

Unlocking Seamless Experiences: Innovations in QR Code Ticketing by MIT

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ABSTRACT—MIT has developed a groundbreaking mobile application leveraging QR code scanning technology to streamline ticketing for a specific location-based service. The application caters to varying duration of user engagement, offering tailored experiences for low, middle, and high-duration visits. At its core, the app utilizes QR code scanning to efficiently manage entry and exit processes, ensuring seamless access for users across different time frames. Upon scanning the QR code, the application dynamically adjusts its functionalities based on the anticipated duration of the user's stay. For low-duration, such as quick stops or brief engagements, the app provides swift ticket validation and entry, optimizing for speed and convenience. Middle duration visits, encompassing moderate lengths of stay, are met with one standout feature: its intelligent time-based selection, allowing users to seamlessly choose their location and specify short or long-distance travel. The app incorporates a unique buzzer sound mechanism, with short distances triggering a quick notification while longer distances activate a prolonged alert. Moreover, the app is equipped with distance-delay capabilities, enabling it to adjust the timing of alerts based on the distance traveled. This ensures timely notifications without overwhelming users with unnecessary updates. Additionally, the app facilitates efficient communication by automatically sending SMS alerts to drivers, providing them with crucial information in real-time. Through these advancements, MIT's QR code ticketing app sets a new standard for convenience, safety, and reliability in transportation systems.

KEYWORDS

QR Code Scanning, Booking Interface, Payment, SMS Communication, Notification, Fare Payment, MIT Mobile App

I. INTRODUCTION

MIT, renowned for its groundbreaking research and pioneering advancements across various domains, has once again propelled innovation forward with its revolutionary developments in QR code ticketing. In an era characterized by digital transformation and seamless user experiences, traditional ticketing systems have faced challenges ranging from inefficiency to limited accessibility. Recognizing these shortcomings, MIT has embarked on a journey to redefine ticketing through the integration of Quick Response (QR) codes, leveraging cutting-edge technology to streamline the ticketing process while enhancing convenience and security. This visionary approach not only simplifies ticket management for organizers but also empowers users with a frictionless and versatile means of accessing events, transportation services, and other experiences. MIT's endeavors in QR code ticketing epitomize its commitment to driving innovation that transcends boundaries, shaping the future of ticketing systems worldwide. The QR code itself is simply an array of bits to be identified by a scanner. Bits are reserved for the scanner to be able to identify and orient the image, as well as for version and format information. The remaining bits are used to encode the message, and the specific amount of available space leftover is dependent on the version of the QR code, which indicates the number of bits per row/column, and the level of error correction, which introduces redundancy. Capable of encoding the same amount of data in about one-tenth the space of traditional 1-D barcodes, QR codes present a much more space-efficient way of presenting scannable data. Initially invented for use in automotive factories in Japan, QR codes were used to programmatically identify and track car parts quickly in order to speed up production. However, they soon began to see

more widespread use as convenient methods of sharing and transmitting data. With the increase in usage of QR codes in the general public, it is necessary to ensure that the data conveyed through the QR code is not harmful to the user.

II. LITERATURE REVIEW

1. Zhongze Lv Hu Guan et al "Using QR Code to Enhance Extraction Efficiency of Video Watermark Algorithm" IEEE-2020:

Video watermarking can effectively protect the copyright of video contents, but how to improve efficiency of watermarking algorithms is an urgent problem to be solved. In this paper, QR Code is embedded in the scene change frames of videos based on the advantage of QR Code's strong fault tolerance. Combined with the characteristic of high decoding reliability of QR Code, a strategy to terminate the extraction process in advance

is proposed to improve the extraction efficiency of the watermark algorithm. Experimental results show that the proposed algorithm has higher extraction efficiency than the algorithm that directly uses character string as watermark.

