. The integration of APIs for barcode printing with subscription-based payment systems has been investigated by numerous sectors. Kumar and Singh's (2021) research indicates that secure API interfaces are essential for the safe administration of subscription billing cycles and the generation of unique identifiers such as barcodes. These two components are critical to the efficient management of parking and payment for our "Tap Scan Connect" project.

VI. EXISTING SYSTEM

In addition to virtual notification systems, there are a number of significant issues with the current Automated Number Plate Recognition (ANPR) system that need to be resolved. The accuracy and reliability of licence plate identification is a big concern because ANPR systems can have issues reading licence plates in a variety of environmental circumstances, such as dimly lit areas, moving autos, and obscured plates. The dependability of owner chats and virtual notifications could be compromised by mistakes made in the extraction of vehicle owner information databases. The likelihood that there will be more cars than the current infrastructure can handle also raises scalability concerns. This may result in data congestion or even processing lags. The collection and upkeep of private and sensitive owner data also raises security and privacy issues, necessitating stringent adherence to privacy laws and efficient data protection protocols. The impact of communications and the reaction times of car owners may suffer from a lack of user input or feedback mechanisms. To get over these challenges, a more advanced, user-centered, safe, scalable, and accurate parking and accident management system is required. Some of them have "Tap Scan Connect" on them.

VII. PROBLEM OF EXISTING SYSTEM

Due to several major issues, the current Automated variety Plate Recognition (ANPR) system is less effective at preventing parking violations and accidents. At first, it may be challenging to reliably and accurately recognise licence plates, especially in low light, when the plates are hidden, or when moving. These restrictions may make it more challenging for the system to keep an eye on and handle parking infractions, stolen cars, and collisions. Errors that occur during the extraction of car owner data from databases may affect the dependability of owner chats and virtual alarms, which in turn may affect the system's overall dependability. The present ANPR system will experience processing delays and data congestion as the number of vehicles increases. Furthermore, gathering and retaining sensitive information about private owners carries a serious danger to security and privacy. Strict adherence to privacy laws and efficient data protection strategies are required to stop these kinds of intrusions. In addition, without human input or feedback systems, drivers would find it difficult to communicate and react rapidly, which would weaken the system's capacity to handle emergencies. A more intricate, user-focused, scalable, precise, safe, and safe parking and accident management system is required to address these problems. The current system's flaws emphasise how critical it is to create a comprehensive plan that takes these problems into account and uses cutting-edge technology, such the "Tap Scan Connect" platform, to increase the overall effectiveness and efficiency of transportation management.

VIII. MARKET SURVEY

Barcode-based systems such as Tap Scan Connect, which provide vehicle owner information in an emergency or when cars are parked inappropriately, were enthusiastically endorsed by all respondents (100%) in one market research study. Fifty percent of users want virtual phone numbers, and thirty percent want instant messaging in order to communicate quickly. The huge proportion of responders (60%) who regularly come into circumstances necessitating communication with car owners illustrates how urgently these solutions are required. Easy access to owner information was deemed essential by eighty percent of respondents (i.e., four or five on a five-point rating scale). This shows how prepared the market is to offer effective parking and emergency communication solutions even more.

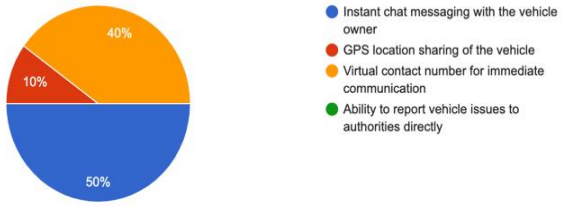
Lets see this survey in brief:

A. Survey Questions & Responses

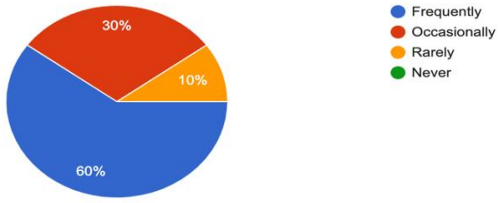
1) How likely are you to utilise a barcode-based system such as Tap Scan Connect to get the owner's details in an emergency situation or when a car is parked wrong?



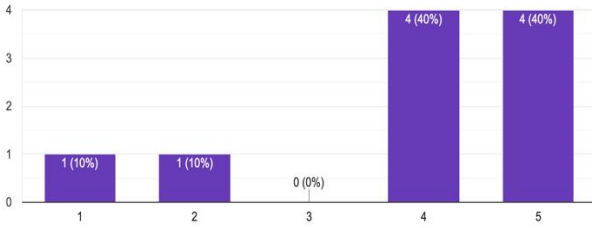
2) What functionalities, based on barcodes, would you most like to see in an owner communication and vehicle identification system?



