华东师范大学软件工程学院实验报告

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实验名称：SQL-Homework-Lab02	实验日期：2025.3.28	指导老师：姚俊杰

实验目标

- 使用编程语言连接数据库并实现批量化插入删除查询等功能。
- 注意事项：本次实验不限定编程语言，但仅提供windows环境下的java用例，如果使用其他环境或其他语言连接亦可，我们更推荐使用java(JDBC)或c++(ODBC)，想要选用其他语言的同学需自行查阅相关语言的数据库连接文档。

实验要求

小项目作业：

- i. 连接SQL(实验报告1)中使用的college数据库。
- ii. 现在，你就是学校信息系统的程序员，使用JDBC编写程序，完成以下任务：
  2.1 通过输入的登陆ID和密码，开启与数据库的连接
  2.2连接成功后，要求用户输入一个字符串。返回所有名字中含有该子串的学生的信息，包括（ID，name，dept_name, tot_cred）4个字段。
  2.3 然后要求用户输入一个整数（0～99999），并显示ID与之完全匹配的的学生的信息，内容要求同上。
  2.4 若2.5中修读课程不为空，则在用户输入1后，计算该学生的计算平均绩点，并显示。
  2.5 若2.3中学生查找成功，则在用户输入1后，输出学生所修读的所有课程信息。包括以下信息：
  a. 课程ID
  b. 上课年份
  c. 上课学期
  d. 课程名称
  e. 开课院系
  f. 成绩等级
  g. 课程学分数
- iii. 以上错误处理要求如下：
  3.1 若2.1连接失败，提示用户错误并允许重试
  3.2 若2.2查询结果为空，提示用户无相关学生并允许重新输入

