Payment System for University

Chinmay Arora[1], Ritvik Gupta[2]

[1]BTech CSE, SRM IST, KTR
Email: *ca7109[at]srmist edu.in*

[2]BTech CSE, SRM IST, KTR
Email: *rg8225[at]srmist edu.in*

Abstract: *A college ID card payment system permits students to use their ID cards to pay for various goods and services on campus. Students can add funds to their card accounts and make payments by swiping or touching their cards at designated payment terminals by integrating a payment gateway with the college's existing identification card system. Implementing a college ID card payment system can result in numerous benefits, including increased convenience, decreased cash handling costs, and enhanced security. However, the system must be meticulously designed and implemented to ensure that it is secure, dependable, and user - friendly for both students and administrators.*

Keywords: Payment System, University, College

1. Introduction

This paper provides an overview of the technical considerations involved in developing a college payment system. It examines the components and data required to construct the system, as well as the database requirements for compliant and secure data storage.

2. Literature Review

Implementation of QR code - based payment systems: QR code - based payment systems are gaining popularity due to their usability and security features. Several universities around the world, including The University of Texas at Austin, Singapore Management University, and The University of Hong Kong, have already implemented such systems.

Benefits of QR code - based payment systems: Compared to conventional payment methods, QR code - based payment systems offer several advantages, including quicker and more convenient transactions, reduced fraud risk, and increased security. These systems can also be incorporated with existing payment infrastructure and can help universities reduce expenses associated with cash and other payment methods management.

Technical considerations for implementing QR code - based payment systems: Implementing a QR code - based payment system requires technical considerations such as integrating a payment portal with the university's existing payment infrastructure, ensuring the security and privacy of user data, and training and supporting users.

Challenges and limitations of QR code - based payment systems: Despite the fact that QR code - based payment systems offer a number of advantages, they face obstacles such as smartphone compatibility issues, potential security flaws, and limited user adoption in some regions.

Integration with ID cards: Integrating the QR code payment system with student identification cards can further facilitate the payment process for students by eliminating the need for them to carry additional payment cards or devices. This can also help universities manage student payment transactions more efficiently and reduce the risk of fraud.

Mobile payment trends: The use of mobile payment systems is expanding rapidly across the globe, and QR code - based payment systems are gaining popularity due to their widespread adoption and simplicity of use. Universities that implement QR code - based payment systems can capitalize on this trend to provide students with a more convenient and secure payment experience.

3. Methodology

Python and the popular Flask web framework were used to write the code for reading student ID cards and processing payments.

This code establishes a Flask endpoint at /pay that accepts a POST request containing the student ID and payment amount. The server then verifies whether the student is present in the student's dataset and, if so, whether the student has sufficient funds to make the payment. The student's balance is updated and a success message is returned if the payment is successful. Otherwise, a message of error is returned.

4. Algorithms

Magnetic Stripe Reader (MSR) Algorithm: This algorithm is used to retrieve information from the magnetic stripe on the rear of a college ID card. The data can include, among other things, the cardholder's name, ID number, and account balance. This data may be employed to authorise a payment transaction.

Near Field Communication (NFC) Algorithm: NFC is a technology that facilitates wireless communication between two devices when they are in close proximity. An NFC chip can be embedded in a college ID card payment project, enabling the cardholder to make payments by tapping the card on a reader.

5. Results

This Python code implements a basic purchasing cart application by utilising the Tkinter GUI library. The application enables the user to add items to a purchasing cart before proceeding to checkout, where a QR code for the payment amount is generated. The payment details are recorded in a payment history, and the item's supply levels are updated accordingly.

The application consists of two frames: a product frame on the left and a shopping cart frame on the right. The item frame displays a list of available objects with their prices and stock quantities. Each product has a "Buy" button that enables the user to add the product to the shopping cart. The cart frame displays the total amount of items in the cart and enables the user to remove items and proceed to the checkout page.

Using the qrcode library, a QR code is generated for the payment amount when the user proceeds to the purchase page. The QR code is then displayed using the PIL library in a new window. The payment information is recorded in a payment history, which includes the total amount, the inventory of items purchased, and the date and time of the payment.