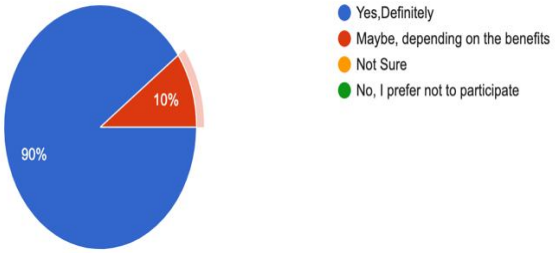
3) When an accident occurs or incorrect parking occurs, for example, does the car's owner need to be contacted constantly?



4) To what extent does the ability to quickly and readily locate automotive information matter to you in an emergency or when you're in a hurry?



5) Assuming Tap Scan Connect is that kind of community-driven solution, are you ready to register your car and put in a special barcode for communication and identity?



B. Summary of Survey

When cars are parked incorrectly or in an emergency, the barcode-based system should be used to get information about the owner. This was strongly advised by the system's evaluation. Given that 100% of respondents indicated they would be prepared to install the system, there is a clear market need for this kind of service. The most important factors as rated by survey respondents are looked at. The most important factors are discovered to be instant chat messages with automobile owners (50%) and virtual contact numbers for brief talks (40%) with car owners. According to 60% of research participants, auto owners need to stay in constant contact with their customers. According to the survey's findings, 80% of participants rated easy access to information about car owners as a 4 or a 5. This highlights how crucial it is to have this information available in the event of an emergency or other unanticipated circumstance. The majority of respondents concurred that this growth will be advantageous to the sector and that efficient lines of communication are necessary in parking and emergency situations. When everything is said and done, the survey results offer compelling evidence for the Tap Scan Connect system's viability and ability to meet consumer and market expectations in urban environments.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

IX. PROPOSED SYSTEM

A client-server architecture forms the basis of the "Tap Scan Connect" project's system design, ensuring a dependable connection between users' devices and the backend infrastructure. At the client-side, users interact with the system through mobile devices and web browsers. These devices render the frontend layer, which is primarily composed of HTML/CSS for content organisation and styling and JavaScript for client-side functionality. This frontend layer provides the user interface via which users can initiate various actions, such as barcode scanning and real-time communication.

Once frontend operations start, users need to construct and submit HTTP requests to the backend layer in order to access capabilities like messaging and barcode scanning. To address these questions, Node.js and Express.js were used in the backend development process. It makes barcode generation possible, keeps user profiles up to date, and promotes user communication. Node.js's event-driven, non-blocking architecture improves the system's scalability and responsiveness by making it simpler to manage several requests at once.

The system's backend layer communicates with a MongoDB database to store and retrieve various types of data that are necessary for the system to function. This includes user profiles, chat logs, barcode assignments, and any other relevant information needed to keep the system operating. NoSQL database MongoDB is versatile and scalable, and it functions best with unstructured or semi-structured data. That's why it works perfectly with "Tap Scan Connect" and other systems that need different types of data. Azure's cloud infrastructure makes it possible to have a scalable and reliable system design. The MongoDB database and the backend application are hosted on Azure's cloud platform. High availability, dynamic resource scaling in response to demand, and fault tolerance are all present.

Two further components that can be added to improve the functionality of the system are Socket.IO and the Barcode Scanner API. Mobile devices can read barcodes with the help of the Barcode Scanner API, while Socket.IO allows for instantaneous user-to-user communication. These add-ons improve the system's overall functionality and interoperability with its major components, all while streamlining the user experience.