3.3 若2.3查询结果为空，提示用户无该学生并允许重试

3.4 若2.4和2.5中用户输入0，则停止本次查询

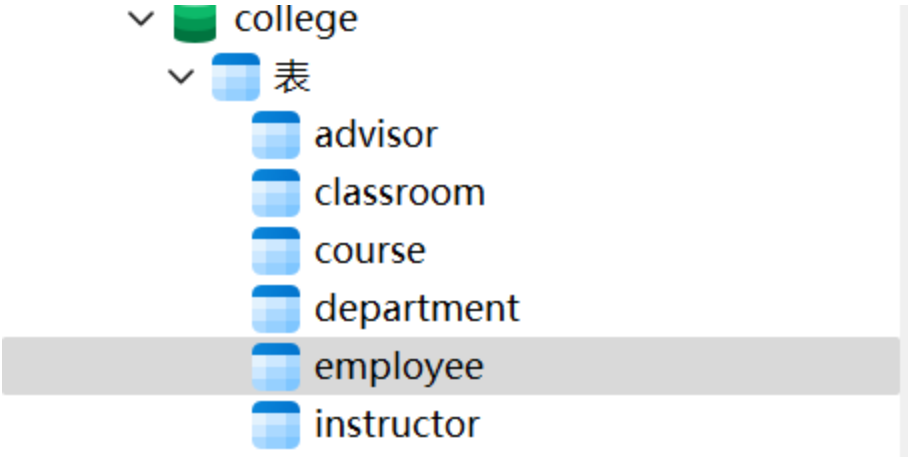
3.5 连接数据库成功后，请捕获所有数据库有关异常并处理，不要抛出停止程序。

实验过程记录

测试JDBC连接数据库

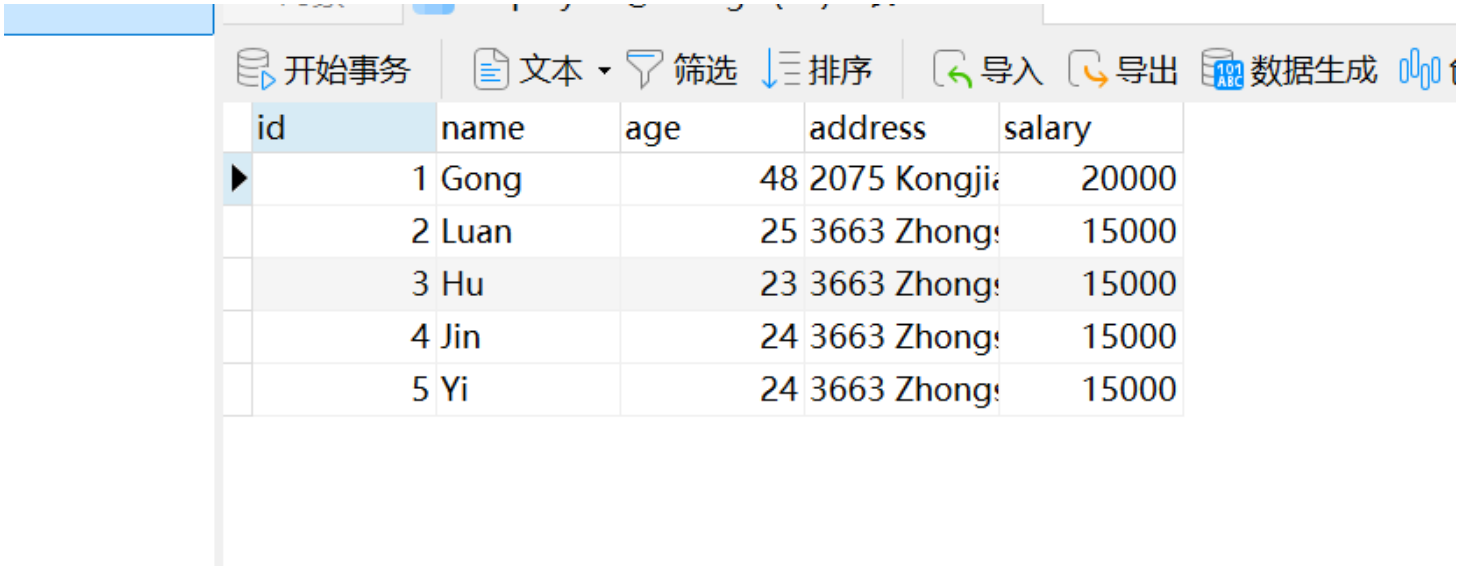
1.创建表

```
@Test
public void JDBCCreate() throws Exception {
    String url = "jdbc:mysql://localhost:3306/college";
    String user = "root";
    String password = "123456";
    Connection connection = DriverManager.getConnection(url, user, password);
    Statement statement = connection.createStatement();
    try {
        String sql = "CREATE TABLE employee (id INT," +
                     " name VARCHAR(20) NOT NULL, " +
                        " age INT NOT NULL, " +
                        " address VARCHAR(50), " +
                        " salary REAL, " +
                        "PRIMARY KEY (id))";
        statement.executeUpdate(sql);
    } catch (Exception e){
        System.err.println(e.getClass().getName() + ": " + e.getMessage());
        e.printStackTrace();
    }finally{
        statement.close();
        connection.close();
    }
    System.out.println("Create table successfully");
}
```



2.插入数据

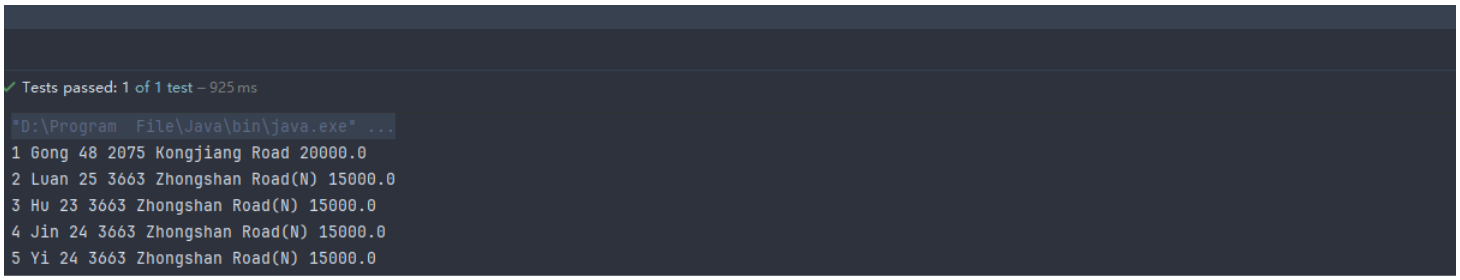
```
@Test
public void JDBCInsert() throws Exception {
    String url = "jdbc:mysql://localhost:3306/college";
    String user = "root";
    String password = "hkx171901";
    Connection connection = DriverManager.getConnection(url, user, password);
    Statement statement = connection.createStatement();
    try {
        String[] insertSQL = {
            "INSERT INTO employee VALUES (1, 'Gong', 48, '2075 Kongjiang Road', 20000.00 );'
            "INSERT INTO employee VALUES (2, 'Luan', 25, '3663 Zhongshan Road(N)', 15000.00
            "INSERT INTO employee VALUES (3, 'Hu', 23, '3663 Zhongshan Road(N)', 15000.00 );
            "INSERT INTO employee VALUES (4, 'Jin', 24, '3663 Zhongshan Road(N)', 15000.00 )
            "INSERT INTO employee VALUES (5, 'Yi', 24, '3663 Zhongshan Road(N)', 15000.00 );
        };
        for (String sql : insertSQL) {
            statement.executeUpdate(sql);
        }
    } catch (Exception e){
        System.err.println(e.getClass().getName() + ": " + e.getMessage());
        e.printStackTrace();
    }finally {
        statement.close();
        connection.close();
    }
    System.out.println("Insert data successfully");
}
```



