DBS Project 1 Report

Objective

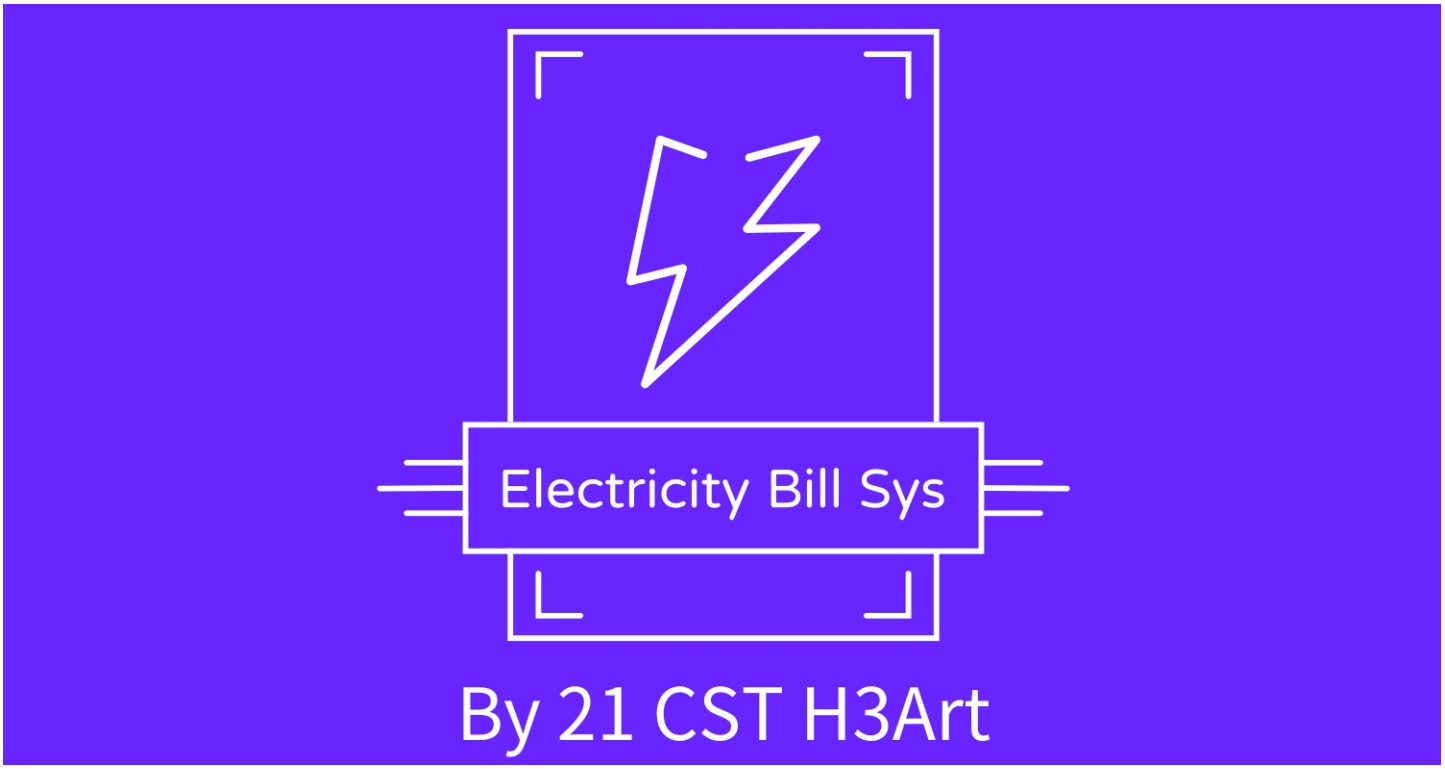
1. Write a Java program to connect, access and update a real DB with JDBC. It should operate both on data and meta-data, work as a simple management tool for DBAs, accept SQL statements and show the results in proper text format.
2. Write a simple project report to describe the file structure of the program and a simple usage guide with snapshots to demonstrate the main functions.
3. Compress all source code and the project report in pdf to a zip/rar file (named “CST_DBS_P1_YourName”) and send it to the course email: 1024455890@qq.com before 22pm, Nov. 21.

JDBC Introduction

The JDBC API is a Java-based framework that enables the interaction with various types of tabular data, particularly those found in relational databases. This API facilitates three primary programming tasks in Java applications. It encompasses four key components: the JDBC API itself, which allows Java programs to interact with relational data; the JDBC Driver Manager, which establishes connections between Java applications and JDBC drivers; the JDBC Test Suite, which assists in verifying the compatibility of JDBC drivers with specific programs; and the JDBC-ODBC Bridge, which provides JDBC connectivity through ODBC drivers. Utilizing JDBC in programming involves several steps: connecting to a data source such as a database, sending queries and update statements, and then retrieving and processing the database's responses to these queries.