2. Rahul Patil Sagar Salunke et al proposed “Efficient Cash Withdrawal from ATM Machine Using QR code Technology” IEEE-2020:

Nowadays, dependency on banking in the virtual world has been increased to the peak position. To make it consistent advanced technologies should be used. As OTP is currently used worldwide for security purposes, it can be overruled by QR code. Main advantage of QR code over OTP data storage. OTP can only confirm that the user is authorized user and not some third party is involved in this transaction while QR code not only confirms the authorized user but QR code itself can store information such as transaction id, transaction date, time and also amount of transaction. So, there is no need of explicitly keeping track of transaction every transaction. Aim of this paper to enhance the functionality of ATM machine using android application. Proposed system is combining the ATM and mobile banking and minimizes the time of withdrawing cash from ATM. This will increase the speed of transaction almost three times fast; could have excellent impact on customer's satisfaction. With the help of QR code information get encrypted so it also increases security. The Internet of Battlefield Things (IOBT) Based.

3. Yijie Li; Yi-Chao Chen et al proposed “ScreenID:

Enhancing QR Code Security by Fingerprinting Screens” IEEE-2021:

Quick response (QR) codes have been widely used in mobile applications due to its convenience and the pervasive built-in cameras on smartphones. Recently, however, attacks against QR codes have been reported that attackers can capture a QR code of the victim and replay it to achieve a fraudulent transaction or intercept private information, just before the original QR code is scanned. In this study, we enhance the security of a QR code by identifying its authenticity. We propose SCREENID, which embeds a QR code with information of the screen which displays it, thereby the QR code can reveal whether it is reproduced by an adversary or not. In SCREENID, PWM frequency of screens is exploited as the unique screen fingerprint. To improve the estimation accuracy of PWM frequency, SCREENID incorporates a model for the interaction between the camera and screen in the temporal and spatial domains. Extensive experiments demonstrate that SCREENID can differentiate screens of different models, types, and manufacturers, thus improve the security of QR codes.

4. Riccardo Carotenuto Massimo Merenda et al proposed “Indoor Object Positioning using Smartphone and RFID or QR Code” IEEE-2020:

Positioning objects such as appliances inside rooms has become of fundamental importance in the Internet of Things (IoT) and òin-home automation, as well as in augmented reality (AR). A new positioning system based on a smartphone and radio-frequency identification (RFID) tags applied to the objects to be localized is presented. The 3D positioning of the smartphone is obtained through an ultrasound system while its orientation in space is obtained with the onboard magnetometers and accelerometers. When a certain RFID tag is read through the near-field communication (NFC) interface of the smartphone, from its distance and from the orientation of the smartphone that reads it, the 3D position of the tagged object is obtained. The system architecture is explained and simulation results are presented. Positioning accuracy of about ten centimeters is achieved.

III. EXISTING SYSTEM

QR code, which has become a research hotpot due to the additional functional characteristics of its colors as the wide application of QR code technology. This code combines multiplexing and color-coding technology to present the publicly encoded information (such as advertisements, public query information) as plain code, and traceability, blockchain, anti-counterfeiting authentication and other information concealed in the form of hidden code.

IV. PROPOSED SYSTEM

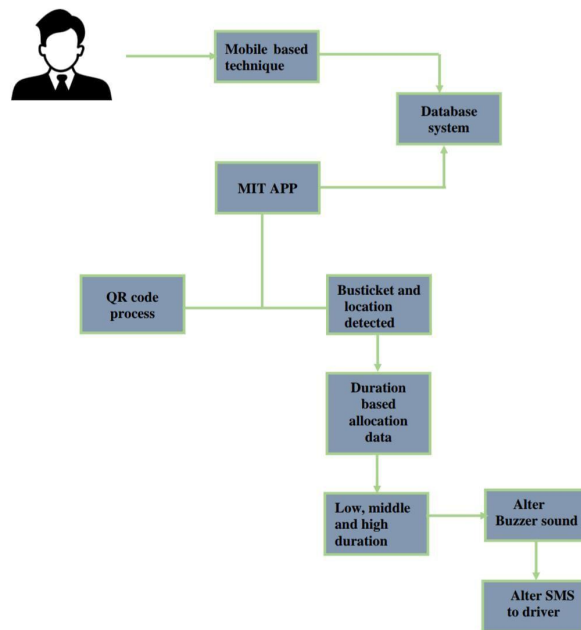
The proposed system developed by MIT, which leverages QR code scanning technology for seamless bus ticket booking and navigation. This cutting-edge app aims to redefine the commuting experience by providing users with a hassle-free journey from start to finish. Using the app is simple and efficient. Users begin by scanning a QR code at their current location to access the booking interface. Here, they input their desired destination, and within seconds, the app confirms the availability of buses along the route. Once confirmed, users can proceed to pay the ticket amount securely through the app. In case of any need to alter the travel time or destination, users can easily communicate with the driver through SMS functionality integrated into the app. Upon receiving the request, the driver is notified through a buzzer sound, ensuring prompt attention to the user's requirements. Upon