id	name	age	address	salary
1	Gong	48	2075 Kongji	20000
2	Luan	25	3663 Zhong	15000
3	Hu	23	3663 Zhong	15000
4	Jin	24	3663 Zhong	15000
5	Yi	24	3663 Zhong	15000

3.查询数据

```
@Test
public void JDBCSelect() throws Exception {
    String url = "jdbc:mysql://localhost:3306/college";
    String user = "root";
    String password = "hkx171901";
    Connection connection = DriverManager.getConnection(url, user, password);
    //为了防止注入攻击使用预编译语句
    PreparedStatement preparedStatement = connection.prepareStatement("select * from employe
    ResultSet resultSet = preparedStatement.executeQuery();
    try{
        while (resultSet.next()){
            int id = resultSet.getInt("id");
            String name = resultSet.getString("name");
            int age = resultSet.getInt("age");
            String address = resultSet.getString("address");
            double salary = resultSet.getDouble("salary");
            System.out.println(id + " " + name + " " + age + " " + address + " " + salary);
        }
    }catch (Exception e){
        System.err.println(e.getClass().getName() + ": " + e.getMessage());
        e.printStackTrace();
    }finally{
        resultSet.close();
        preparedStatement.close();
        connection.close();
    }
}
```


Tests passed: 1 of 1 test – 925 ms
"D:\Program File\Java\bin\java.exe" ...
1 Gong 48 2075 Kongjiang Road 20000.0
2 Luan 25 3663 Zhongshan Road(N) 15000.0
3 Hu 23 3663 Zhongshan Road(N) 15000.0
4 Jin 24 3663 Zhongshan Road(N) 15000.0
5 Yi 24 3663 Zhongshan Road(N) 15000.0

4.更新数据

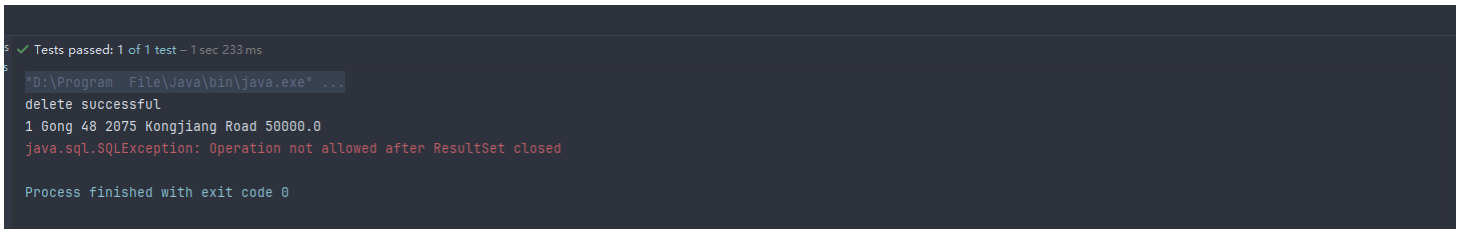
```java
@Test
    public void JDBCUpdate() throws Exception {
        String url = "jdbc:mysql://localhost:3306/college";
        String user = "root";
        String password = "hkx171901";
        Connection connection = DriverManager.getConnection(url, user, password);
        //为了防止注入攻击使用预编译语句

        try{
            PreparedStatement preparedStatement1 = connection.prepareStatement("UPDATE employee
            PreparedStatement preparedStatement2 = connection.prepareStatement("select * from er
            ResultSet resultSet = preparedStatement2.executeQuery();
            int i = preparedStatement1.executeUpdate();
            if(i < 0){
                System.out.println("Update failed");
            }
            else System.out.println("Update successful");
            while (resultSet.next()){
                int id = resultSet.getInt("id");
                String name = resultSet.getString("name");
                int age = resultSet.getInt("age");
                String address = resultSet.getString("address");
                double salary = resultSet.getDouble("salary");
                System.out.println(id + " " + name + " " + age + " " + address + " " + salary);

                resultSet.close();
                preparedStatement1.close();
                preparedStatement2.close();
            }
        }catch (Exception e){
            System.err.println(e.getClass().getName() + ": " + e.getMessage());
        }finally {
            connection.close();
        }
    }
```

