VNR Vignana Jyothi Institute of Engineering and Technology
(Affiliated to J.N.T.U, Hyderabad)

Bachupally(v), Hyderabad, Telangana, India.

QR Payments System.

A course based project submitted in complete requirements for the award of the degree of

BACHELORS OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING (AI&ML).

Submitted By:

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Bachupally(v), Hyderabad, Telangana, India.

CERTIFICATE

This is to certify that Mr. K. Santhosh Kumar (20071A6620), Mr. M. Sai Ritish Reddy (20071A6626), Mr. M. Uday Krishna (20071A6627), Mr. M. Harikesh (20071A6629) have completed their course project work at Department of Computer Science & Engineering (AIML & IoT) of VNR VJIET, Hyderabad entitled **"QR PAYMENTS SYSTEM"** in complete fulfilment of the requirements for the award of B. Tech degree during the academic year 2021-2022. This work is carried out under my supervision and has not been submitted to any other University/Institute for award of any degree/diploma.

Dr. Sayeeda Khanum Pathan
Assistant Professor

Department of CSE (AIML & IoT)

VNR VJIET

DECLARATION

This is to certify that our project report titled "**QR PAYMENTS SYSTEM**" submitted to Vallurupalli Nageswara Rao Vignana Jyothi Institute of Engineering and Technology in complete fulfilment of requirement for the award of Bachelor of Technology in Computer Science and Engineering (AI&ML) is a bonafide report to the work carried out by us under the guidance and supervision of Mrs.Sayeeda Khanum Pathan Assistant Professor, Department of Computer Science and Engineering (AIML & IoT), Vallurupalli Nageswara Rao Vignana Jyothi Institute of Engineering and Technology. To the best of our knowledge, this has not been submitted in any form to other university or institution for the award of any degree or diploma.

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ABSTRACT

In an initiation to establish digitalised India one of the vastly used inventions came is online payment systems refferred as Unified Payments Interface (UPI) which created cashless digitalised transactions. Payments through UPI are being done with the usage of internet and one often fails to make payments due to an improper internet connectivity at the places they wish to pay. This could be even more useful if these payment systems work without an internet connectivity i.e.., development of an offline payment system.

The QR Payments system can be considered as a mini offline payment system which is developed to digitalise the transactions made in the canteen of VNR VJIET which works without an internet connectivity. Students often face the problem of internet connectivity in the college because of which they fail to make their UPI payments to the canteen, the QR Payments system resolves this problem as it helps students by not asking any internet connectivity to make payment and payments are done just by scanning a QR code generated which operates the database that contain details of user, stalls, food items and prices.

Students are required to deposit money with the college management, the payments made by the students will be appended in the respective databases designed for college management, student and food stalls.

INDEX

Introduction

This project "**QR Payments System**" is made with the motive of enabling user to make digital payments when he is offline. This project is restricted to the premises of our college canteen area. We are motivated to solve this problem when we faced the problem in making our UPI payments while ordering food in college canteen. Due to lack in internet services making a UPI payment is very hard.

The survival of this project is with few assumptions like:

- The college maintains student account where user deposit his pocket money.
- The food stall owners were provided with internet connectivity (Wi-Fi) by the college.
- Student has an all time updated QR Generation app on his device to make payments successful.

This project has two distinct products and their implementation. The first product is a **QR Generator** used by students. The second product is a **QR Scanner** used by food sellers.

How students use QR Generator?

Students use the QR Generator app (as of now is a hosted web application) to generate QR codes. This QR codes represent the user's food orders. User while having the internet connectivity gets himself logged in to this application. And even when he is offline user can generate QR codes. This stores data regarding food stalls, food items and it’s prices. User can select his food quantity and enter pin while generating the QR code. This pin will be encrypted before encoded in the QR code. Thus user can make his food order as a QR code. Username (his roll no) is included in the QR code as he is logged into the app. This is made with the intention to replace any order taking touch panels to decrease equipment cost.

How sellers use QR Scanner?

The food sellers will have the QR Scanners installed at their desk. This helps in taking the student food orders. This QR Scanner will decode the QR code and understand the user food order and extract the user credentials and validate the user. After validating the user, the system validates the QR code based on it’s time of generation and try to re-use status. Upon successful validation of QR code on checking for sufficient funds in user account transaction will be completed.

Literature

At this section we understand the development segments of QR code, QR code generator and QR scanner in deep. And the modules which were used in developing the different features of this project are as follows:

- **QR code:**
  - pyqrcode (python module to generate a QR code).
- **QR Generator Application:**
  - **Front-End:**
    - HTML5.
    - Bootstrap.
    - CSS.
    - JavaScript.
  - **Server-APIs:**
    - Flask.
- **QR Scanner Interface:**
  - pyzbar (a python module to scan QR codes).
  - opencv-python.
- **Database & application connectivity:**
  - MySQL (a R-DBMS).
  - Python-sql-connector (to connect to database).

- **pyqrcode:**

    1. This is a python module which is used to make QR codes.
    2. It provides decent inbuilt functions to encode data inside a QR code.
    3. The create function of this module creates a QR code by encoding the given data.
    4. And the generated QR code is obtained as a png image with desired name.

- **HTML5:**

    1. HTML5 is a markup language which is used to create the content that can be rendered as web pages.
    2. All the required web pages for the QR Generator were built using the HTML5 markup language.

- **Bootstrap:**

    1. Bootstrap is a framework which provides a vast area of builtin styles.
    2. It is useful in developing dynamic styles easily.
    3. It helps by providing many useful pre-designed styles.

- **Cascading style sheets:**

    1. Cascading style sheets is a styling language which is used to add styles to the content created by HTML.
    2. It makes the web content user attractive.
    3. It is used to make custom styles apart of those provided by bootstrap.

- **JavaScript:**

    1. JavaScript is the only programming language used at the user side.
    2. It is used in developing dynamic nature to the web content.
    2. It is used in performing DOM (Document Object Manipulation).

- **Flask:**

    1. Flask is a python micro framework which is used to create server APIs in python.
    2. Using flask we can perform serving of web pages based on user request.
    3. By using flask Jinja templating data is dynamically rendered onto web pages.
    4. This helps in making an integration between the python code and web pages.

- **pyzbar:**

    1. pyzbar is a python module used in reading the QR codes and barcodes.
    2. It is built on top of the zbar module.
    3. zbar module is developed in c++ but pyzbar is built on top of the zbar to support python.

- **opencv-python:**

    1. opencv-python is a python module which helps in performing the operations between python code and system camera.
    2. To scan the QR code we use system camera using opencv-python module.

- **MySQL:**

    1. SQL has high performance.
    2. Light and fast comparatively with other Databases.
    3. Open Source.
    4. On-Demand Scalability.

- p**ython-sql-connector:**

    1. This is a python module used for making the python code communicate with the database built on SQL.
    2. This is useful for storing the data got from web page into the database and fetching data that to be rendered onto the web page.
    3. It helps in writing the SQL queries for all database related operations with in python.

Requirements

Functional Requirements:

1. Login.
2. Food stall data.
3. Pin encryption.
4. Single time usage of a QR code.
5. QR must be valid for limited time.
6. Download QR code.
7. Validate User.
8. Check for sufficient funds from user.
9. Complete transaction only if all database transactions are done without fail.
10. Generate Bill.

Non-Functional Requirements:

1. Usability:

1. we get the response within seconds.

2. The software must have a simple, user friendly interface so
customers can save time and confusion.

2. **Reliability:**

    1. The system is more reliable because of the qualities that are inherited from the chosen platform python. The code built by using python is more reliable.

3. **Supportability:**

    1. The system is designed to be the cross platform supportable. The system is supported on a wide range of hardware and any software platform which is having python interpreter built into the system.