Following the completion of the payment, the stock levels of the items are updated and the purchasing cart is emptied. A messagebox then notifies the user of the successful payment.
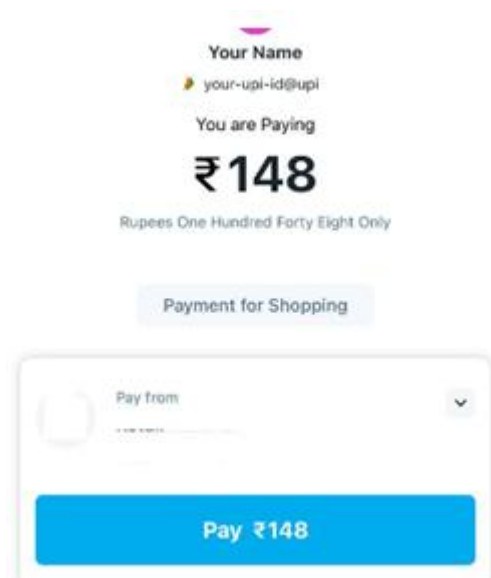
This code illustrates the utilisation of the Tkinter, qrcode, and PIL libraries to implement a rudimentary shopping cart application with payment capabilities.

A list of available items and cart
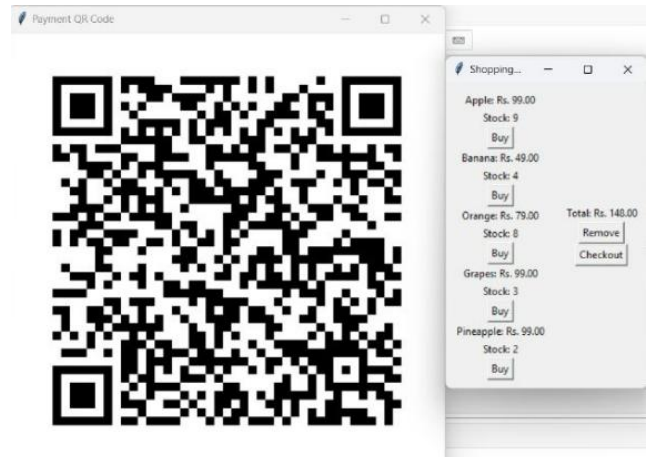
QR code for payment

Payment gateway linked to QR code

6. Scope and Application

- **Employee payments**: A smart card system can be used to pay employees for services, including hourly wages and salaries. This can reduce the need for cheques and cash payments and increase the efficiency of the payment process.
- **Access control**: Smart cards can be used to control access to secure office areas or to restrict access to particular resources or data.
- **Vending machines and cafeterias**: Smart cards can be used to make purchases from vending machines and cafeterias within the office, making it easier for employees and reducing the need for cash transactions.
- **Loyalty programs**: Smart cards can be used to implement loyalty programs that reward employees for their loyalty and encourage office purchases.

7. Innovation idea of the project

Incorporating contactless payment technology into ID cards could be a potential innovation for using ID cards for payments in the workplace. This would enable employees to make payments with their ID cards without actively swiping or inserting the cards into a payment terminal.

Integration of the system with employee benefits or rewards programs could also be a viable innovation concept for ID card payments in the workplace. This would enable employees to accrue points or rewards for using their ID cards to make purchases, which could be redeemed for discounts or other incentives.

Encryption and authentication measures could be implemented to prevent unauthorized access or fraud from occurring with contactless payment technology. In addition, transaction frequency or monetary limits could be imposed to prevent system abuse.

In general, these innovations could improve the efficacy and convenience of ID card payments in offices, making transactions quicker and simpler for employees while assuring security and preventing fraud.

8. Challenges and Limitations in Existing System

Cost: The cost associated with the current ID card system is another shortcoming. Producing and distributing identification cards can be expensive, especially when upgrading or replacing existing cards.

Limited Acceptance: Another difficulty is the limited recognition of payments made with ID cards. Although many merchants and service providers accept payment with an ID card, not all do. This can reduce the utility of ID card payments, especially for those who depend on cashless transactions.

Reliability: Existing payment ID card systems can be unreliable at times. This may be due to technical errors, network outages, or card - specific issues. Such dependability issues can cause inconvenience for users, especially when transactions cannot be completed.

Security: Security is one of the main challenges of the current ID card system for payments. The current system may be insufficient to prevent unauthorized access, hacking, or deception. This can result in financial losses and a breach of sensitive data.

9. Conclusion

In conclusion, the payment system that utilises ID cards and QR codes has the potential to revolutionise college campus payment transactions. The system provides a safe, effective, and user - friendly method of payment for college students and retail vendors. The implementation of the payment system necessitates meticulous planning and cooperation between the college administration and store vendors. The payment system can improve college students' financial management and overall experience.

References

[1] "A Secure Mobile Payment System for University Campus Based on NFC Technology" by Yanqing Zheng, Qing Xu, and Jun Shen (2015)
[2] "A Smart Campus System Based on IoT and Mobile Payments" by Liang Zhang and Yan Li (2017)
[3] "Design and Implementation of Campus Smart Card System Based on Mobile Payment" by Xiaozhou Zhang and Jingang Wang (2018)