IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.105109

FARE TRANSFER IN PUBLIC TRANSPORT USING RFID

Mr. Shailendra Singh[1], Ms. Pooja Pathak[2], Yash Kumar Gupta[3], Ankur Kumar Kushwaha[4], Avinash Yadav[5], Arpan[6]

Assistant Professor, CSE Department, Inderprastha Engineering College, Ghaziabad, India[1]

Assistant Professor, ECE Department, Inderprastha Engineering College, Ghaziabad, India[2]

CSE Department, Inderprastha Engineering College, Ghaziabad, India[3,4,6]

EN Department, Inderprastha Engineering College, Ghaziabad, India[5]

Abstract: In India, approximately 11 Crore Indians travel by auto rickshaw daily. And one problem while traveling that most of them face is not having change money. Although some autorickshaw drivers have started accepting UPI but still there are many variables that come with UPI such as, the customer needs to have a mobile phone with an active internet connection, for that internet connection he/she needs to have an active recharge and the mobile data provider's network. And even after having all that, a UPI transaction can fail either due to server issues or if the number of transaction limit for UPI has reached. Therefore, there are many things that can go wrong with UPI. Therefore, we decided to make a machine that is currently in use in Metro transport to solve this problem. We will be developing a system for public transport that digitally accepts payment from the customer using a RFID-enabled card and transfers it to the driver's account. The card machine will be installed on every auto rickshaw/bus and the customer can enter the auto just by tapping the card on the device. This system is already being used in metro transportation across India. The payment process will take less than 2 seconds, much faster than even the market-leading UPI. The cost of the fair will be calculated by the algorithms fed into the machine installed on the bus/auto. With this, the driver, or the customer will not have to worry about keeping change as they can pay money directly from the card, just by tapping. With this, we aim to make traveling by auto or bus more convenient, and as simple as traveling through the metro.

Keywords - RFID (Radio Frequency Identification), Payment Gateway, Fare Calculation Algorithm, Payment Processing, Automatic fare collection System, Transit Ticketing, Payment Security, Driver's Account, Tap-to-pay Technology.INTRODUCTION

In India, approximately 11 Crore Indians travel by auto rickshaw daily. And one problem while traveling that most of them face is not having change money.

Although some auto rickshaw drivers have started accepting UPI but still there are many variables that come with UPI such as, the customer needs to have a mobile phone with an active internet connection, for that internet connection he/she needs to have an active recharge and the mobile data provider's network.

And even after having all that, a UPI transaction can fail either due to server issues or if the number of transaction limits for UPI has reached. Therefore, there are many things that can go wrong with UPI.

Therefore, we decided to make a machine that is currently in use in Metro transport to solve this problem Since the majority of people travel through public transport, this project will help them to travel with the same convenience that they have while traveling through metro transportation. The project will also help digitize the economy by minimizing the use of cash in public transport and encouraging cashless money transfer.

By implementing this system, we aim to make public transport more convenient, safer, and cashless, which aligns with the Government of India's vision to digitize the economy. This research paper intends to discuss the technical aspects of the proposed system and its potential impact on public transport in India.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.105109

LITERATURE REVIEW

A lot of research has been done in the field of the development of seamless payment transfer in public transport through NFC technology

In 2019, M A Masyuk, et al. [1] The work describes and classifies some currently known vulnerabilities of the corresponding protocols and devices that implement them, and considers cryptanalysis tools and software. The result of the work is an assessment of the risk of using certain specific NFC devices.

In 2010, Izabela Lacmanović, et al. [2] This paper describes the advantages of using RF technology by the other cards like master, visa cards.

In 2021, Anuja Varshney, et al. [3] in which RFID-enabled SIM can be used for different applications. This mode of payment provides freedom, flexibility, mobility, and security to the customer.

In 2018, the development of an electronic transit payment system using RFID smart cards and card readers has the potential to revolutionize the transportation industry in Nigeria. This innovative solution can improve operational efficiency, reduce costs, and enhance customer service. By implementing this system, Nigerian transit companies, including Covenant Universities, can stay competitive in the market and provide better services to their customers. The adoption of this technology is a step towards a more sustainable, efficient, and effective public transportation system in Nigeria.