5.删除数据

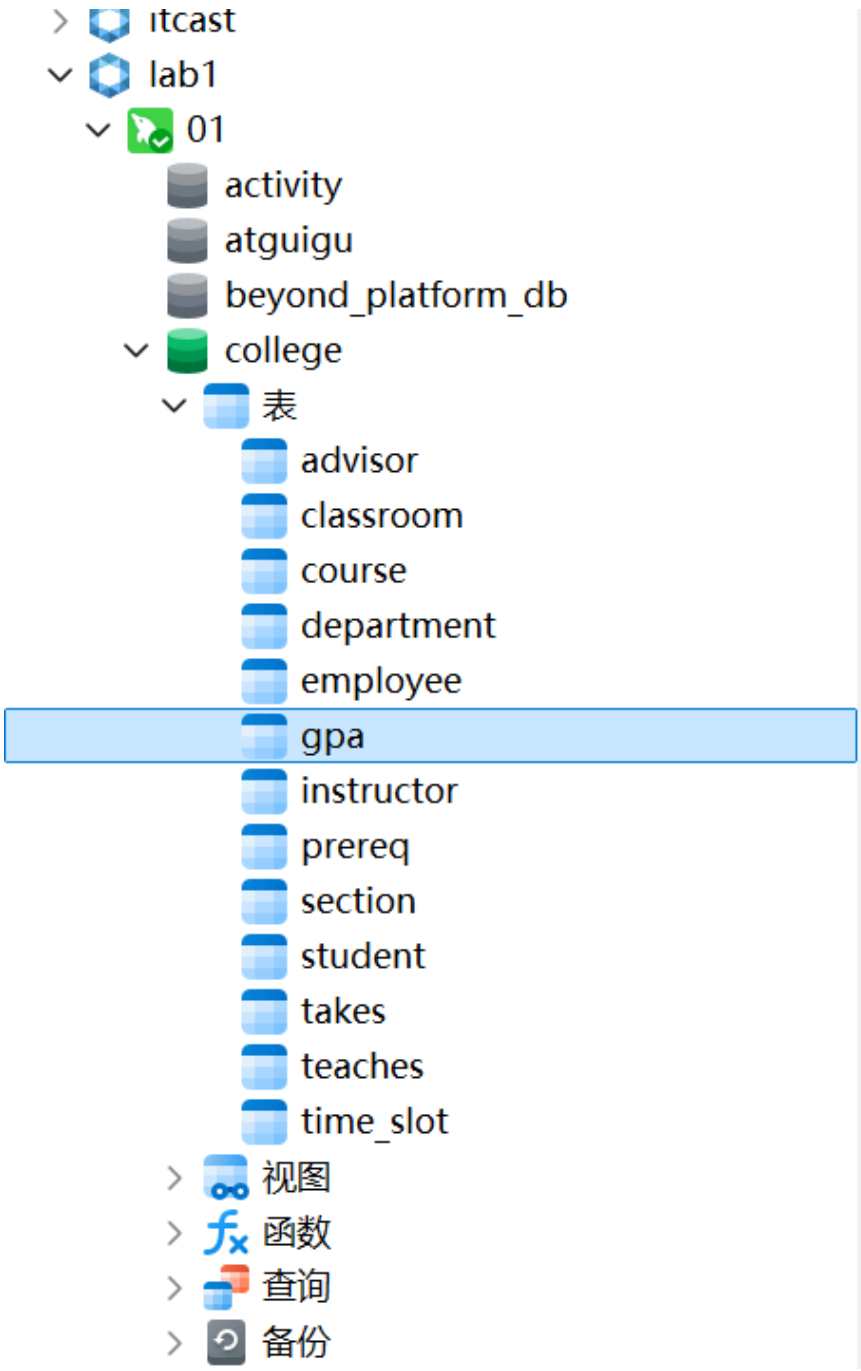
```
@Test
public void JDBCDelete() throws Exception {
    String url = "jdbc:mysql://localhost:3306/college";
    String user = "root";
    String password = "hkx171901";
    Connection connection = DriverManager.getConnection(url, user, password);
    //为了防止注入攻击使用预编译语句
    try{
        PreparedStatement preparedStatement1 = connection.prepareStatement("DELETE from emp
        PreparedStatement preparedStatement2 = connection.prepareStatement("select * from e
        int i = preparedStatement1.executeUpdate();
        ResultSet resultSet = preparedStatement2.executeQuery();
        if(i < 0){
            System.out.println("delete failed");
        }
        else System.out.println("delete successful");
        while (resultSet.next()){
            int id = resultSet.getInt("id");
            String name = resultSet.getString("name");
            int age = resultSet.getInt("age");
            String address = resultSet.getString("address");
            double salary = resultSet.getDouble("salary");
            System.out.println(id + " " + name + " " + age + " " + address + " " + salary);
            //释放资源
            resultSet.close();
            preparedStatement1.close();
            preparedStatement2.close();
        }
    }catch (Exception e){
        System.err.println(e.getClass().getName() + ": " + e.getMessage());
    }finally {
        connection.close();
    }
}
```