Project Introduction

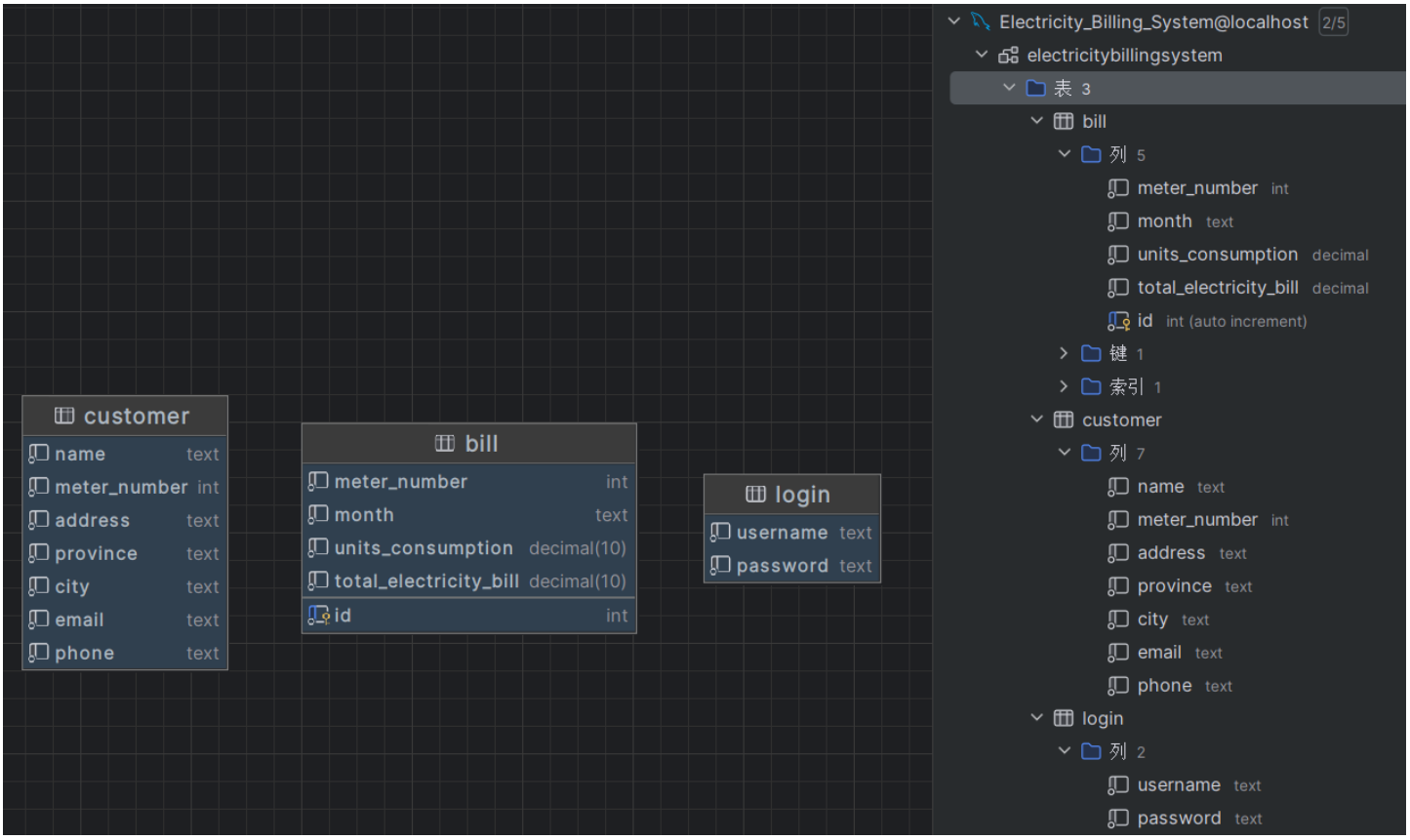
This Java project is a modern transformation of the classic electricity billing system. The project is developed using JavaFX and JDBC packages. It can operate on electricity billing data. The goal is to automate the entire process to make it seamless, convenient and effective. At the same time, the software can calculate the bill amount based on the electricity consumed in a month.



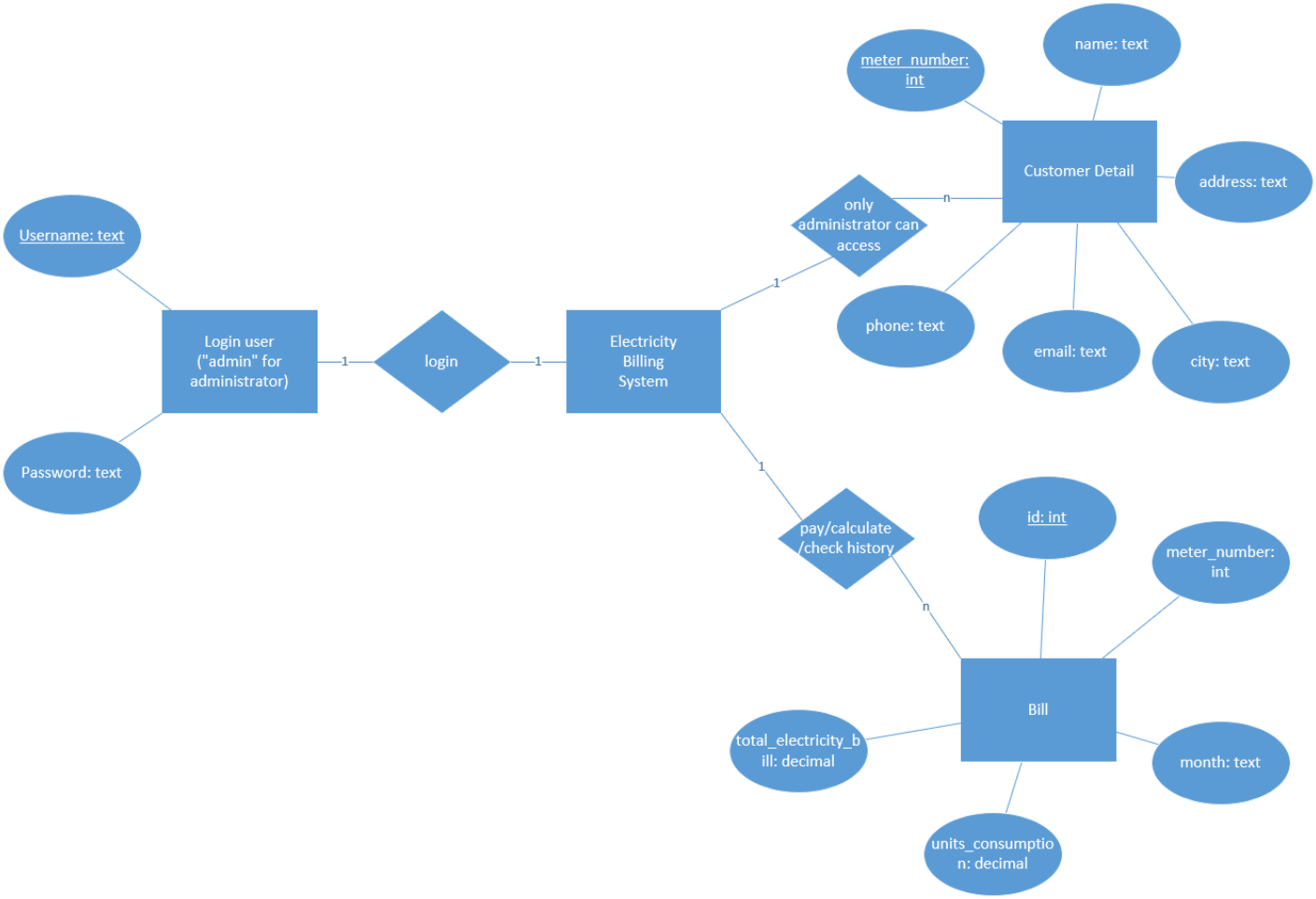
The application has the following features:

- The database can store login information for different users, and the login information can be used to encrypt the login process
- The program can calculate the user's billing information and print the billing data for the corresponding month
- User's billing information and address information can be recorded in the application and interact with it using the database

Table contents for this project:



Corresponding E-R diagram:



Project Development Environment

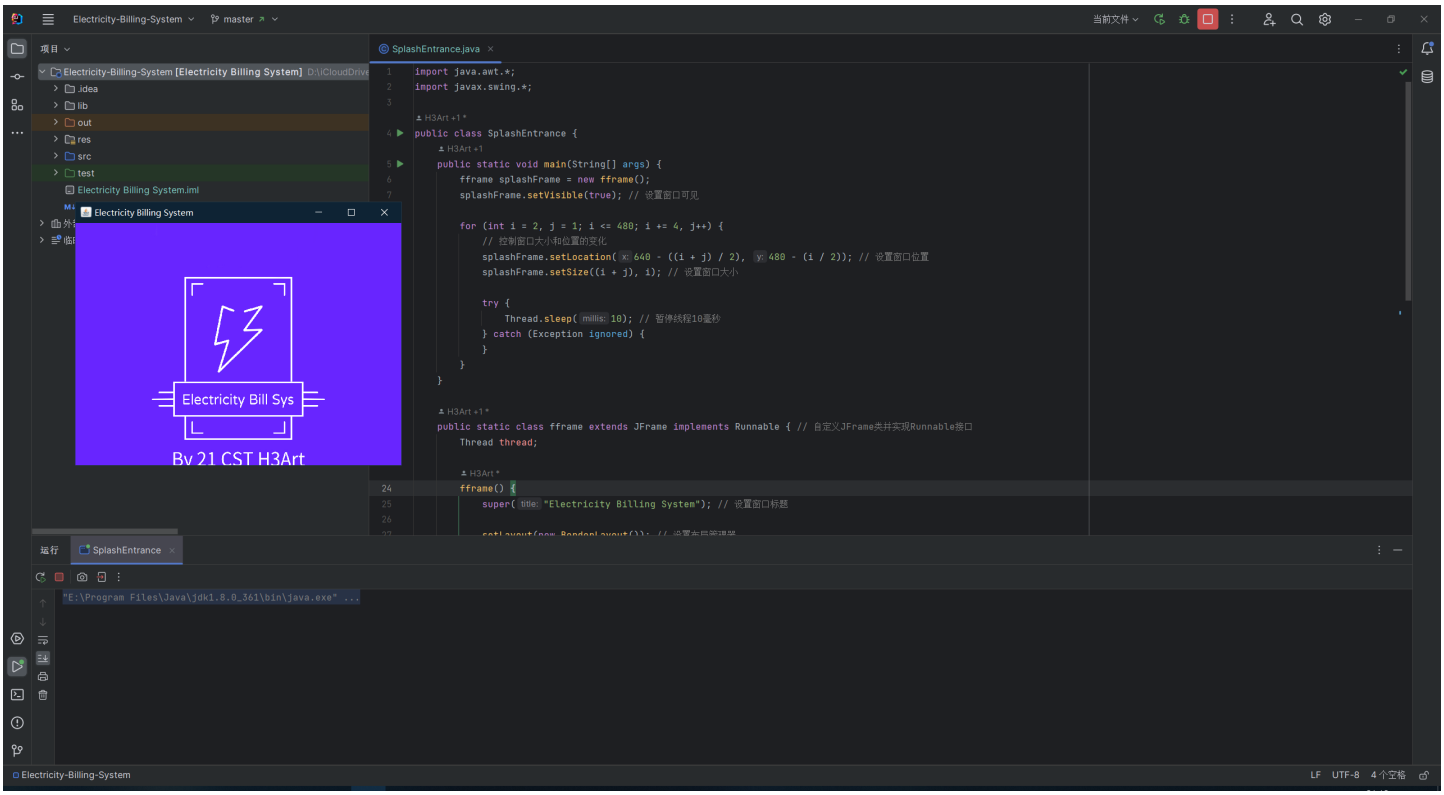
- **JDK:** Oracle JDK, Version 8u361
- **Database:** MySQL, Version 8.2.0
- **JDBC Driver:** Version 8.0.25
- **IDE:** IntelliJ IDEA 2023.1.2
- **OS:** Windows 10(but also available in macOS)

File Structure

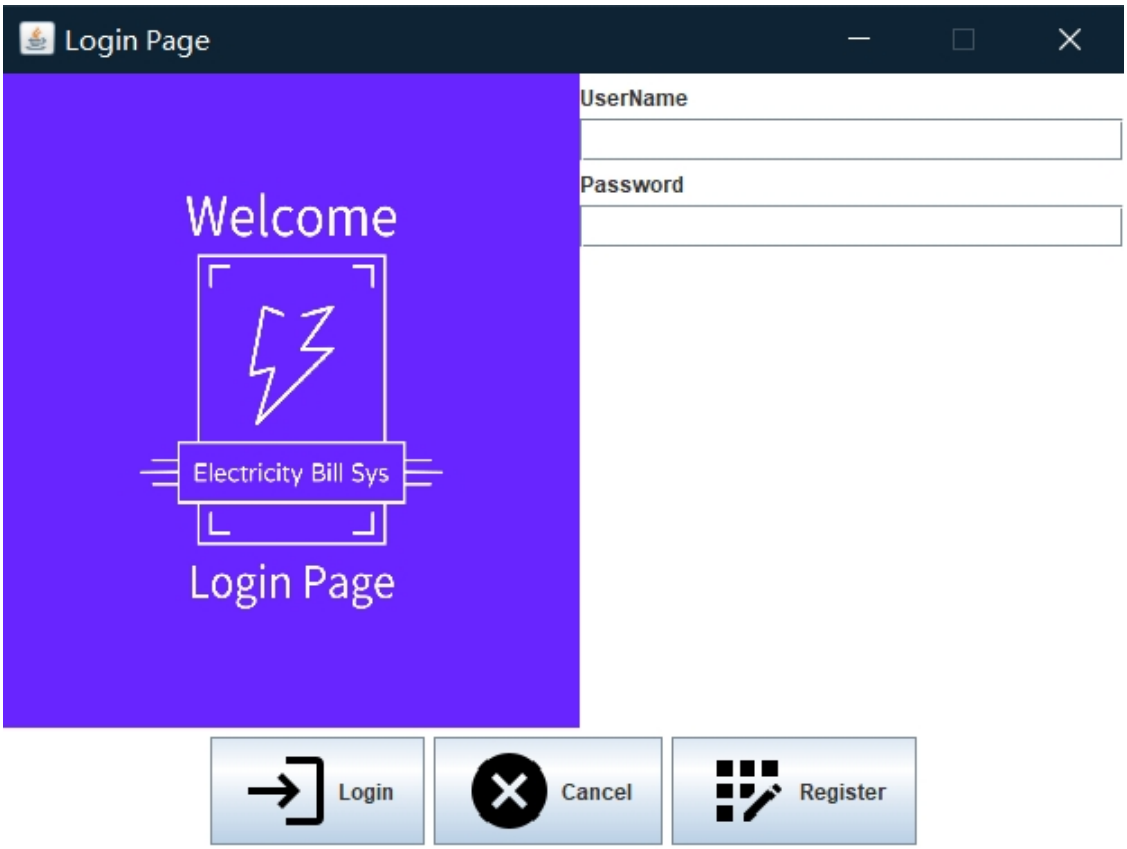
```
Electricity-Billing-System [Electricity Billing System]
├── .idea
├── lib
├── out
│   ├── production
│   └── test
├── res
│   ├── bg_bill_calculator_left.jpg
│   ├── bg_customer_add_left.jpg
│   ├── bg_login_page_left.png
│   ├── bg_main_page.png
│   ├── bg_splash_page.jpg
│   ├── icon_bill_calculator.png
│   ├── icon_bill_history.png
│   ├── icon_bill_report.png
│   ├── icon_cancel.png
│   ├── icon_customer_detail.png
│   ├── icon_exit.png
│   ├── icon_login.png
│   ├── icon_new_customer.png
│   ├── icon_pay_bill.png
│   └── icon_register.png
├── src
│   ├── BillCalculator
│   ├── BillGenerator
│   ├── BillHistory
│   ├── BillPayment
│   ├── CreateDatabase(added on Nov.18, implementing direct database creation)
│   ├── CustomerDetails
│   ├── DataBaseConnector
│   ├── LoginPage
│   ├── MainPage
│   ├── NewCustomer
│   ├── RegisterPage
│   └── SplashEntrance
└── test
    ├── BillCalculatorTest
    ├── LoginPageTest
    └── RegisterPageTest
```