In 2009, M. G. Gnoni, A. Rollo; P. Tundoin in [5], RFID technology has potential in mobility of persons and goods. The Integrated Mobility System (IMS) improves ticketing and identification in public transport networks for enhanced efficiency, accuracy, and passenger experience. Continued research is vital.

In 2018, Ampah, Leon, et al. [6] this project has successfully developed a cashless payment solution for transportation in Ghana, filling a critical gap in the country's cashless payment system. By employing modern technologies such as NFC, QR codes, and smartphones, a mobile application and a web-based application were created. The mobile app enables public transport commuters to pay their fares in a cashless manner using QR codes and NFC, while vehicle owners can monitor transactions made by their vehicles. The web-based app enables system status administrators to monitor the system and transport credit retailers to sell transport credits. This solution will undoubtedly be a valuable asset to the average Ghanaian, enhancing their daily lives and contributing to the growth of the country's cashless economy.

In 2014, Tor-Morten Grønli, Pardis Pourghomi, Gheorghita Ghinea., et al. [7] the Web of Things (WoT) ecosystem has given rise to innovative models of interaction for applications, including contactless interaction between devices. Near Field Communication (NFC) technology is one of the key enablers of contactless interactions, and this paper proposes a new lightweight architecture for the WoT based on RESTful approaches.

METHODOLOGY

The project is based on NFC Technology through which the fare deduction based on initial and final position of the passenger from his account and transfer to the driver account using RFID

The project is implemented in Django using python language.

- Django is used for the Admin portal through which Administrator all the things will be managed.
- An android application which will be available as two modes one as driver mode and another one is customer.
- A SQL Database will be used to store the data of drivers and customers for the further processing.
- A rest API will be used to make a concurrent system which will synchronize the all systems.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.105109

- We have RFID cards through which the customer taps on the machine which is installed on the auto rickshaw. When user taps on it. The transaction will be done.

RFID Scanner Machine

An RFID scanner machine is a device used to read information stored in RFID tags. It consists of a reader, antenna, and transmitter that emit and receive radio signals to and from the tags. RFID scanner machines can read tags without direct line-of-sight access and can read multiple tags simultaneously, making them ideal for inventory management applications. They come in various sizes and configurations, including handheld and industrial machines, and are used in different industries, such as healthcare. Overall, RFID scanner machines provide real-time visibility into the location and status of assets, helping businesses make informed decisions, reduce waste, and improve productivity.

Django technology

Django is a high-level web framework that is used for building web applications quickly and efficiently. In the Trippay project, Django is used to build the backend of the payment system. Django is a powerful tool that provides a lot of useful features out of the box, such as the ORM (Object-Relational Mapping) system, which allows developers to interact with databases using Python code.

In the Trippay project, Django is used to handle the payment requests sent by the card machine. When a user taps their RFID-enabled card on the card machine, the card machine sends a payment request to the payment system backend built with Django. Django receives the payment request, calculates the fare based on the algorithms fed into the system, and sends a payment confirmation back to the card machine.

Additionally, Django provides a robust authentication and authorization system, which is used in the Trippay project to ensure that only authorized users can access the payment system backend. Django also has built-in security features, such as protection against CSRF (Cross-Site Request Forgery) attacks, which help to secure the payment system and prevent fraud.

Django also enables the use of RESTful APIs (Application Programming Interfaces) in the Trippay project, which are used to enable communication between the card machine and the payment system backend. The RESTful API architecture allows for efficient data transfer and easy integration with other systems, which is essential for the success of the Trippay project.

Overall, Django is an essential technology in the Trippay project, as it provides a robust backend framework for the payment system, allowing for secure and efficient payment processing.

Database Creation

The Trippay project requires a database to store information about transactions, user accounts, and auto-rickshaw/bus details. We can use a relational database management system like MySQL or PostgreSQL to create and manage the database.

We can define the following tables in our database:

User: This table will store information about the users of the system, including their name, phone number, and email address. Each user will have a unique ID as the primary key.

Card: This table will store information about the RFID-enabled cards issued to the users. Each card will have a unique ID as the primary key, and will be associated with a user ID in the User table.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.105109

Auto: This table will store information about the auto-rickshaws and buses registered with the system, including their license plate number and driver details. Each auto will have a unique ID as the primary key.

