

RFID Based Smart Public Transport Ticketing System Using QR Code Online Payment Method

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Abstract — The Smart Public Transport Ticketing System uses an Arduino mega board with RFID, keyboard, LCD, TFT, SIM800L, RTC and MP3 modules. Users scan RFID cards and ask the system to retrieve their name and cell phone number. Clear instructions guide you to select your destination on the 20*4 LCD screen and the payment QR code is displayed on the TFT screen. After a successful payment, the system waits for confirmation from the SIM800L, displays a success message and waits for the payment status. The real-time clock feature ensures the date and time on the ticket sent to the user's mobile phone is correct. For ease of use, the system features text-to-speech guidance. Once the process is complete, the system is restored and ready for the next user, providing a streamlined and modernized public transport ticketing solution.

Keywords: RFID Card, 20x4 LCD Display, TFT Screen, QR Code, 4x3 Keypad, SMS Message, SIM800L Module, Real-Time Communication, Public Transport Tickets

I. INTRODUCTION

The Smart Public Transport Ticketing System revolutionizes traditional ticketing processes by combining cutting-edge technologies to provide a seamless and efficient user experience. Powered by an Arduino Mega board and a range of modules including RFID, keyboard, LCD, TFT display, SIM800L, RTC and MP3, the system offers a sophisticated yet intuitive user interface. Users start the process by simply scanning their RFID cards so that the system can retrieve their name and cell phone number. The intuitive 20*4 LCD screen then guides you through the destination selection process, culminating in the generation of a payment QR code on the TFT screen.

Once the payment is successful, the system communicates with the SIM800L for confirmation and displays a success message waiting for the payment status. The integration of the real-time clock function ensures accurate date and time information on the mobile ticket. This innovative solution, based on voice guidance, represents a significant advance in public transport ticketing, seamlessly resetting for the next user and demonstrating a streamlined and modernized approach.

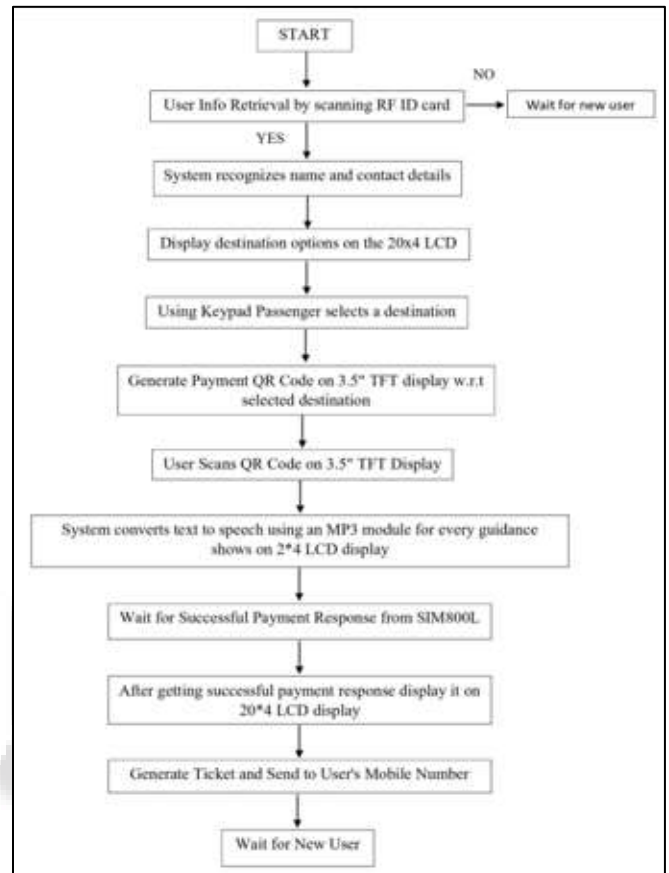


Fig. 1: Flow chart

The system begins by initiating the retrieval of user information by scanning an RFID card. If no RFID card is recognized, the system waits for a new user. After successful recognition of the RFID card, the system retrieves the user's name and contact details and displays them on a 20x4 LCD screen. Targeting options are then displayed on the LCD screen and the user navigates through them using a keyboard. After selecting a travel destination, a payment QR code specific to the selected travel destination will be generated and displayed in a 3.5 TFT screens. The user scans the QR code via the same TFT screen. The system then converts the displayed text into speech using an MP3 module to provide guidance, which is simultaneously displayed on the 20x4 LCD screen. The system is waiting for a successful payment response from the sim800l module. After confirmation, the success message will be displayed on the 20x4 LCD screen. A ticket is generated and sent to the user's mobile number. The system then waits for a new user to repeat the process. This integrated system efficiently manages user identification, destination selection, payment processing and ticket creation, providing users with a seamless experience while ensuring payment security and the provision of accurate information.