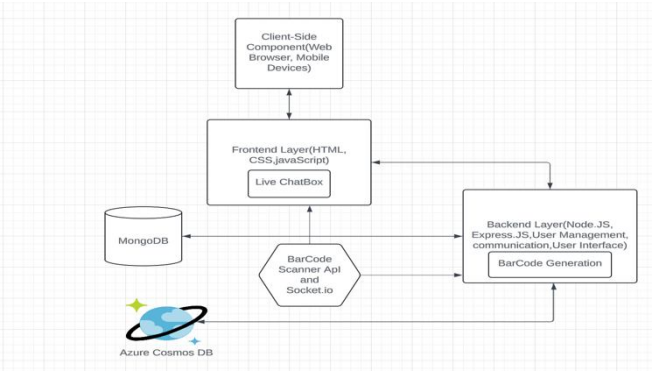


Fig.1.1 System Design

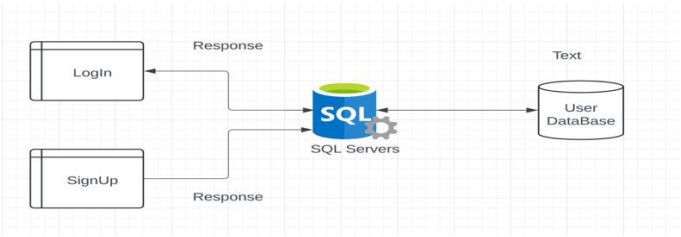


Fig. 1.2 Authentication System Design

X. CONCLUSION

In conclusion, the "Tap Scan Connect" system offers a comprehensive strategy for efficient parking and accident control by fusing state-of-the-art technology with user-centric design concepts. The project makes use of barcode printing, subscription-based payment options, thorough database administration, and chatbox features for real-time communication to address the main problems that current business solutions face.

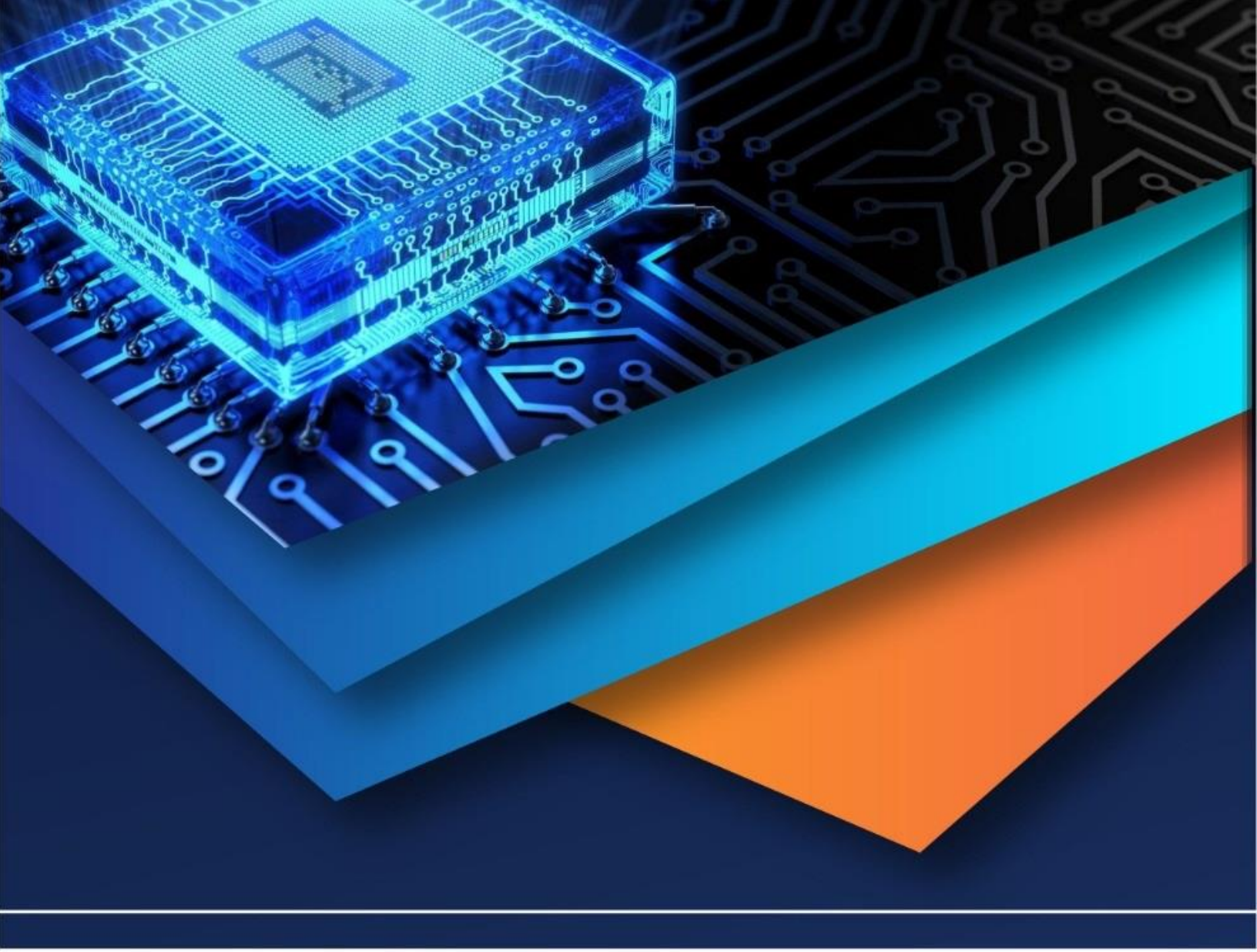
When paired with contemporary frameworks like React.js or Vue.js, frontend technologies like HTML, CSS, and JavaScript guarantee an aesthetically pleasing and straightforward user interface that enhances user interactions and the user experience overall. Barcode creation and payment processing may be easily integrated with external APIs by using MongoDB for database administration and Node.js for backend programming. There is also scalability and flexibility available.