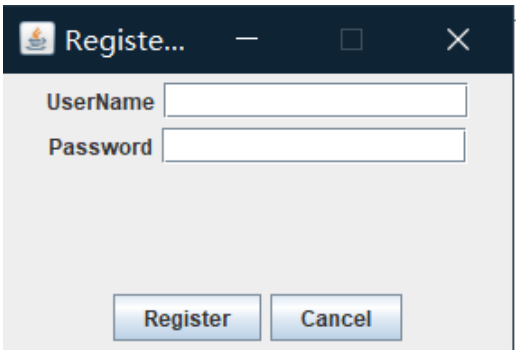
Usage Guide

`SplashEntrance` is the sequential execution entry of the entire program, but other partial files can also be used as separate program entries. When SplashEntrance is started, the window will open in a magnified form. This is a common human-computer interaction delaying technique and reduces the user's sensitivity to the loading speed of other components.

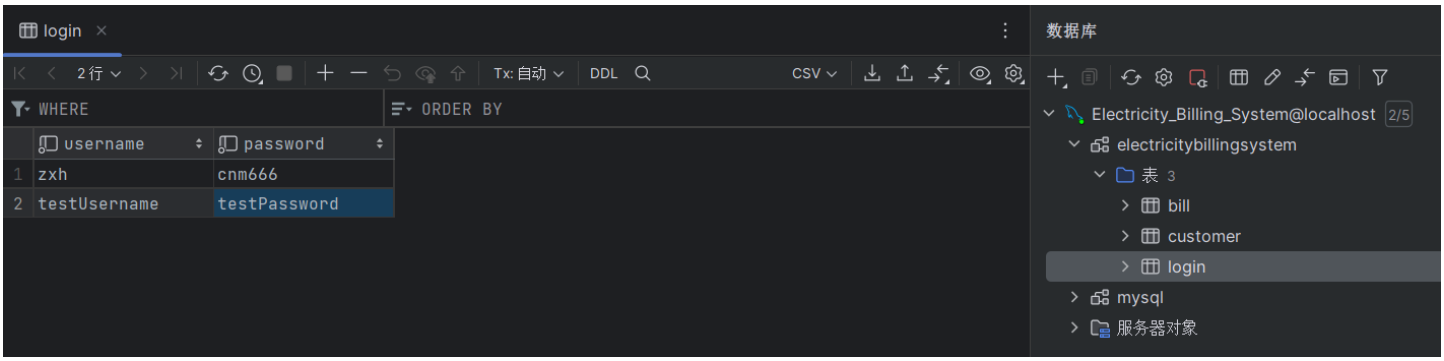


When SplashEntrance is loaded, it will jump to the login interface. At this time, the user can choose to directly enter the account password to log in, or click the registration option in the lower right corner to register. Both the registration and login verification operations interact with the database:



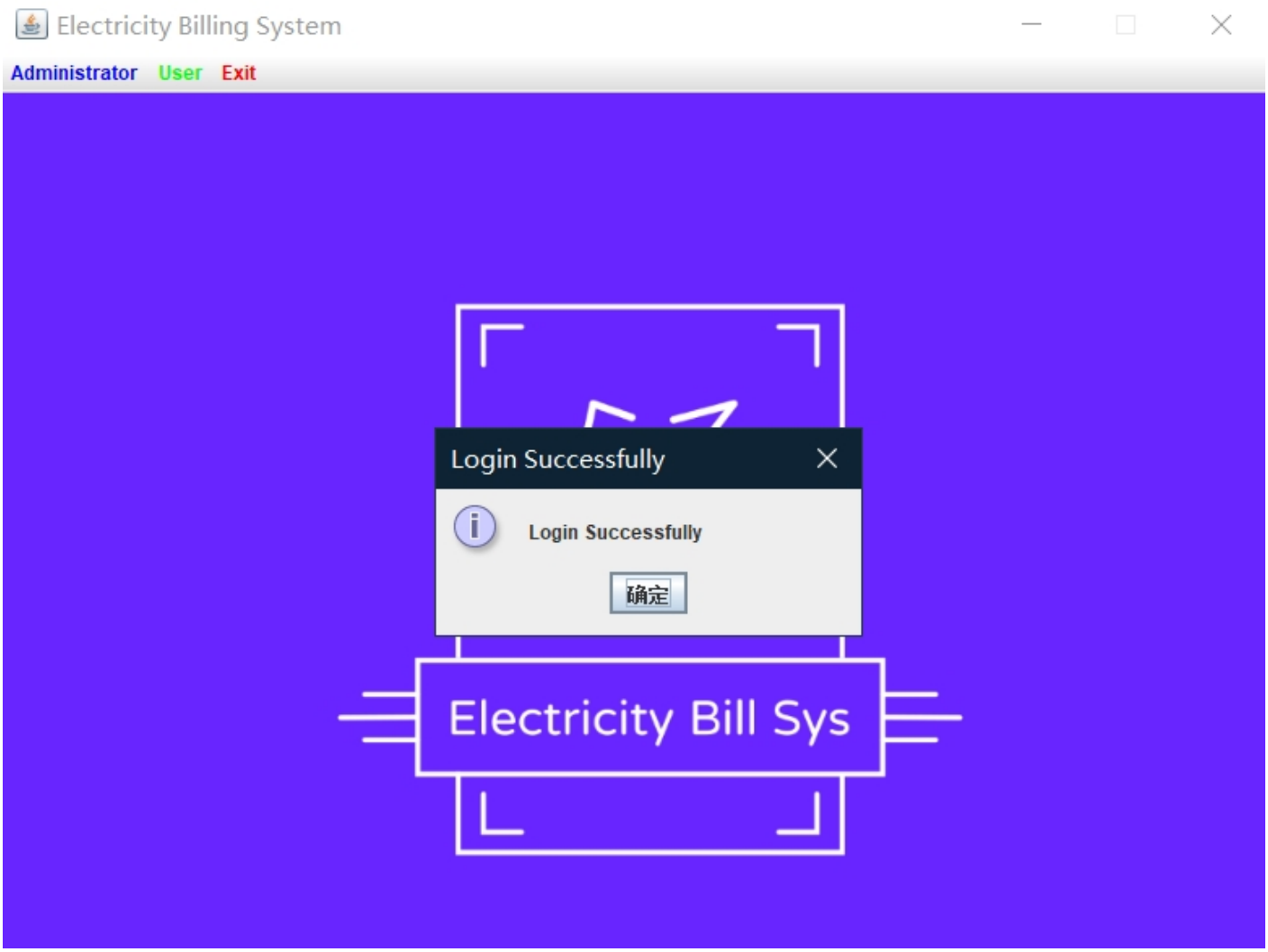


The user's login account information can be viewed on the database side:

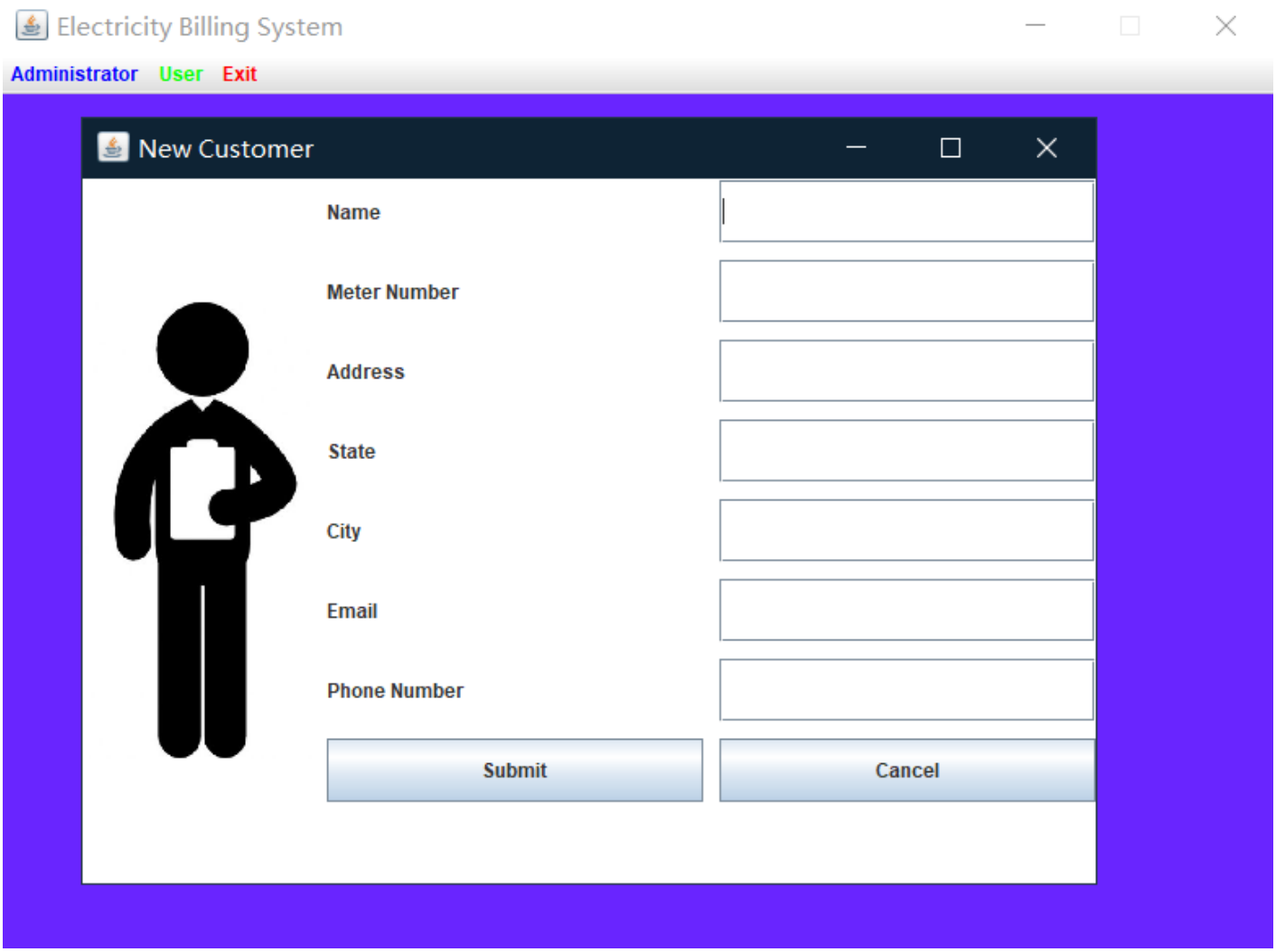


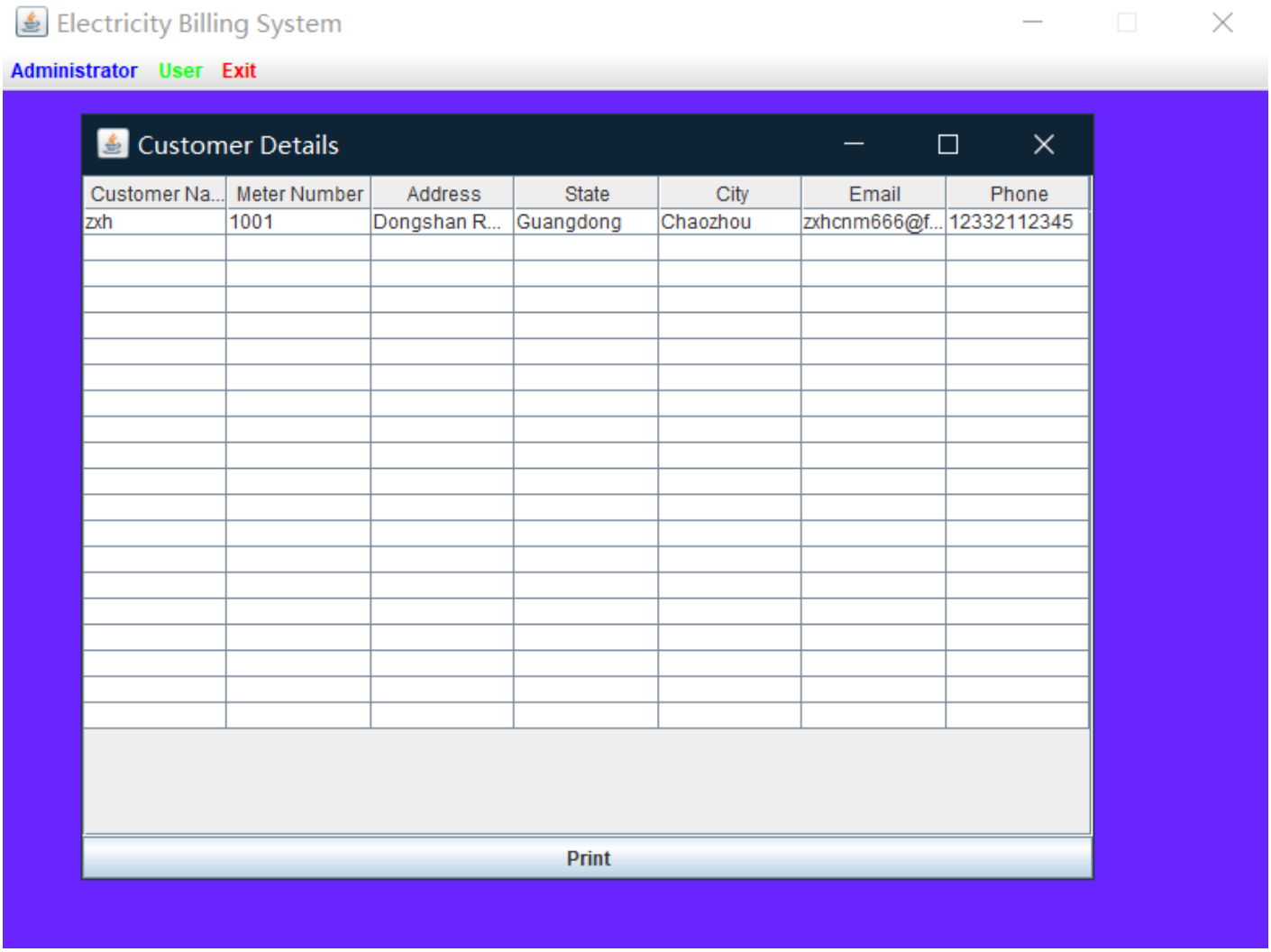
After successful login, you can enter the main interface as shown below:

Please note that if you are not an administrator account, you will not be able to access the contents of the Administrator column. The administrator account is *admin* and the password is *admin123*.

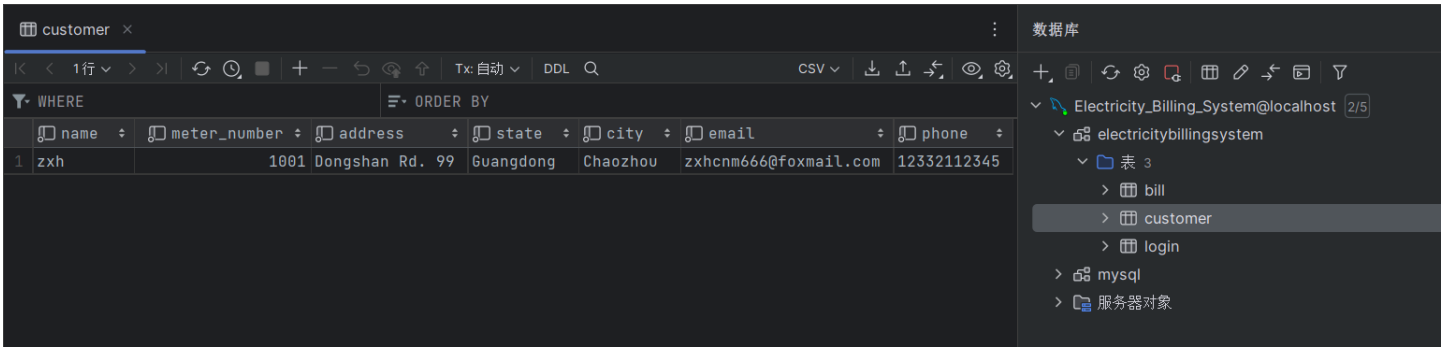


In the administrator options, you can add consumer information and view recorded consumer information, which also interacts with the database:

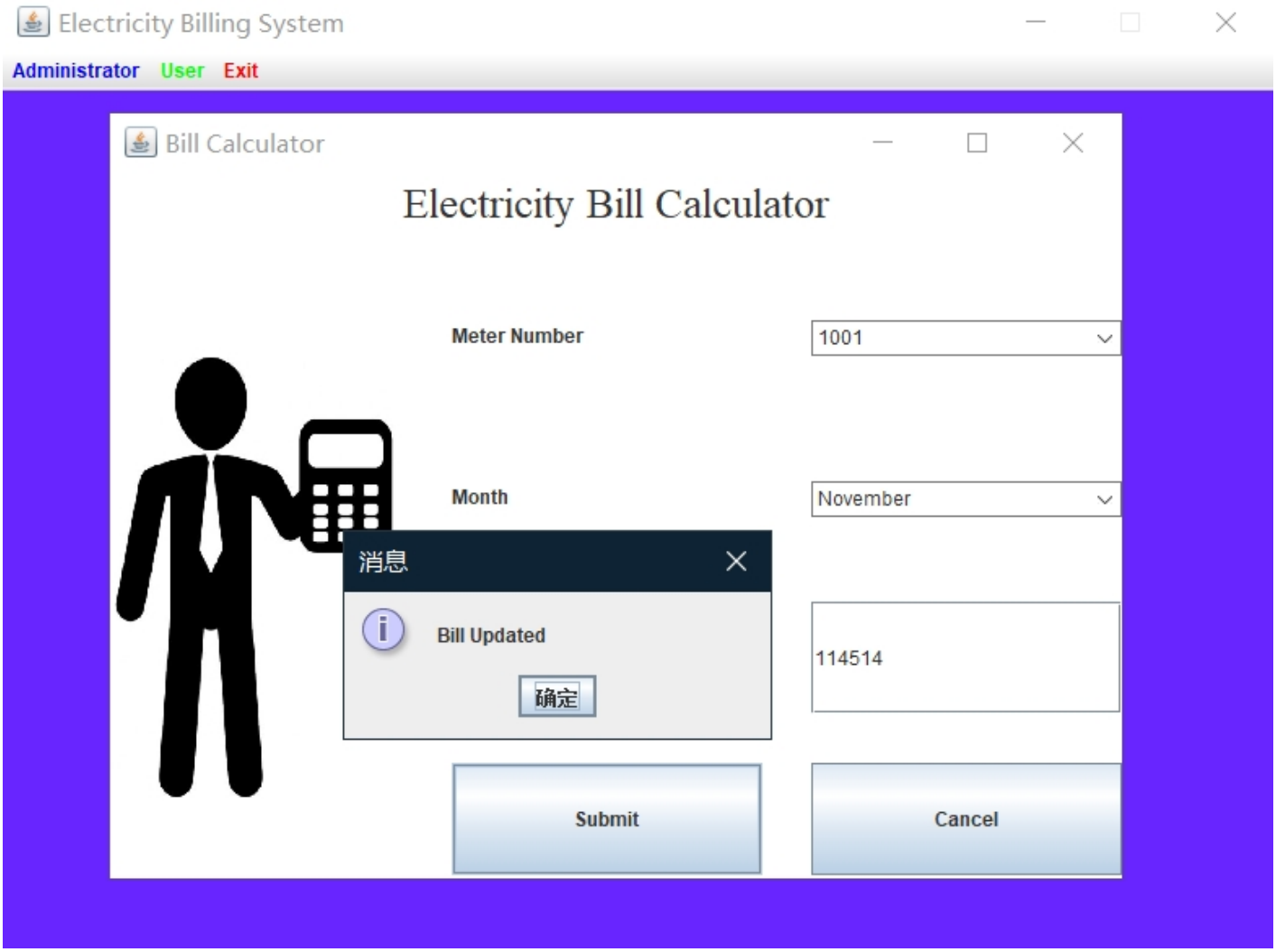


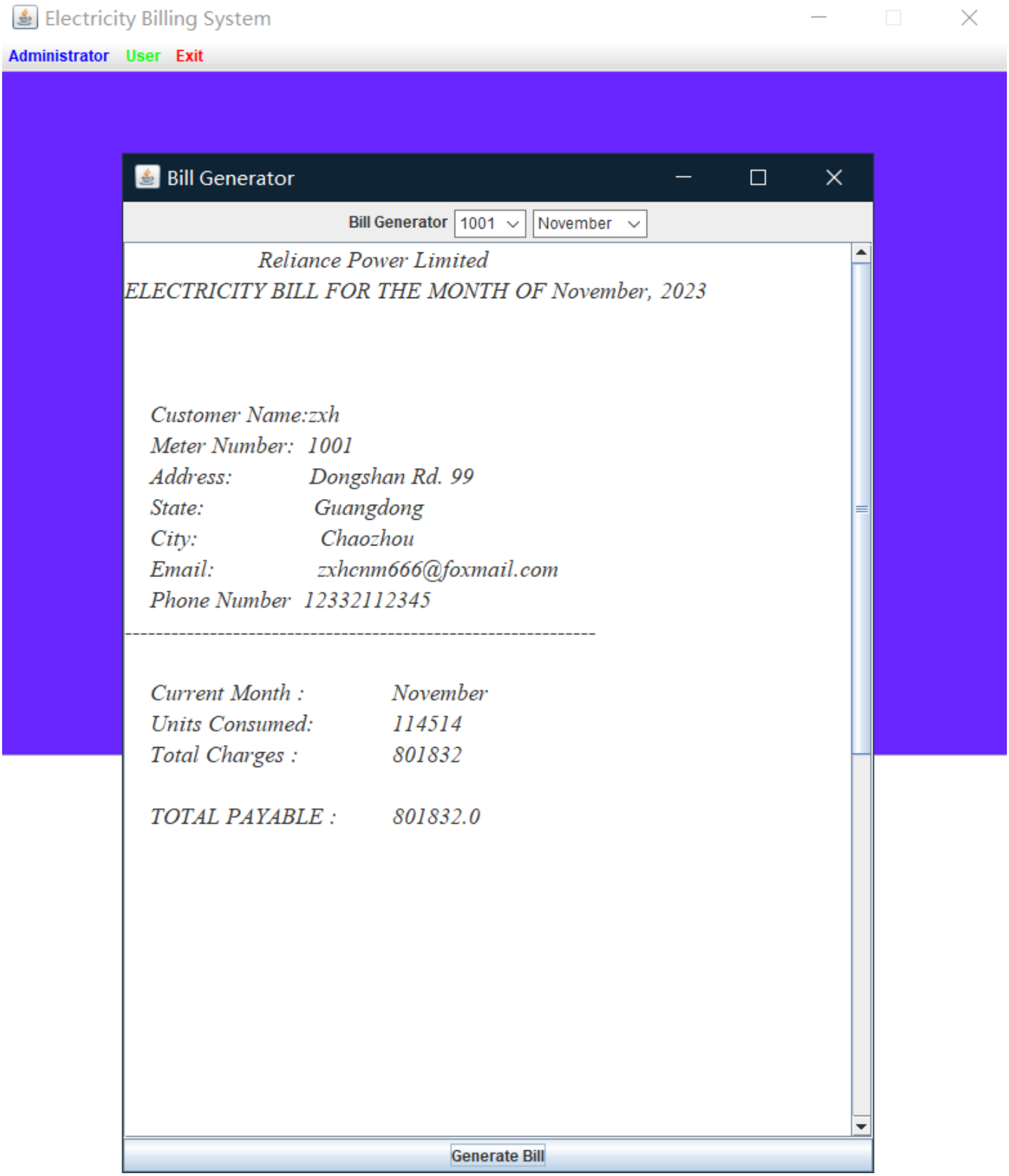


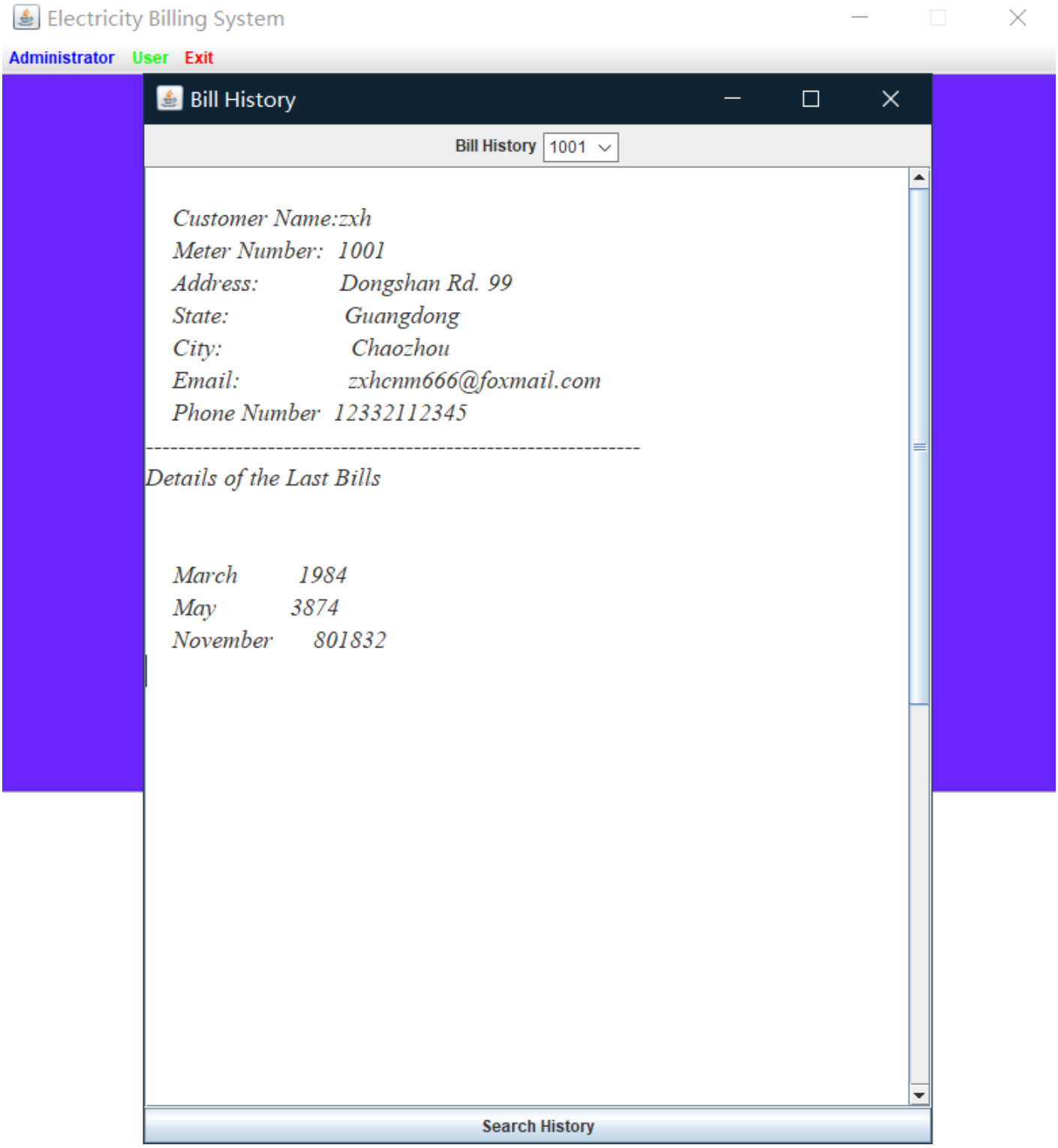
The customers information can be viewed on the database side:



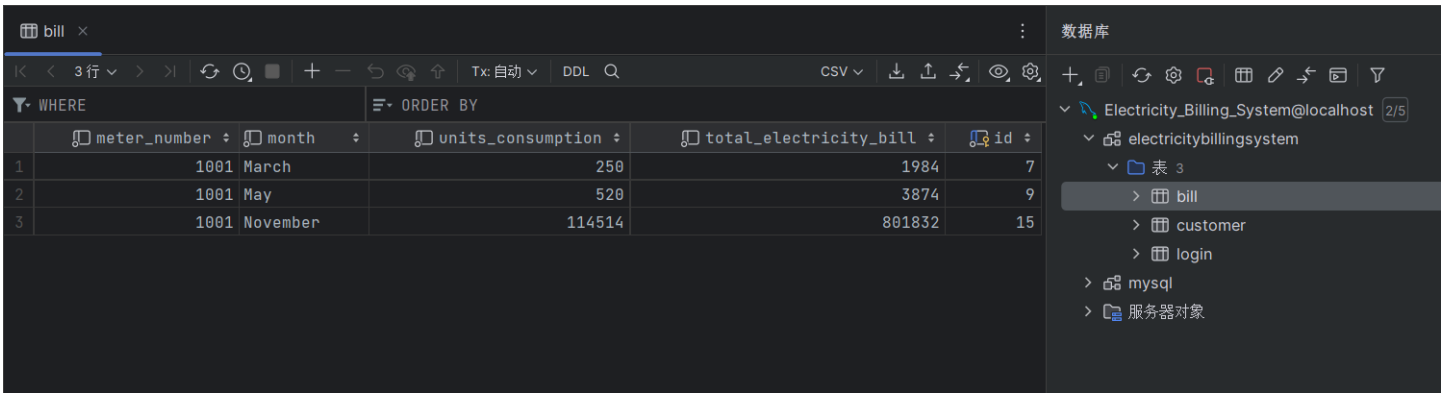
In the user options, you can pay bills (this will open a page that jumps to the official website of the power grid), calculate bill information, generate bill information, and view historical bill information. In addition to paying bills, the rest of the operations will communicate with the database. The results of calculating billing information will be stored in the billing table items of the database. Generating bills and viewing historical billing information are all based on querying the billing table items of the database:


Electricity Billing System
Administrator
User
Exit
Bill Calculator
Electricity Bill Calculator
Meter Number
1001
Month
November
消息
Bill Updated
确定
114514
Submit
Cancel


Electricity Billing System
Administrator User Exit
Bill Generator
Bill Generator 1001 November
Reliance Power Limited
ELECTRICITY BILL FOR THE MONTH OF November, 2023
Customer Name:zxh
Meter Number: 1001
Address: Dongshan Rd. 99
State: Guangdong
City: Chaozhou
Email: zxhcnm666@foxmail.com
Phone Number 12332112345
Current Month : November
Units Consumed: 114514
Total Charges : 801832
TOTAL PAYABLE : 801832.0
Generate Bill



The bills information can be viewed on the database side:



Thoughts

Through the construction of this project, I learned the process of using Java's JDBC library to interact with the database, and gained a deeper understanding of the database system.

At the same time, on the day of the presentation, I realized that my knowledge of the course was still insufficient. After the presentation, I changed all the parts of the project that interacted with the database to interact in the form of prepareStatement, and added content detection to more fields to ensure system stability.