4. **Implementation:**

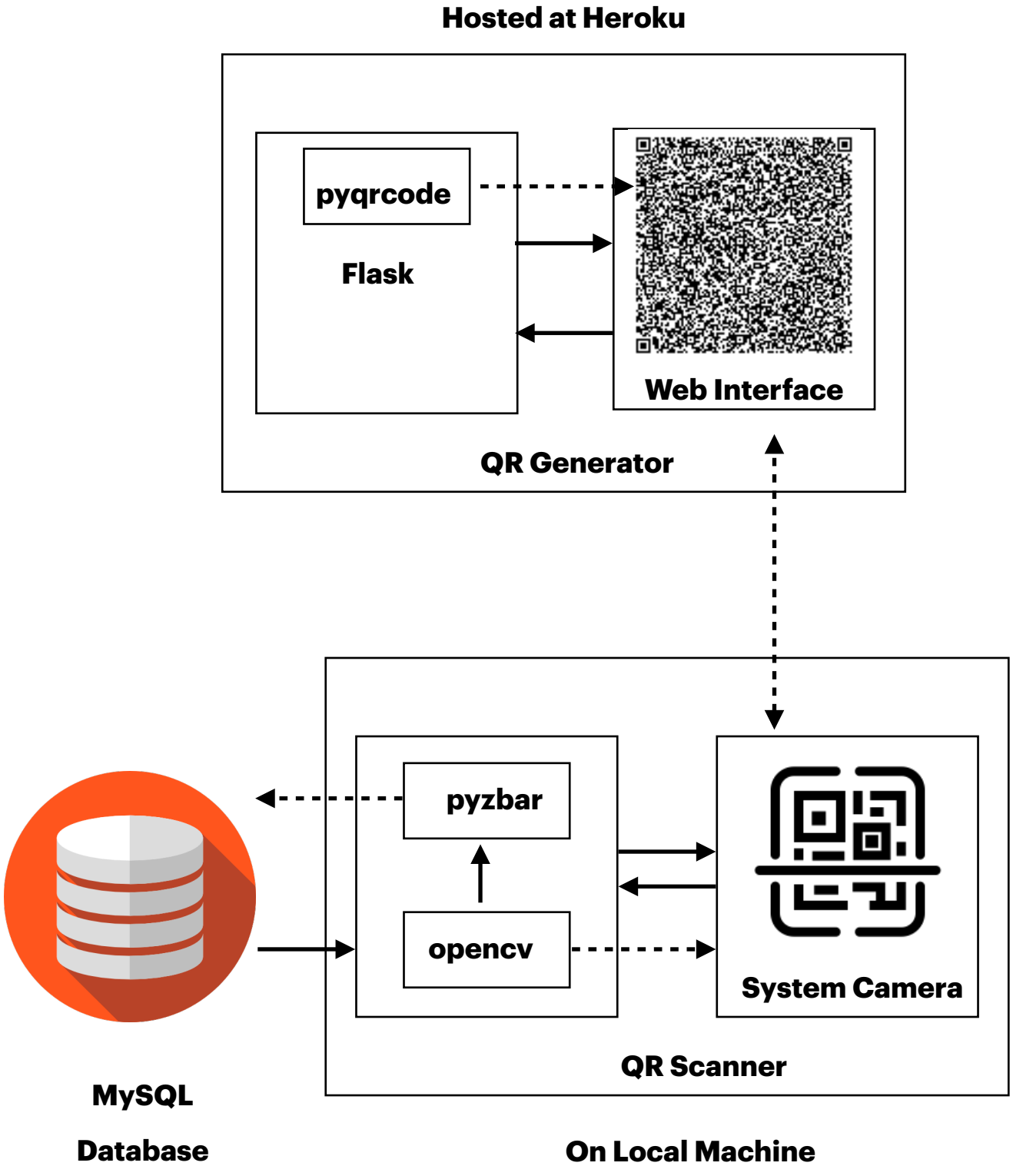
    1. The system is implemented in a cloud based hosting service called heroku.

5. **Interface:**

    1. The user interfaces are the web pages which are developed using the HTML and other styling frameworks.
    2. The interface design is aimed at a flexible front-end communication to provide the user with clear information in navigating a user-friendly interface is planned.

Architecture

Representation of Control-Flow:



Modules

Modules of QR Generation Section:

This section has four modules:

1. View Stalls.
2. Order Food.
3. Enter pin.
4. View QR code.

1. View Stalls:

1. This section allows the use to see all the stalls available to order food.
2. User can select any of the stalls and view the food available in that stall through order food module.

2. Order Food:

1. This section provides the details of food available at a stall and their base price.
2. This section allows user to order food by modifying the quantity of food item user wants to order.
3. This section also displays a sub-total (per each selected food item) and grand total (for all selected items) as a bill.

3. **Enter Pin:**
    1. This section allows user to enter his 6-digit security pin.
    2. This pin is encrypted before encoded as QR code.
4. **View QR code:**
    1. This section displays the QR code generated with the data:
        1. Username.
        2. Encrypted pin.
        3. Foodstall name.
        4. Food ordered.
        5. Food prices.
        6. QR generation day & time.
    2. This also provides the feature to download the generated QR code.

Modules of QR Scanner Section:

This section has four modules:

1. QR code validation.
2. User validation.
3. Fund validation.
4. Complete Transaction.

1. **QR code validation:**
    1. QR code validation is done based on 2 criteria:
        1. Single time usage.
        2. Generation time.
    2. Every QR code on successful usage appended in QR records table, which helps in identifying it when user tries to use the same QR twice.
    3. Every QR code has a time of generation in it, and from time of generation it is valid only for 15 minutes.
2. **User validation:**
    1. User is validated by looking for username in users details table.
    2. On finding a matching username password is decrypted and matched with password that is in database.
3. **Fund validation:**
    1. By comparing the food prices in the QR and prices in the data base for selected food items we generate the bill.
    2. Upon generating the bill we look for sufficient amount of funds in the user's account.

4. Complete Transaction:

1. Upon successful completion of all the above procedures we deduct the bill amount from user's account and credit in that stall account for that day.
2. Then we append this food order details in that respective stall orders table for future reference.
3. Then we append QR information in QR Records table to prevent multiple usage of same QR code.
4. All the transactions are committed only if all are completed successfully. Otherwise, we rollback and display corresponding problem.
5. On committing the transactions we display bill complete transaction.

Implementation

This project has two different products to be implemented. The QR Generator is hosted at heroku cloud hosting services and can be accessed using the link generated. The flask server APIs are the control flows between different request url generated by the user.

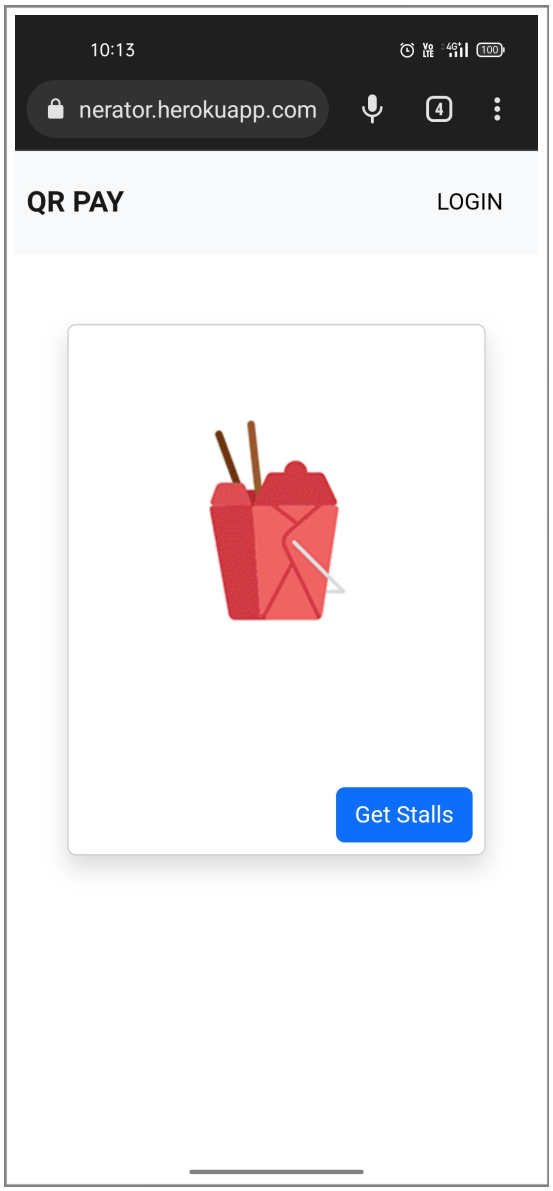
While the QR Scanner is executed on a remote laptop as we chose to use a Relational Database Management System like MySQL we had it locally to perform database operations.