II. LITERATURE SURVEY

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- 2) "E-Ticketing Strategy and Implementation in an Open Access System: The Case of Deutsche Bahn "Authors: Grace Ng- Kruelle, Paul A Swatman, Oliver Kruelle Published on: March 1, 2006.
- 3) "A Scheme of Digital Ticket for Personal Trusted Device "Author: F. Bao Published in: 15th IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC04), 2004, IEEE.
- 4) "A Mobile Ticket System Based on Personal Trusted Device "Authors: Y. Y. Chen, C. L. Chen, J. K. Jan Published in: Wireless Personal Communications: An International Journal, 2007.
- 5) "ATMs of Banks: Fair Pricing and Enhanced Access - Draft Approach Paper "Dated: December 24, 200? (Please provide the complete year for a more precise reference)

A. Block Diagram Description:

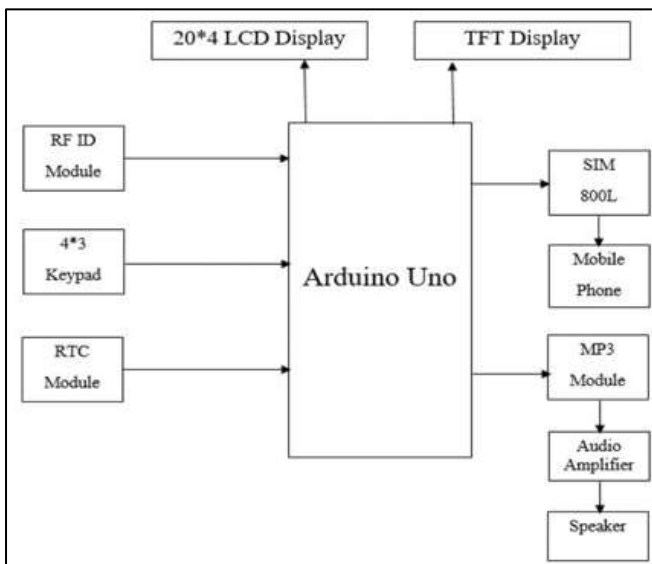


Fig. 2: Block Diagram

The methodology used in the development and implementation of the Intelligent Public Transport Ticketing System involves a systematic integration of several technological components. The Arduino Mega board serves as a central controller and orchestrates the collaboration between the RFID, keyboard, LCD, TFT display, SIM800L, RTC and MP3 modules. In the initiation phase, users effortlessly scan RFID cards, which triggers the system to retrieve relevant user information such as name and mobile number. A user-friendly interface is enabled by a 20*4 LCD screen that guides the user through target selection. To complete this process, a payment QR code will be generated and displayed on the TFT screen.

After payment, the system interacts with the SIM800L module to confirm, simultaneously displays a success message and waits for the payment status. The addition of a real-time clock function ensures accurate time

data on the mobile ticket. Additionally, text-to-speech guidance enriches the user experience. The innovative solution is designed to be seamlessly reset for successive users, exemplifying a simplified and modernized approach to public transport ticketing.

III. WORKING PROCESS

The system works in several sequential steps to provide a seamless user experience. Below is a detailed workflow for each phase:

A. User initiation and identification:

- The system is waiting for an RFID card to be scanned.
- If no RFID card is detected, the system remains in standby state waiting for a new user.
- If the RFID card is successfully recognized, the system recognizes the unique identifier associated with the card.

B. User information recovery:

- The system retrieves user information, including name and contact details, based on the RFID card identifier.

C. Target selection:

- The 20x4 LCD displays a list of targeting options.
- The user interacts with the system via a keyboard to select the desired destination.

D. QR code generation:

- Once the destination is selected, the system will generate a specific payment QR code for the selected destination. This QR code is displayed on a 3.5 TFT screen for the user to scan.
- The user scans the displayed QR code via the 3.5 TFT screen.