因为删除操作使while循环无法继续执行，所以在删除操作后，需要重新查询数据库，并释放资源。

6.pre操作

```java
@Test
    public void JDBCPrepare() throws Exception {
        String url = "jdbc:mysql://localhost:3306/college";
        String user = "root";
        String password = "hkx171901";
        Connection connection = DriverManager.getConnection(url, user, password);
        PreparedStatement preparedStatement1 = connection.prepareStatement("CREATE TABLE IF NOT
        preparedStatement1.executeUpdate();
        try {
            String[] strArray = new String[11];
            strArray[0] = "A";
            strArray[1] = "A-";
            strArray[2] = "B+";
            strArray[3] = "B";
            strArray[4] = "B-";
            strArray[5] = "C+";
            strArray[6] = "C";
            strArray[7] = "C-";
            strArray[8] = "D";
            strArray[9] = "D-";
            strArray[10] = "F";
            double[] doubleArray = new double[] {4.0,3.7,3.3,3.0,2.7,2.3,2.0,1.5,1.3,1.0,0};
            PreparedStatement preparedStatement2 = connection.prepareStatement("INSERT INTO GPA(
            for(int i = 0;i < 11; i++){
                preparedStatement2.setString(1, strArray[i]);
                preparedStatement2.setBigDecimal(2,BigDecimal.valueOf(doubleArray[i]));
                preparedStatement2.addBatch();
            }
            preparedStatement2.executeBatch();
        }catch (Exception e){
            System.err.println(e.getClass().getName() + ": " + e.getMessage());
        }finally{
            preparedStatement1.close();
            connection.close();
        }
    }
```



开始事务 文本 筛选

grade	grade_point
A	4.00
A-	3.70
B+	3.30
B	3.00
B-	2.70
C+	2.30
C	2.00
C-	1.50
D	1.30
D-	1.00
F	0.00
A	4.00
A-	3.70
B+	3.30
B	3.00
B-	2.70
C+	2.30
C	2.00
C-	1.50
D	1.30
D-	1.00
F	0.00