The below are the rendered web pages of QR Generator:

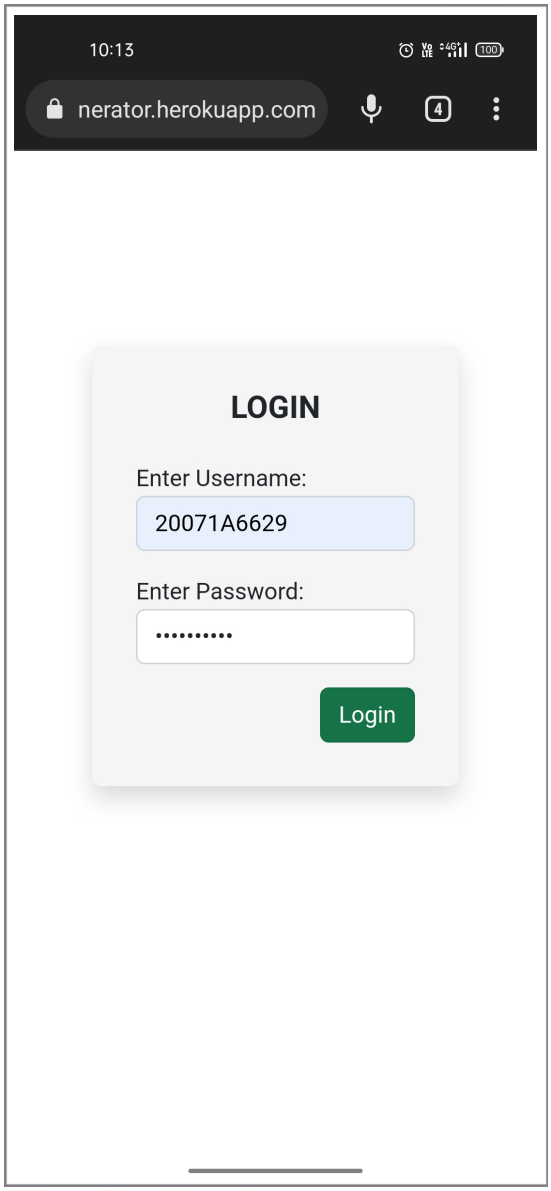
Hosted link: https://qrps-qr-generator.herokuapp.com/

The QR Generator App:

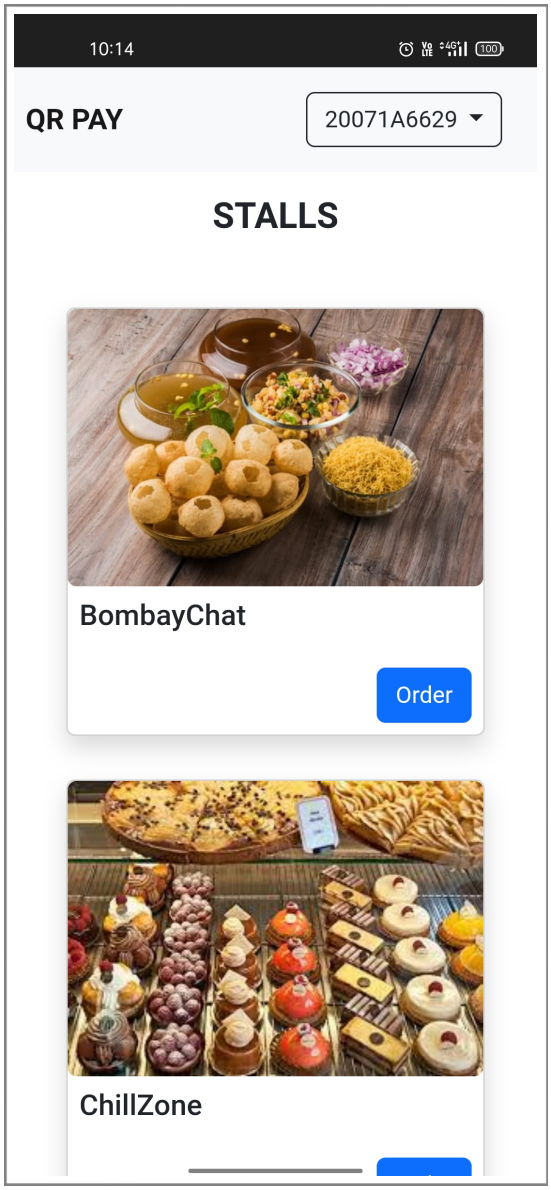
Home page:

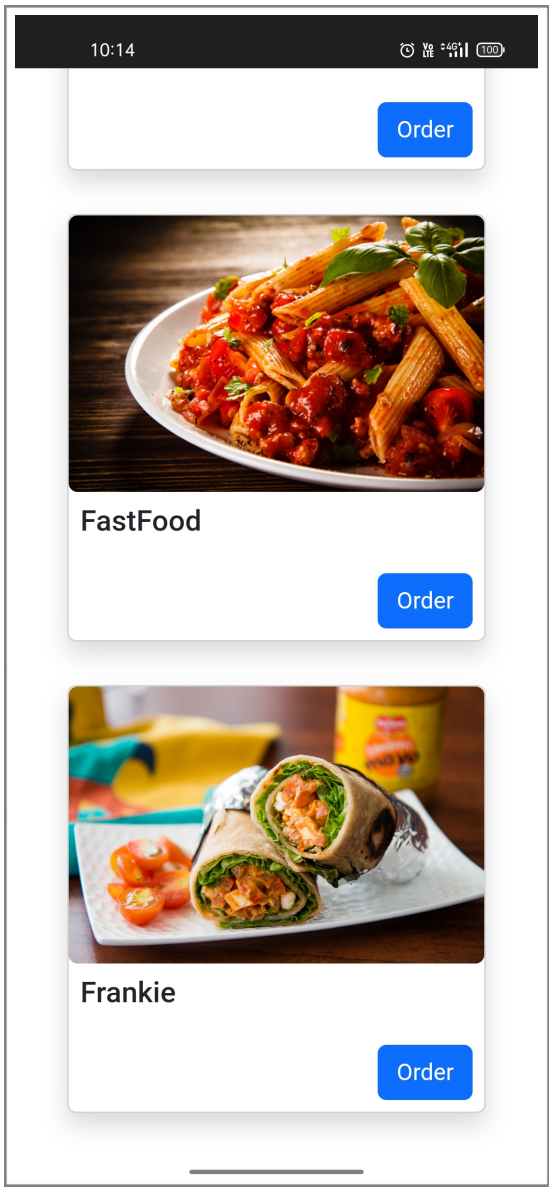


Login Page:

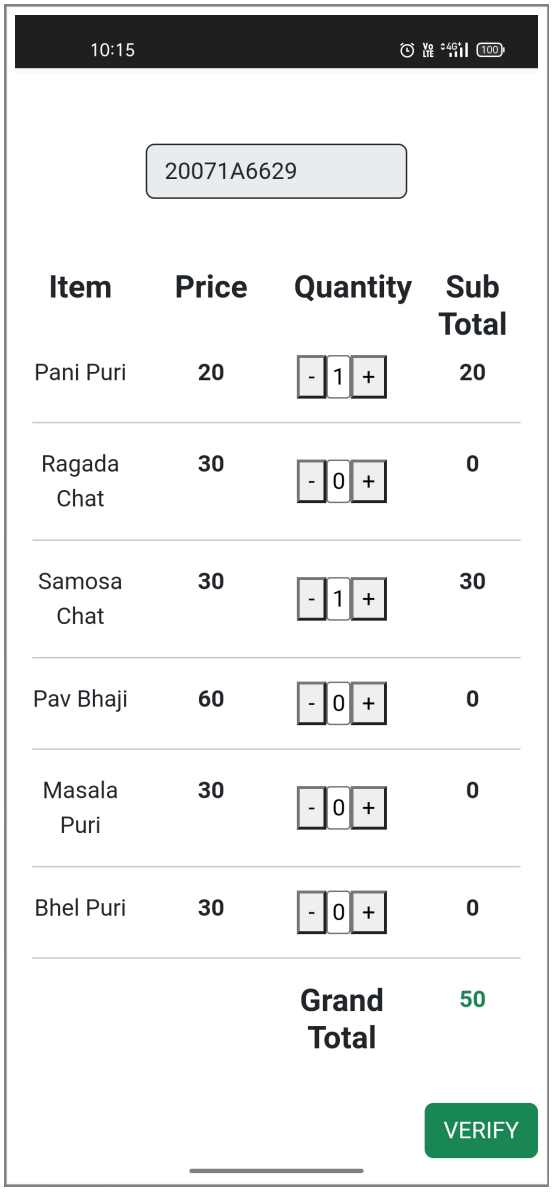

10:13
nerator.herokuapp.com
LOGIN
Enter Username:
20071A6629
Enter Password:
Login

Stalls Page:

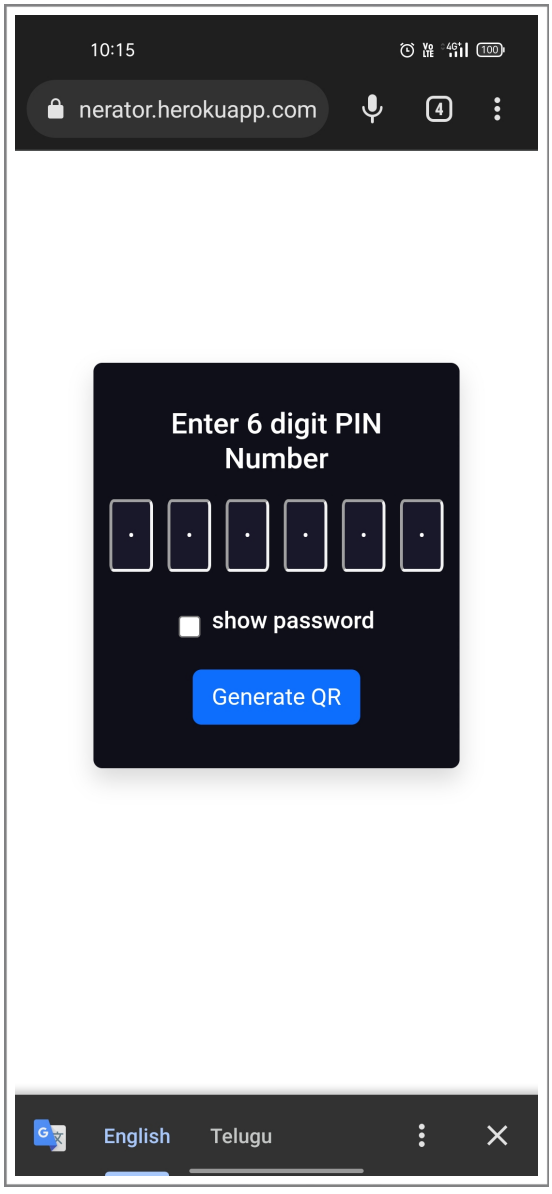



10:14
Order
FastFood
Order
Frankie
Order

Order Food Page:



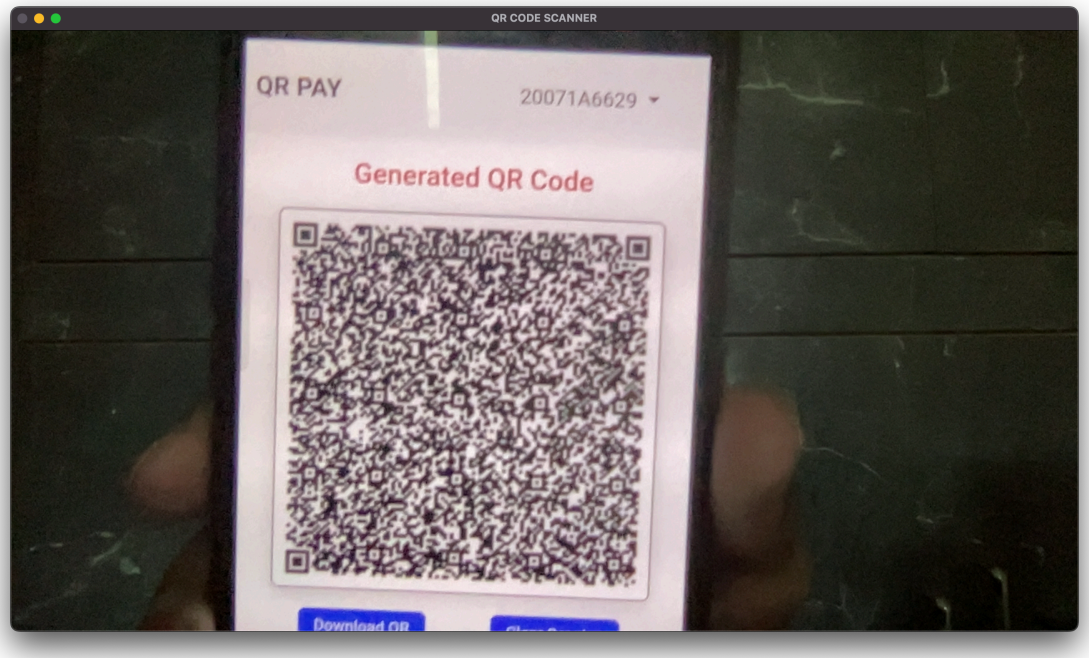
Enter Pin Page:



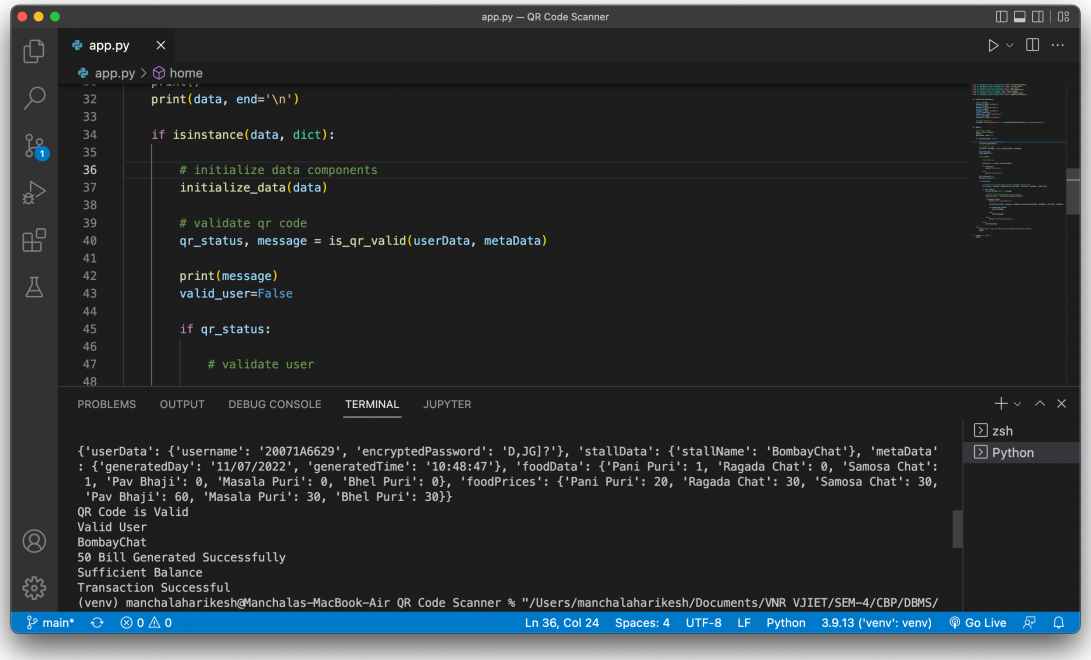
QR Display Page:

The QR Scanner Module:

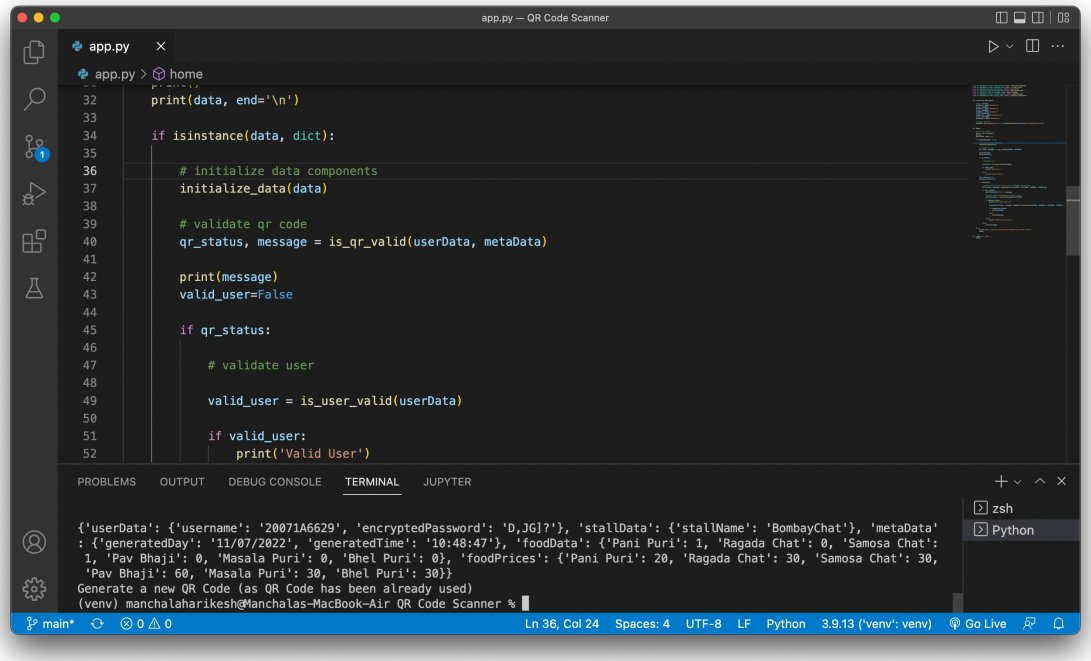
QR Scanner:



QR Scanner Result (scanning QR for first time):

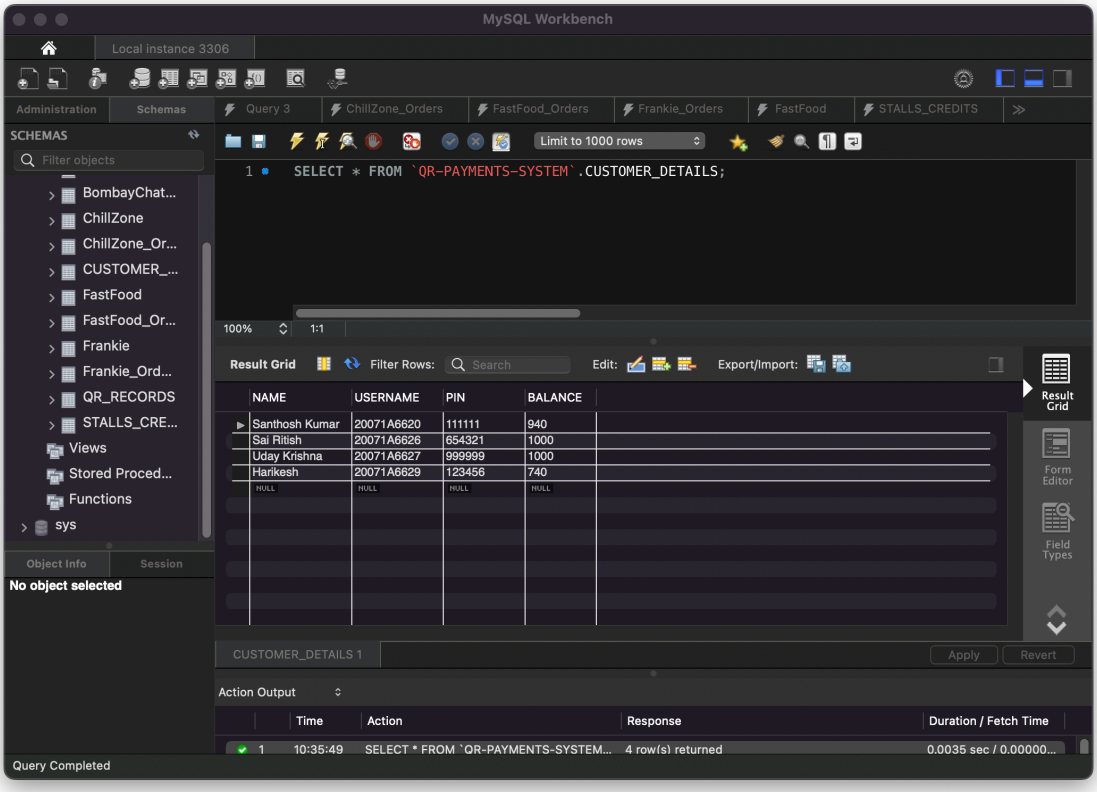


QR Scanner Result (scanning QR for second time):



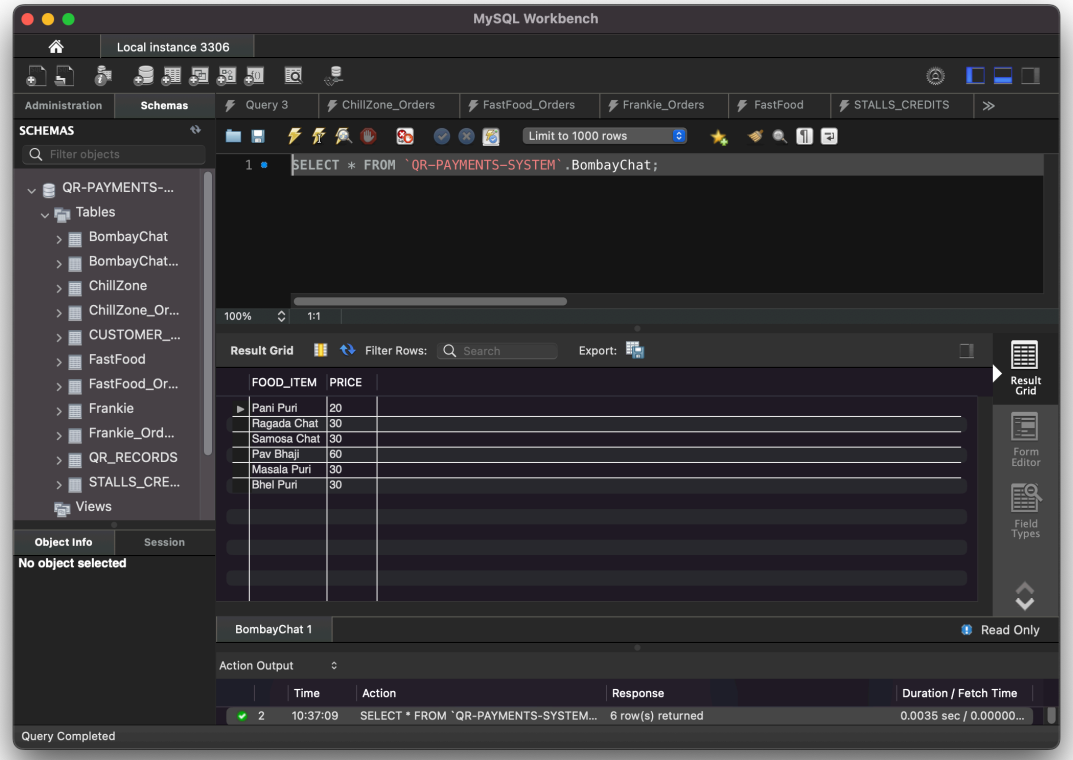
Database Schemas:

Customer Details Table:

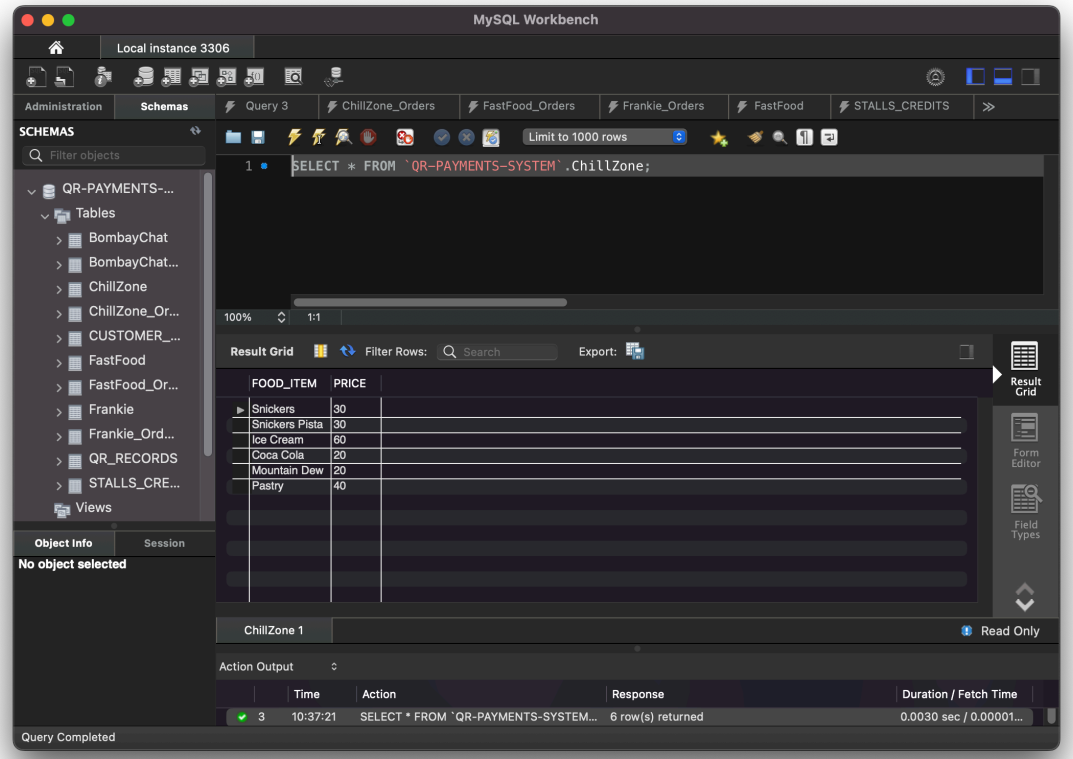


Food Stalls Tables:

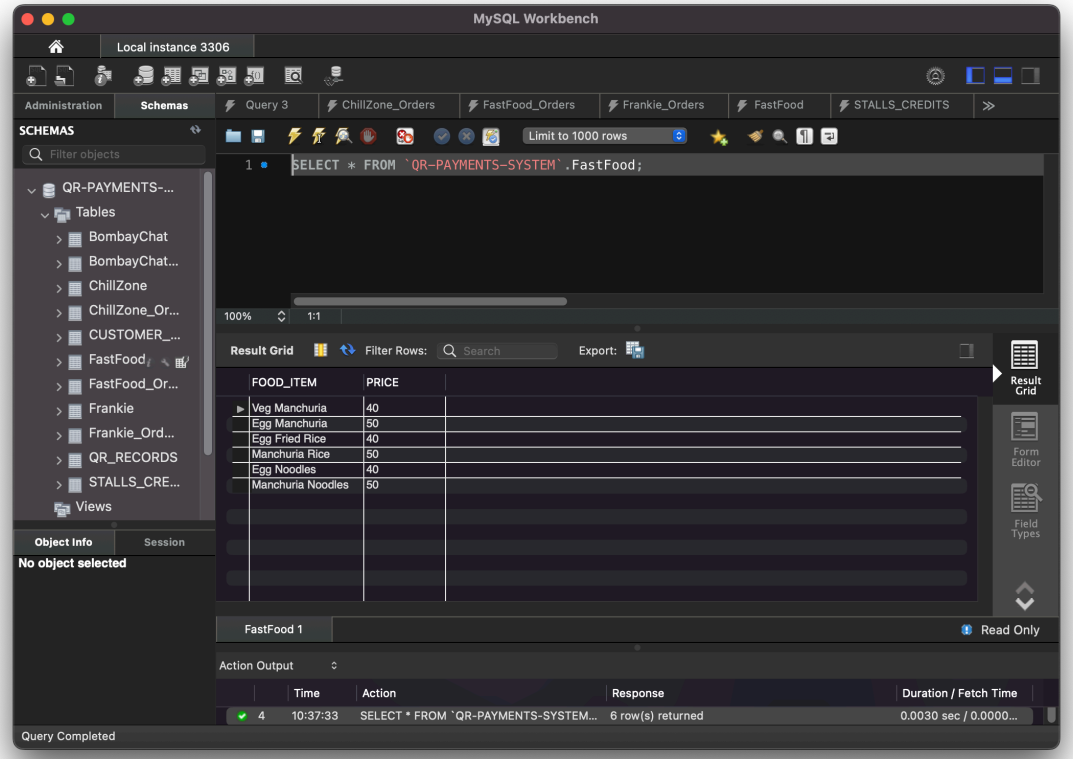
Bombay Chat:



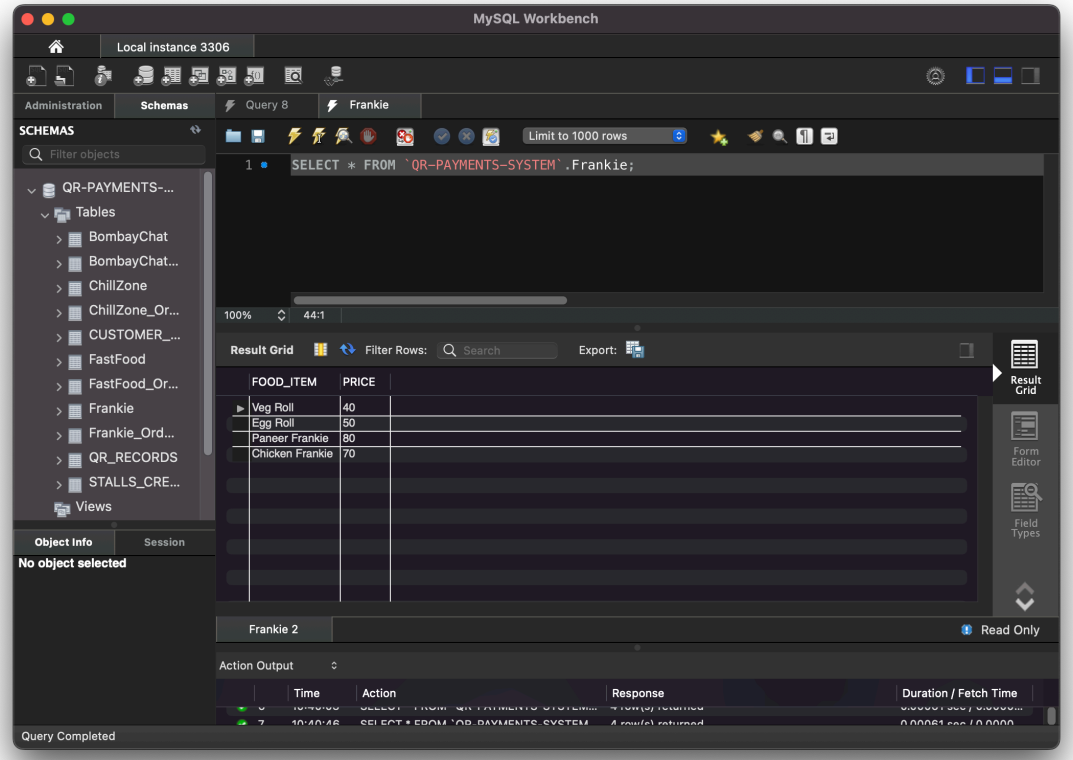
ChillZone:



Fast Food:

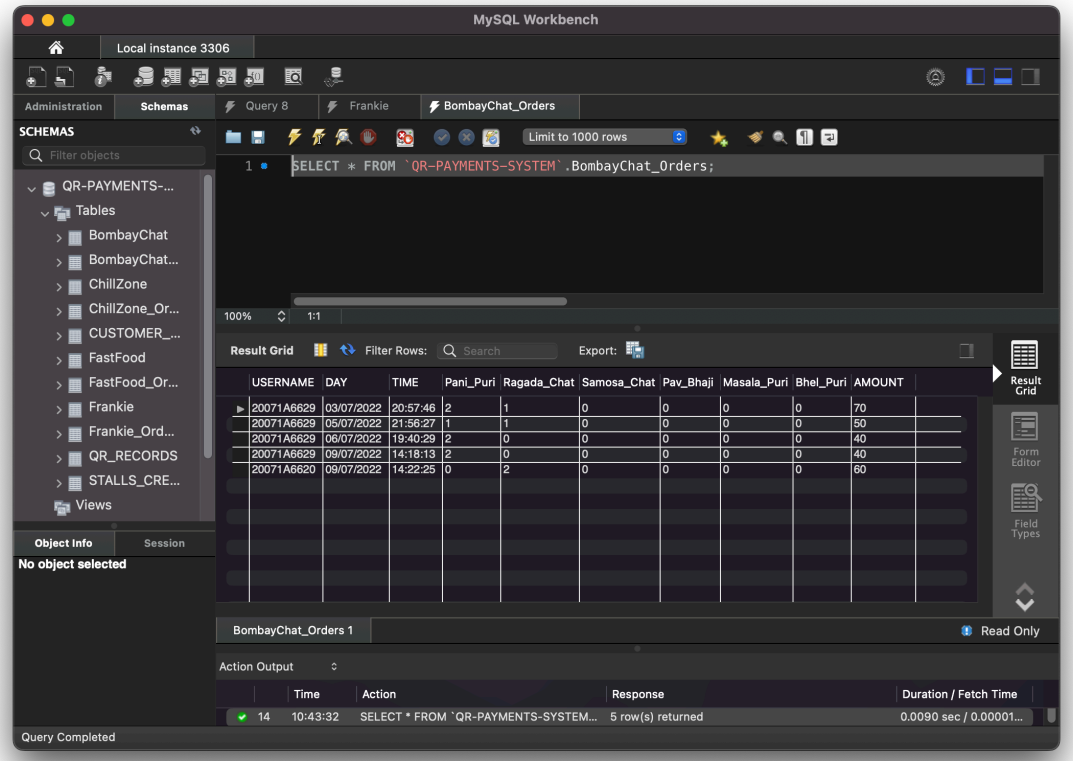


Frankie:



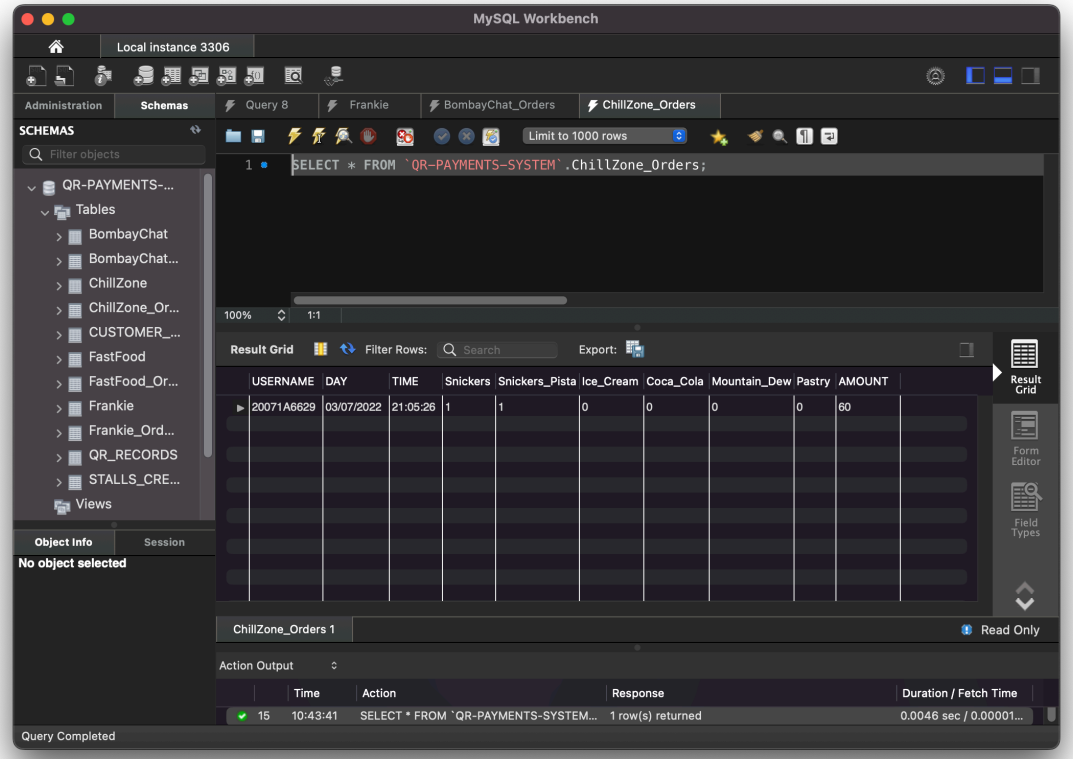
Bombay Chat Orders Table:

This table stores the details of order details of the Bombay chat food stall.