E. Text-to-speech targeting:

- At the same time, the system converts text into speech using an MP3 module and provides audio guidance.
- The guide is played over speakers and also displayed on the 20 x 4 LCD screen for the user to follow.

F. Payment processing:

- The system is waiting for a successful payment response from the sim800l module to ensure transaction completion.

G. Payment response screen:

- After receiving a successful payment response, the system will display a confirmation message on the 20x4 LCD screen.

H. Creation and delivery of tickets:

- The system generates a digital ticket for the user containing relevant travel details.
- The ticket is sent to the user's mobile number for reference.

I. Waiting status for new user:

- The system returns to the waiting state and waits for a new user to start the process.

IV. RESULT AND DISCUSSION

A. Results:

1) Scanning RFID Cards:

- Successful recognition of an RFID card triggers the start of the user identification process.

2) User identification:

- RFID card recognition allows retrieval of user information including name and contact details.

3) Target selection:

- Targeting options are displayed on a 20x4 LCD screen.
- The user interacts with a keyboard to select the desired destination.

4) QR code generation:

- A payment QR code is dynamically generated based on the selected destination.
- The QR code is displayed on a 3.5 TFT screen.

5) QR Code Scanning:

- The user scans the generated QR code using the 3.5 TFT display.

6) Text-to-speech targeting:

- The system converts the text guidance into speech using an MP3 module.
- The audio guide is played over the speakers and the corresponding text is displayed on the 20x4 LCD screen.

7) Payment processing:

- The system is waiting for a successful payment response from the sim8001 module.

8) Payment response screen:

- After receiving a successful payment response, a confirmation message will be displayed on the 20x4 LCD screen.

9) Creation and delivery of tickets:

- A digital ticket is generated with the details of the trip.
- The ticket is sent to the user's mobile number.
- The system returns to the waiting state and waits for the next user to repeat the operation.

B. Discussion:

1) User initiation and scanning of RFID card:

- We discussed the importance of using RFID cards for user identification and how the system starts.
- We considered the benefits of RFID technology in terms of fast and efficient user identification.

2) User identification and information retrieval:

- We learned the importance of retrieving user information such as names and contact details for a personalized user experience.
- We discussed possible security measures to protect user data during the identification process.

3) Target selection:

- We considered designing the UI to display targeting options on a 20x4 LCD screen.
- We discussed the role of the keyboard in allowing users to interact and select the desired destination.

4) Generation and display of QR codes:

- We discussed how the system dynamically generates a payment QR code based on the selected destination.

- We discussed the benefits of using a 3.5 TFT screen to present the QR code to users.

5) QR Code Scanning and Text-to-Speech Guide:

- We Analyzed user experience during QR code scanning process with 3.5 TFT screens.
- We discovered the benefits of integrating text-to-speech guidance using an MP3 module and improve user accessibility.

6) Payment processing and response:

- The system wait time for a successful payment response from the sim8001 module.
- We discussed the importance of ensuring safe and reliable payment processing.

7) Confirmation display and ticket creation:

- We discovered the function of the 20x4 LCD display by showing a confirmation message upon successful payment.
- We discussed the ticketing process and its importance in providing users with a record of their transaction.

8) Mobile ticket delivery and queuing system:

- We discussed the method used to send the generated ticket to the user's mobile number.
- Explore system efficiency by returning to standby state and ready for the next user.

V. CONCLUSION

The smart public transport ticketing system powered by an Arduino Mega at its core, featuring RFID, 4x3 keyboard, 20x4 LCD display, 3.5" ILI9486 TFT display, SIM800L, and RTC and has an MP3 module. With a compatible speaker, it sets new standards and optimizes the ticketing process. Users begin the process by scanning their RFID cards, which prompts the system to retrieve personal information. The 20x4 LCD screen guides users in selecting their destination and leads to the generation of a personalized payment QR code on the 3.5-inch TFT screen. After scanning the QR code, the system waits for a successful payment response from the SIM800L module and displays the successful transaction on the 20x4 LCD screen. The RTC module provides accurate ticket information in real time and is sent electronically to the user's mobile phone via the SIM800L card. Connecting an MP3 module to a compatible speaker enables text-to-speech guidance, improving the user experience. Overall, this integrated system demonstrates a modernized, user-centered approach to public transit ticketing designed to effectively meet the needs of today's travelers.

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