JDBC小项目作业

java代码如下：

```java
package lab2;
import java.sql.*;
import java.util.Scanner;

public class JDBCProject {
    public static void main(String[] args)  {
        String url = "jdbc:mysql://localhost:3306/college";
        Scanner sc = new Scanner(System.in);
        Connection connection = null;

        while (true) {
            try {
                System.out.println("请输入你的用户名:");
                String user = sc.nextLine();
                System.out.println("请输入你的密码:");
                String password = sc.nextLine();
                connection = DriverManager.getConnection(url, user, password);
                System.out.println("数据库连接成功！");
                break; // 成功连接后退出循环
            } catch (SQLException e) {
                System.err.println("数据库连接失败: " + e.getMessage());
                System.out.println("请重新输入用户名和密码。");
            }
        }//使用循环来实现重新输入的功能

        try {
            //2.2的查询
            while(true) {
                System.out.println("请输入要查询的学生姓名");
                String name = sc.nextLine();
                PreparedStatement prepared = connection.prepareStatement("select ID,name,dept_na
                String input = "%" + name + "%";
                prepared.setString(1, input);//为占位符赋值,同时实现模糊查询
                ResultSet resultSet = prepared.executeQuery();
                if (!resultSet.next()) {
                    System.out.println("无该学生信息");
                    continue;
                }
                //输出学生信息
                do {
                    int sid = resultSet.getInt(1);
                    String sname = resultSet.getString(2);
                    String dname = resultSet.getString(3);
```

```
            int tot = resultSet.getInt(4);
            System.out.println(sid + "\t" + sname + "\t" + dname + "\t" + tot);
        } while (resultSet.next());
        resultSet.close();
        prepared.close();
        break;

}
//2.3的查询
Boolean tag = true;
label1:
while(tag) {
   System.out.println("请输入学生id");
   int id = sc.nextInt();
   sc.nextLine();
   PreparedStatement prepared2 = connection.prepareStatement("select * from student
   prepared2.setInt(1, id);
   ResultSet resultSet2 = prepared2.executeQuery();
   if(!resultSet2.next()) {
    System.out.println("无该学生的记录");
    continue;
    }
   else{
    do {
    int sid= resultSet2.getInt(1);
    String sname = resultSet2.getString(2);
    String dname = resultSet2.getString(3);
    int tot = resultSet2.getInt(4);
    System.out.println(sid + "\t" + sname + "\t" + dname + "\t" + tot);
    }  while (resultSet2.next());
    resultSet2.close();
    prepared2.close();


    //2.4的查询
    System.out.println("请输入1来查看该学生的所有课程,输入0则停止本次查询");
    int key1 = sc.nextInt();
    sc.nextLine();
    if (key1 == 1) {
        PreparedStatement prepared3 = connection.prepareStatement(
                "SELECT t.course_id, t.year, t.semester, c.title, c.dept_name, t.gra
                        "FROM takes t " +
                        "JOIN course c ON t.course_id = c.course_id " +
```

```
                    "WHERE t.id = ?"
        );
        prepared3.setInt(1,id);
        ResultSet resultSet3 = prepared3.executeQuery();
        while (resultSet3.next()) {
            int tid= resultSet3.getInt("course_id");
            int year= resultSet3.getInt("year");
            String semester= resultSet3.getString("semester");
            String title= resultSet3.getString("title");
            String deptName= resultSet3.getString("dept_name");
            String grade= resultSet3.getString("grade");
            int credits= resultSet3.getInt("credits");
            System.out.printf("%d\t%d\t%s\t%s\t%s\t%s\t%d\n", tid, year, semester, t
        }
        resultSet3.close();
        prepared3.close();


         //2.5的查询
        System.out.println("请输入1来查看该学生的平均成绩，输入0则停止查询");
        int key2 = sc.nextInt();
        sc.nextLine();
        if (key2 == 1) {
            PreparedStatement prepared4 = connection.prepareStatement("SELECT " + "
                    " JOIN " + " gpa g ON t.grade = g.grade " + " WHERE " + " t.id =
            prepared4.setInt(1,id);
            ResultSet resultSet4 = prepared4.executeQuery();
            while (resultSet4.next()) {
                Double gpa= resultSet4.getDouble("average_gpa");
                System.out.println("average_gpa: "+gpa);
            }
            tag = false;
            resultSet4.close();
            prepared4.close();
        }
        else if (key2 == 0) {
            tag = false;
            break label1;
        }

    }
    else if (key1 == 0) {
        tag = false;
```