reaching the destination, users are prompted to pay the ticket fare through the app before exiting the location. The entire process is streamlined, eliminating the need for cash transactions and reducing wait times significantly. This proposed system not only simplifies bus ticket booking and payment but also enhances communication between passengers and drivers for a more efficient and enjoyable commuting experience. Then to find the bus sit With MIT's innovative QR code scanning technology, commuting has never been easier.

V. MOBILE APPLICATION

A mobile application (also called a mobile app) is a type of application designed to run on a mobile device, which can be a smartphone or tablet computer. Even if apps are usually small software units with limited function, they still manage to provide users with quality services and experiences. Contrary to applications designed for desktop computers, mobile applications move away from integrated software systems. Instead, each mobile app provides an isolated and limited functionality. For example, it can be a game, a calculator, or a mobile web browser. Let's explore the various technical aspects to make it easier to understand how to build a mobile app. This includes both the technologies used to build mobile apps and the solutions that make other apps work well on mobile devices. Because of the limited hardware resources of the early mobile devices, mobile apps avoided multi-functionality. However, even if the devices used today are far more sophisticated, mobile apps remain narrowly functional. This is how mobile app owners allow consumers to handpick exactly the functions their devices. This example illustrates how the company developed a project management tool that can be used by teams on different platforms, Windows, Mac, iOS and Android, which is a cross-platform application. It allows teams to collaborate and manage their projects seamlessly, regardless of the platform. Mobile app development is rapidly growing. From retail, telecommunications and e-commerce to insurance, healthcare and government, organizations across industries must meet user expectations for real-time, convenient ways to conduct transactions and access information.

VI. BLOCK DIAGRAM



VII. MODULES DESCRIPTION

1. QR CODE SCANNING MODULE: This module allows users to scan a QR code at their current location to access the booking interface of the app. User Interaction: Users approach a designated area, such as a bus stop or

transit station, where a QR code is displayed prominently. QR Code Scanning: Using their mobile device equipped with the MIT-developed app, users scan the QR code using the device's camera. The app's QR code scanning functionality interprets the code and extracts the relevant information encoded within it. Access to Booking Interface: Upon successful scanning of the QR code, users are automatically directed to the booking interface of the app. This interface serves as a gateway for users to input their desired destination and initiate the ticket booking process.

2. BOOKING INTERFACE MODULE: Once users have scanned the QR code, they are directed to the booking interface where they can input their desired destination. The app then confirms the availability of buses along the route. The booking interface module is a critical component of the proposed system developed by MIT for seamless bus ticket booking and navigation. After users have scanned the QR code at their current location, they are directed to this interface within the app. Here, users can input their desired destination, specifying where they want to travel. Once users have inputted their destination, the app utilizes its internal database or external APIs to confirm the availability of buses along the route to the specified destination. This involves checking factors such as bus schedules, routes, and availability of seats on buses that can accommodate the user's

travel request.