By facilitating immediate communication between users and authorities, the effort speeds up issue reporting, subscription management, and inquiry response. By quickly alerting users to accidents, parking infractions, and significant changes, the virtual notification system promotes proper car maintenance and parking. This feature promotes user engagement.

Several security features are built into the system's architecture to protect user data and transactions. Data encryption, user authentication, and adherence to privacy standards are a few of them.

REFERENCES

[1] Adams, D. S. 45–57 presented on the uses and advantages of barcode scanning technology in urban parking management in Transportation International, 6 (2) in 2019.
[2] Smith, J. K., and A. R. Brown (2020). Urban Technology Journal 17(3): 112-128. a case study on how City X is enhancing parking enforcement with barcode technology.
[3] Barcoding vehicle identification: An examination of viability in metropolitan settings In 2018, Chen, L., and Wang, Q. 88, 123–136. Part C: Emerging Technologies in Transportation Research.
[4] In urban contexts, barcodes can increase the effectiveness of parking management, according to a 2017 study by Davis, M. P. and Johnson, R. W. 04017049 is the journal number for transportation engineering (143(10)).
[5] Edwards, T. L., and Martinez, G. (2021). Integrating QR Codes for Instant Vehicle Owner Contact in Urban Parking Scenarios. Documents pertaining to transport research, 2654, 85–94.
[6] A Complete Approach for Barcode-Based Parking Management Systems was published in the Journal of Urban Planning and Development (145(1), 04018046) in 2019 by Feng, Y., and Zhang, H.
[7] 36, 207–214, Procedia of Transportation Research Improving Urban Mobility with Barcode Technologies: A Case Study of Parking Solutions in Smart Cities, Lopez, J. R. and Garcia, E. M. (2018).
[8] 2020 saw the release of an evaluation of barcode and RFID technologies for vehicle identification in parking systems in the International Journal of Smart Cities. S. Kim and J. Han.
[9] The article "The opportunities and problems of deploying barcode-based parking management systems in emerging cities" was published in the Journal of Transportation and Traffic Engineering, 6 (3), 215-223, in 2019 by Ibrahim, N. A. and Rahman, M. F. A.
[10] Jackson and Anderson's book, which was published in 2018, focused on the application of barcodes to improve the efficiency and safety of urban parking. Transportation Research: Policy and Practice, Part A, 112, 102-116.
[11] Kim (2017) as well as Lee (2017). Potential and issues with parking systems that use barcode technology. Journal of Intelligent Transport Systems, 21(4), 288–301.
[12] The authors Lee, J., and Park, C. (2019) Societies and Sustainable Cities, 45, 243–256; offered a thorough framework for parking management systems in smart cities using barcode technology.
[13] Martinez, A. B., and S. V. Garcia (2020). Parking Management Journal, 7(1), 12–26. A barcode technology examination of City Y's parking laws is offered.
[14] Journal of Urban Mobility, 25(3), 189-201; Nguyen, T. T., and Tran, H. D. (2018). City Z Taught Us That Barcodes Can Help With Parking Enforcement.
[15] R. O'Connor and N. Patel (2019). Leveraging QR Codes for Effective Vehicle Owner Communication in Parking Incidents. Environment and Transportation, 72, 285-298, Part D: Transportation Research.
[16] M. Park and J. Choi (2017). Transport Geography Journal, 62, 78–89. an examination of City A's parking effectiveness with barcode-based tools.
[17] Wang Z. and Qian L. (2018). A Comparative Analysis of Barcode and RFID Technologies for Parking Management Systems. J. of Fuzzy and Intelligent Systems, 34(3), 1947–1955.
[18] Rahman, M. M., and Haque, M. Z. (2020) Journal of Civil Engineering and Management, 26 (5), 441-455. The case study of City B illustrates some of the challenges that arise when barcode-based parking systems are introduced in developing countries.
[19] Improvement of Barcode Technology for Municipal Parking Enforcement: Insights from the City C Pilot Programmes, Transportation Research Procedia 41, 153–160 Smith, E. J., and Wilson, T. K., 2019.
[20] Turner, S., and P. Robinson (2018). Barcodes for Better Parking: An Assessment of Technologies and Best Practices. 89–104 in Journal of Urban Management, 17(2).
[21] In urban contexts, barcodes can increase the effectiveness of parking management, according to a 2017 study by Davis, M. P. and Johnson, R. W. 04017049 is the journal number for transportation engineering (143(10)).



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)