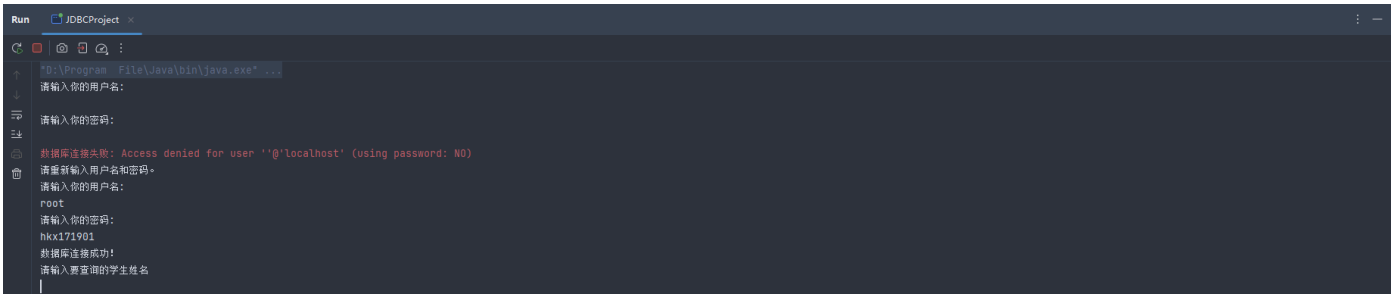
```
                    break label1;
                }

            }
            }

            // 关闭连接
            if (connection != null) {
                connection.close();
            }

        } catch (Exception e) {
            System.err.println("数据库异常: " + e.getMessage());
        } finally {
            // 关闭Scanner对象
            if (sc != null) {
                sc.close();
            }
        }
    }
}
```

- 功能实现
- 2.1
  输入用户名和密码，错误时重新输入



- 2.2
  输入学生姓名，模糊查询，输出学生信息，查询不到时提示无该学生信息，并且继续查询

- 2.3
  输入学生id，查询学生信息，查询不到时提示无该学生的记录，并且继续查询

```
请输入学生id
34243424
无该学生的记录
请输入学生id
1087
1087    Roses   Accounting  73
请输入1来查看该学生的所有课程,输入0则停止本次查询
```

- 2.4

  输入0停止查询

```
请输入要查询的学生姓名
Roses
1087    Roses   Accounting  73
65681   Roses   English 17
请输入学生id
1087
1087    Roses   Accounting  73
请输入1来查看该学生的所有课程,输入0则停止本次查询
0

Process finished with exit code 0
```

  输入1查看该学生的所有课程

```
请输入1来查看该学生的所有课程,输入0则停止本次查询
1
Course ID   Year    Semester    Title   Dept Name   Grade   Credits
192 2002    Fall    Drama   Languages   A+  4
200 2002    Fall    The Music of the Ramones    Accounting  B   4
237 2008    Spring  Surfing Cybernetics B   3
400 2003    Fall    Visual BASIC    Psychology  C+  4
443 2002    Spring  Journalism  Physics C+  4
461 2002    Fall    Physical Chemistry  Math    B   3
486 2009    Fall    Accounting  Geology B   3
496 2001    Fall    Aquatic Chemistry   Cybernetics A-  3
545 2001    Fall    International Practicum History C-  3
561 2006    Fall    The Music of Donovan    Elec. Eng.  A-  4
581 2005    Spring  Calculus    Pol. Sci.   B   4
679 2010    Spring  The Beatles Math    B-  3
702 2001    Spring  Arabic  Biology B+  3
747 2004    Spring  International Practicum Comp. Sci.  A-  4
864 2006    Spring  Heat Transfer   Geology A   3
893 2007    Fall    Systems Software    Cybernetics B   3
991 2008    Spring  Transaction Processing  Psychology  B+  3
```

- 2.5

  输入0停止查询

```
请输入1来查看该学生的平均成绩，输入0则停止查询
0


Process finished with exit code 0
```

  输入1查看该学生的平均成绩

```
请输入1来查看该学生的平均成绩，输入0则停止查询
1
average_gpa: 2.944444
```

实验结论

- 实现了JDBC的增删改查操作，并通过预编译语句防止SQL注入攻击。
- 实现了JDBC的事务处理，通过try-catch-finally来实现事务的提交、回滚和关闭。
- 实现了JDBC的连接池，通过连接池来实现数据库连接的复用，提高数据库连接的效率。
- 通过这次实验，对JDBC的使用有了更深入的理解，掌握了JDBC的相关知识。