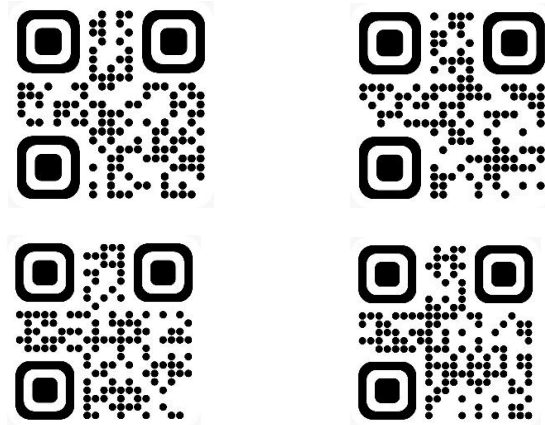
3. PAYMENT MODULE: After confirming the availability of buses, users can proceed to securely pay the ticket amount through the app. This module ensures safe and convenient transactions for users. The Payment Module of the proposed system is designed to facilitate secure and convenient transactions for users. Once users have confirmed the availability of buses and selected their desired route, they can proceed to pay the ticket amount directly through the app. This module employs robust security measures to ensure the safety of users' payment information. It may utilize encryption techniques to protect sensitive data such as credit card details or digital wallet information during transmission. Additionally, the app may integrate with trusted payment gateways or financial institutions to process transactions securely.

4. SMS COMMUNICATION MODULE: In case users need to alter their travel time or destination, they can easily communicate with the driver through SMS functionality integrated into the app. This module facilitates efficient communication between passengers and drivers. User Initiates Communication: If a user needs to change their travel time or destination, they can do so directly through the app. Within the app's interface, there is likely a feature or button that enables users to send a message to the driver. Message Sent as SMS: When the user sends a message through the app, the system converts it into an SMS message. This message is then sent to the driver's phonenumber associated with the specific bus or route. Driver Receives Notification: Upon receiving the SMS message, the driver's phone receives a notification. This notification alerts the driver to the incoming message and prompts them to view it.

5. NOTIFICATION MODULE: When users send a request to alter their travel plans, the driver is notified through a buzzer sound, ensuring prompt attention to the user's requirements. This module ensures that drivers are promptly informed of any changes in passenger requests. The notification module is a crucial component of the proposed bus ticket booking and navigation system developed by MIT. When users send a request to alter their travel plans, such as changing their destination or pickup time, this module ensures that the driver is promptly notified. The notification is sent to the driver through a buzzer sound, which serves as an audible alert to grab the driver's attention. This prompt notification mechanism ensures that drivers are immediately informed of any changes in passenger requests, allowing them to adapt their route or schedule accordingly.

6. FARE PAYMENT MODULE: Upon reaching the destination, users are prompted to pay the ticket fare through the app before exiting the location. This module streamlines the fare payment process, eliminating the need for cash transactions and reducing wait times significantly. The fare payment module is an integral part of the proposed system developed by MIT for seamless bus ticket booking and navigation. Once users have reached their destination, they are prompted to pay the ticket fare through the app before exiting the location. This module streamlines the fare payment process by eliminating the need for cash transactions, which can often be time-consuming and inconvenient for both passengers and drivers. By allowing users to pay the fare directly through the app, the system ensures a more efficient and streamlined experience for everyone involved. Users can complete the payment quickly and securely, without having to worry about carrying cash or waiting for change. This not only saves time for passengers but also reduces wait times for drivers, as they can proceed to the next trip without delay.

VIII. SAMPLE QR CODE



IX. SOFTWARE DESCRIPTION

1.MIT APP: MIT App Inventor is a high-level block-based visual programming language, originally built by Google and now maintained by the Massachusetts Institute of Technology. It allows newcomers to create computer applications for two operating systems: Android and iOS, which, as of 25 September 2023, is in beta testing. MIT App Inventor is an educational tool to learn computational thinking and computational action principles through building mobile apps. Used by over one million people worldwide every year, it is one of the premier platforms for computer science education. Use this companion app to test drive projects, debug blocks code, and show your friends and family your creations. Using a blocks-based programming language, design and code your own projects, or use one of the many books and curricula to learn about coding. App Inventor also includes built-in tutorials for running student workshops. This version of App Inventor includes over 60 components, from user interface elements such as buttons and switches, to sensors, connectivity and multimedia components so your projects can interact with the world.