Transaction: This table will store information about each transaction made using the system, including the user ID, auto ID, transaction amount, and transaction time. Each transaction will have a unique ID as the primary key.

We can create these tables using SQL commands in the chosen database management system, and define relationships between the tables using foreign keys. We can also create indexes on commonly queried columns to optimize query performance.

Once the database is set up, we can use Django's Object-Relational Mapping (ORM) to interact with the database from the application code. The ORM allows us to define Python classes that map to the database tables, and provides methods for querying and modifying the data. This abstraction layer makes it easy to work with the database without having to write complex SQL queries.

Android Application for Customer Access and Driver access

Trippay is an Android application that is used to facilitate payments for auto-rickshaw rides using Near Field Communication (NFC) technology. The app allows users to link their bank account or credit/debit card and make payments directly from the app.

When a user wants to pay for an auto-rickshaw ride, they simply tap their card/phone on an NFC tag installed in the auto-rickshaw. The app automatically detects the tag and displays the fare amount on the user's phone. The user can then confirm the amount and authorize the payment using their preferred payment method.

Trippay also provides features such as ride history, fare estimates, and driver ratings. The app is designed to make payments quick and hassle-free, eliminating the need for cash transactions and reducing the risk of fraud and theft.

Overall, Trippay is a convenient and secure payment solution for auto-rickshaw rides, using the latest NFC technology to make payments fast and easy.

Integration of Database with RFID Scanner Machine with application

Trippay is a payment application used for auto-rickshaw rides that integrates multiple technologies to provide a seamless payment experience. The application uses a database to store user information, payment details, ride history, and other relevant data.

To enable payments using Trippay, the application is integrated with an RFID scanner and a Nordic Semiconductor microcontroller unit (MCU). The RFID scanner is used to read information from RFID tags installed in auto-rickshaws. When a user taps their phone on an RFID tag, the scanner reads the information and sends it to the Nordic MCU.

The Nordic MCU processes the data received from the RFID scanner and sends it to the Trippay application. The application then verifies the data against the user's account information stored in the database and calculates the fare amount for the ride. The user can then confirm the fare amount and authorize the payment using their preferred payment method.

The integration of the database, RFID scanner, Nordic MCU, and Trippay application ensures that payments are fast, secure, and accurate. The application also provides real-time ride history and fare information, allowing users to track their spending and monitor their usage of the service. Overall, the integration of these technologies provides a robust and reliable payment solution for auto-rickshaw rides.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.105109

Workflow of System

The workflow for the Trippay project involves several steps to enable a seamless payment experience for auto-rickshaw riders. The following is a brief overview of the workflow:

1. User registration: Users download the Trippay app and create an account by providing their personal details, payment information, and other relevant information.

2. Auto-rickshaw registration: Auto-rickshaw drivers register their vehicle and install an RFID tag that is linked to their vehicle and driver details.

3. Ride initiation: When a user wants to take an auto-rickshaw ride, they launch the Trippay app, enter their destination, and confirm their pick-up location.

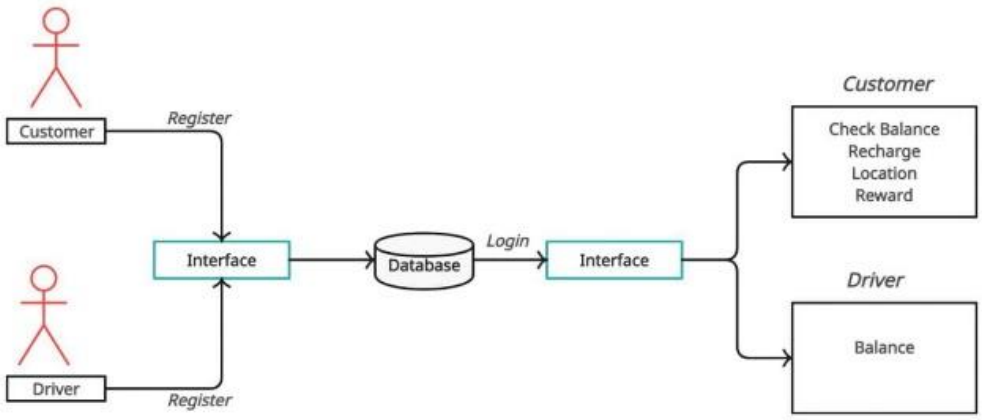
4. RFID tag detection: Once the auto-rickshaw arrives, the user taps their phone on the RFID tag installed in the auto-rickshaw.