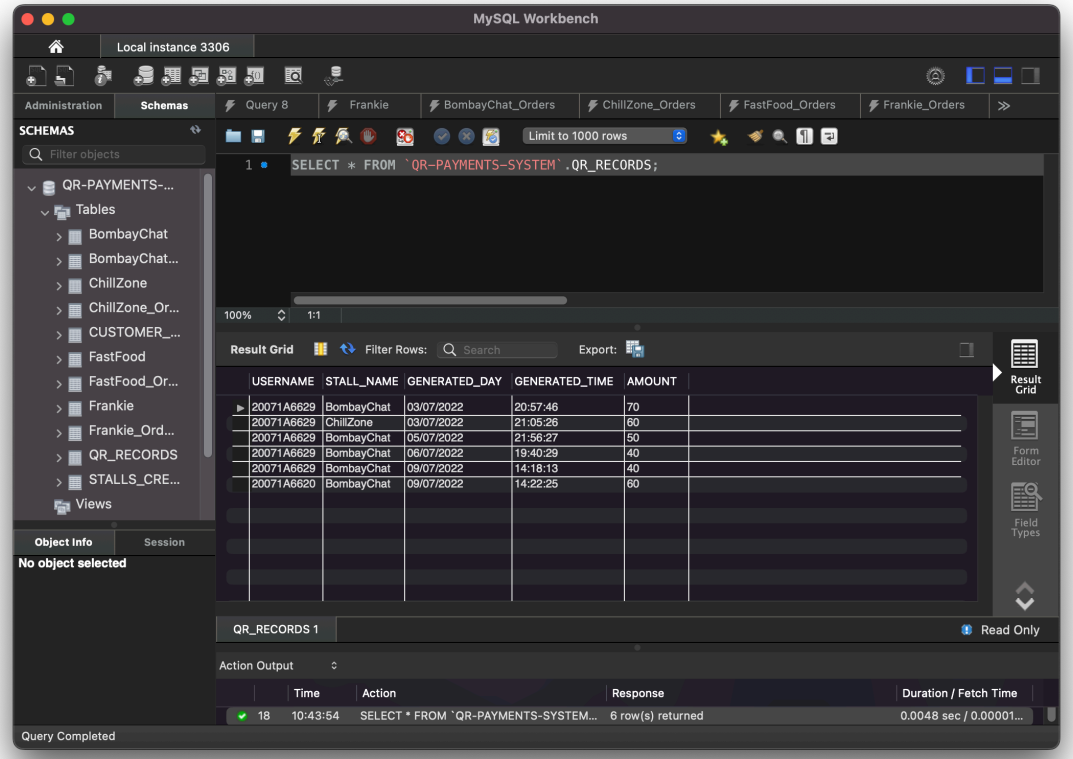
ChillZone Orders Table:

This table stores the details of order details of the ChillZone Food stall.



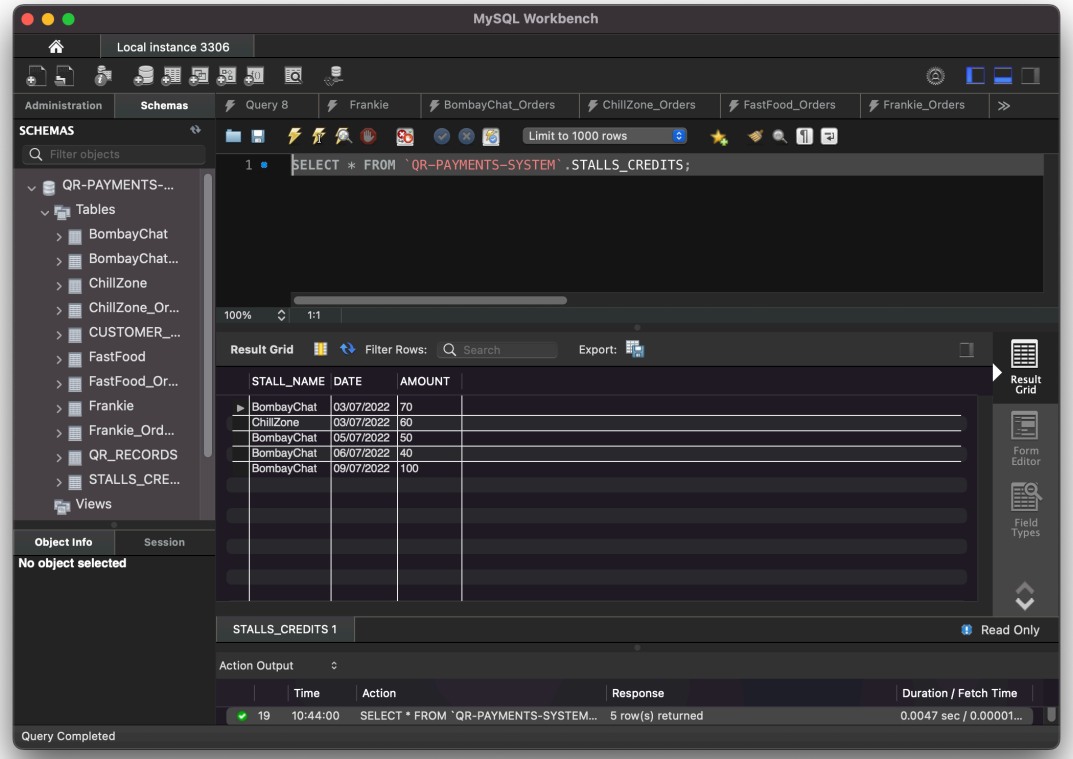
QR Records Table:

This table stores the records of all valid QR codes.

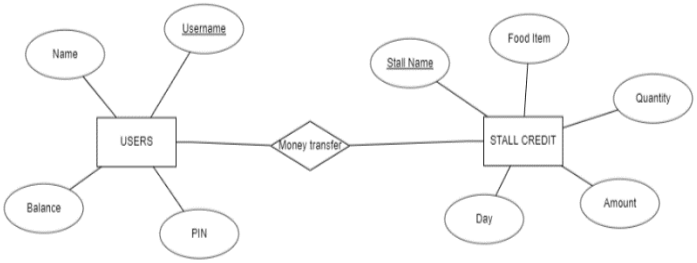


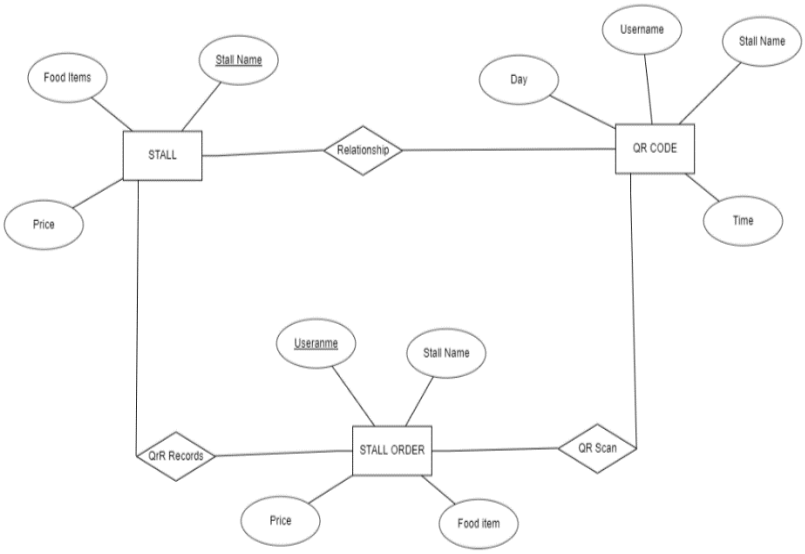
Stall Credits Table:

This table stores the amount credited by student food orders with respective to each day for a particular food stall.



ER Diagrams


Username
Name
Food Item
Stall Name
Quantity
USERS
Money transfer
STALL CREDIT
Balance
PIN
Day
Amount


Username
Stall Name
Food Items
Stall Name
Day
STALL
Relationship
QR CODE
Price
Time
Useranme
Stall Name
QrR Records
STALL ORDER
QR Scan
Price
Food item

Conclusion

With the working of this QR Payments system we can conclude that this idea can be developed and implemented to carry out any type of transactions within the college or the present UPI payments can be made to work with this similar mechanism, a UPI system that works without an internet connectivity can be developed.

As of now, this QR Payments system is a hosted web application and can be deployed into a mobile application.

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1. https://flask.palletsprojects.com/en/2.1.x/quickstart/
2. https://www.w3schools.com/python/python_mysql_getstarted.asp
3. https://www.geeksforgeeks.org/python-generate-qr-code-using-pyqrcode-module/
4. https://learnopencv.com/barcode-and-qr-code-scanner-using-zbar-and-opencv/