2.MOBILE APP: A mobile application or app is a computer program or software application designed to run on a mobile device such as a phone, tablet, or watch. Mobile applications often stand in contrast to desktop applications which are designed to run on desktop computers, and web applications which run in mobile web browsers rather than directly on the mobile device. Apps were originally intended for productivity assistance such as email, calendar, and contact databases, but the public demand for apps caused rapid expansion into other areas such as mobile games, factory automation, GPS and location-based services, order-tracking, and ticket purchases, so that there are now millions of apps available. Many apps require Internet access. Apps are generally downloaded from app stores, which are a type of digital distribution platforms. Most mobile devices are sold with several apps bundled as pre-installed software, such as a web browser, email client, calendar, mapping program, and an app for buying music, other media, or more apps. Some pre-installed apps can be removed by an ordinary uninstall process, thus leaving more storage space for desired ones. Where the software does not allow this, some devices can be rooted to eliminate the undesired apps. Apps that are not preinstalled are usually available through distribution platforms called app stores. These may operate by the owner of the device's mobile operating system, such as the App Store or Google Play Store; by the device manufacturers, such as the Galaxy Store and Huawei AppGallery; or by third parties, such as the Amazon Appstore and F-Droid.

3.APK: The Android Package with the file extension apk is the file format used by the Android operating system, and a number of other Android-based operating systems for distribution and installation of mobile apps. APK is analogous to other software packages such as APPX in Microsoft Windows, APP for HarmonyOS or a Debian package in Debian-based operating systems. To make an APK file, a program for Android is first compiled using a tool such as Android Studio or Visual Studio and then all of its parts are packaged into one container file. An APK file contains all of a program's code (such as .dex files), resources, assets, certificates, and manifest file. As is the case with many file formats, APK files can have any name needed, but it may be required that the file name ends in the file extension for being recognized as such. Most Android implementations allow users to manually install APK files only after they turn on an "Unknown Sources" setting that allows installation from sources other than trusted ones like Google Play. The quirky and controversial life simulation game Palworld has been gaining buzz for its unique premise of using cute creatures called "Pals" as both loyal friends and exploitable workers. Up until now, the game has only been available on PC. Fortunately,

Android users can now get in on the action with the release of Palworld mobile.

X.FUTURE SCOPE

Real-Time Bus Tracking: Integrating GPS tracking technology to allow users to track the real-time location of buses along their route. This feature can provide users with accurate arrival times and help them plan their journeys more effectively. **Personalized Recommendations:** Utilizing machine learning algorithms to analyze users' travel patterns and preferences, the app can offer personalized recommendations for bus routes, timings, and nearby attractions. **Multi-Language Support:** Adding support for multiple languages to cater to a diverse user base, making the app more accessible and user-friendly for people from different linguistic backgrounds. **Accessibility Features:** Incorporating accessibility features such as voice commands, larger fonts, and color contrast options to ensure that the app is usable by individuals with disabilities. **Integration with Public Transit Systems:** Partnering with local public transit authorities to integrate the app with existing transit systems, allowing users to seamlessly transfer between buses, trains, and other modes of public transportation. This project is more convenience, QR

code scanning provides a convenient way to distribute and install Android applications without the need for typing URLs or searching through app stores.

XI.CONCLUSION

The simplicity and efficiency of the app are evident in its user-friendly interface and seamless functionality. Users can easily access the booking interface by scanning a QR code at their current location, input their desired destination, and confirm the availability of buses along the route within seconds. The integration of secure payment options further enhances the convenience of the app, eliminating the need for cash transactions and reducing wait times significantly. The incorporation of SMS functionality enables users to communicate with the driver in real-time, facilitating prompt attention to any changes in travel plans or requirements. This enhances communication between passengers and drivers, contributing to a more efficient and enjoyable commuting

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