5. Data processing: The RFID scanner reads the information from the RFID tag and sends it to the Nordic MCU. The MCU processes the data and sends it to the Trippay app.

6. Fare calculation and payment: The Trippay app calculates the fare based on the distance traveled and the user's payment information stored in the database. The user confirms the fare amount and authorizes the payment using their preferred payment method.

7. Ride completion: Once the payment is processed, the user receives a receipt and the ride is completed.

8. Ride history and feedback: The Trippay app stores ride history and provides users with the option to rate and provide feedback on their experience.



The workflow for the Trippay project is designed to make auto-rickshaw payments fast, easy, and secure. By integrating multiple technologies, including RFID, Nordic MCU, and a database, the Trippay app provides a seamless payment experience for users and drivers alike.

DISCUSSIONS AND RESULT

The Trippay project is an NFC-based payment system designed specifically for auto-rickshaws. The project was created to address the challenges faced by commuters in India who often have to negotiate fares with auto-rickshaw drivers or carry small denominations of cash.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 5, May 2023

DOI: 10.17148/IARJSET.2023.105109

The Trippay system allows passengers to make contactless payments using their smartphones. The system works by integrating an NFC-enabled device into the auto-rickshaw's meter. Once the passenger reaches their destination, they can simply tap their phone on the device to make the payment.

One of the main benefits of the Trippay system is that it eliminates the need for passengers to carry cash, which can be risky and inconvenient. Additionally, the system can help to reduce instances of fare disputes between passengers and drivers, as the fare is automatically calculated based on the distance traveled.

The Trippay project has been met with positive feedback from both commuters and auto-rickshaw drivers. Commuters appreciate the convenience and safety of being able to pay using their smartphones, while drivers benefit from a more efficient and streamlined payment process.

CONCLUSION

Trippay project is a successful implementation of an NFC-based payment system for auto-rickshaws, providing an efficient and secure way for passengers to pay their fares. The project overcame several challenges, including the need to educate both passengers and drivers on how to use the new payment system and the need for a reliable and stable mobile network to support the transactions.

The results of the project have been positive, with a significant increase in the number of passengers using the Trippay system for payment. This has led to improved convenience and security for passengers and a reduction in the amount of cash handling for auto-rickshaw drivers, reducing the risk of theft and the need to carry large sums of money.

Overall, the Trippay project is an excellent example of how technology can be leveraged to solve real-world problems, making everyday transactions more accessible, secure, and convenient for users. It demonstrates the potential of NFC technology in providing efficient and secure payment solutions in a variety of contexts, including public transportation.

REFERENCES

[1] Information security of RFID and NFC technologies To cite this article: M A Masyuk 2019 J.Phys.: Conf.Ser. 1399 033093

[2] Lacmanovic, Izabela Radulovic, Biljana, Lacmanovic, Dejan,2010/05/24 ,SN - 978-1-4244-7763-0 .Contactless payment systems based on RFID technology.

[3] Qadeer, Mohammed & Akhtar, Nadeem & Govil, Shalini & Varshney, Anuja. (2009). A Novel Scheme for Mobile Payment using RFID-enabled Smart SIM card. Future Computer and Communication, International Conference on. 339-343. 10.1109/ICFCC.2009.132.

[4] Fadiya, Samson & Sopuru, Joshua & Odeh, Acheme. (2015). The Future of RFID Technology in Nigeria. 10.13140/RG.2.1.4611. 6324..

[5] Gnoni, Maria & Elia, Valerio. (2012). RFID technology for an intelligent public transport network management. International Journal of RF Technologies Research and Applications. 3. 1-13. 10.3233/RFT-2011-014.

[6] Grønli, Tor-Morten & Pourghomi, Pardis & Ghinea, Gheorghita. (2014). Comsputing Towards NFC payments using a lightweight architecture for the Web of Things. Computing. 97. 10.1007/s00607-014-0397-6.

[7] Fuchs, Florian, et al. "Super-human performance in gran turismo sport using deep reinforcement learning." IEEE Robotics and Automation Letters 6.3 (2021): 4257-4264.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License