数据库系统实验
实验报告

题目	（实验 6）
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一、实验环境

1、 操作系统： Windows 10
2、 DBMS： mysql ,vistual studio 2019

二、实验内容

(1)模拟 create_student_table()实现创建 SC 表或 Course 表。 即实现 create_sc_table()或 create_course_table()子程序的功能。

首先是关于visual studio 的环境配置，这也是耗费了最多时间的项目，主体内容是参考实验教材中的.net环境的配置结果，一开始并未打开最前面需要写入 * 64的位置，所以文件夹中始终没有出现 * 64的文件夹，导致后面对于libmysql.dll 的放置也出现了问题，就会使visual studio 一直报错为找不到对应的mysql接口函数，解决问题后环境配置完成（即可以跑实验指导中的模板文件）

那么现在来看create操作，我这里选择的是生成course 表，具体函数如下

```
int create_course_table() {
    char yn[2];
    result = mysql_list_tables(&mysql, "course");
    unsigned long long num_row = mysql_num_rows(result);
    mysql_free_result(result);

    if (num_row) {
        printf("The course table already exists,Do you want to delete it?\n");
        printf("Delete the table?(y/n):");
        cin >> yn[0];
        if (yn[0] == 'y' || yn[0] == 'Y') {
            if (!mysql_query(&mysql, "drop table course;")) {
                cout << "Drop table course successfully\n\n";
            }
            else {
                cout << "ERROR: drop table course\n\n";
            }
        }
    }
```

其实实验中可以发现，对于mysql的接口，其实就是通过mysql_query这个函数，向控制台输出一些mysql的指令，这些指令是字符串类型了，其实也就相当于我们直接从控制台中写入命令一样，所以我们的代码操作就是通过C++进行字符串的拼接来调用mysql_query函数

分段来看，第一步是判断是否已经存在course表，如果存在了向用户询问是否删除重新创建，用的是mysql_list_tables的接口函数，但是这个函数必须通过一个result和num_row 进行参数的传递，直接放置在if语句中会出现报错

```
    //创建
    int createflag = 1;
    if (mysql_query(&mysql, "create table course (cno char (2) not null primary
key,cname char (30)null,cpno char(2) null, ccredit smallint null,foreign
key(cpno) references course(cno) ) engine = innodb; ") == 0) {
        cout << "create table course successfully!" << endl;
    }
    else {
        cout << "ERROR: create table student" << endl;
    }
```

第二步，如果需要创建，那么向mysql_query函数中输入创建course表的命令，即各个属性以及主键等等，判断是否成功

```
    if (mysql_query(&mysql, "insert into course
values('2','MathematicalAnalysis',null,2);")==0 && \
        mysql_query(&mysql, "insert into course
values('6','FundamentalsOfDataProcessing',null,4);")==0 && \
        mysql_query(&mysql, "insert into course
values('4','OperatingSystemPrinciple','6',3);") == 0 && \
        mysql_query(&mysql, "insert into course values('7','CLanguage','6',3);")
== 0 && \
        mysql_query(&mysql, "insert into course
values('5','DataStructure','7',4);") == 0 && \
        mysql_query(&mysql, "insert into course
values('1','DatabaseSystem','5',4);") == 0 && \
        mysql_query(&mysql, "insert into course
values('3','InformationSystems','1',3);") == 0){

        printf("Success to insert rows to student table! \n\n");
    }
    else {
        printf("ERROR: insert rows\n\n");
    }
    return 0;
}
```

最后一步，为了方便之后的操作，我在course表创建时就输入了所有的已知的数据，方便之后对数据进行进一步的操作

(2)模拟 insert_rows_into_student_table()实现对 SC 表或 Course 表的记录添加。即实现 insert_rows_into_sc_table()或 insert_rows_into_course_table()子程序的功能。

我这里写的还是insert_rows_into_course_table()函数

```
int insert_rows_into_course_table() {
    char tcno[] = "1";
    char tcname[] = "DatabasePrinciple";
    char tcpno[] = "5";
    char tccredit[]= "4";
```

```
    char strquery[100] = "insert into course(cno,cname,cpno,ccredit) values('";
    char yn[2];
    while (1) {
        cout << "Please input cno(eg: 1) :" << endl;
        cin >> tcno;
        strcat(strquery, tcno);
        strcat(strquery, "','");
        cout << "Please input cname(eg: DatabasePrinciple) :" << endl;
        cin >> tcname;
        strcat(strquery, tcname);
        strcat(strquery, "',");
        cout << "Please input cpno(eg: 5) :" << endl;
        cin >> tcpno;
        if (strcmp(tcpno, "null")==0|| strcmp(tcpno, "NULL") == 0) {//0为相等，1为
不相等
            strcat(strquery, "null");
        }
        else {
            strcat(strquery, "'");
            strcat(strquery, tcpno);
            strcat(strquery, "'");
        }
        strcat(strquery, ",");
        cout << "Please input ccredit(eg: 4) :" << endl;
        cin >> tccredit;
/*      int end = 0;
        end=strlen(strquery);
        strquery[end] = tccredit;*/
        strcat(strquery, tccredit);
        strcat(strquery, ");");
        cout << strquery << endl;
        if (mysql_query(&mysql, strquery) == 0) {
            cout << "execute successfully!" << endl;
        }
        else {
            cout << "ERROR: execute" << endl;
        }
        cout << "Insert again? (y-yes,n--no)" << endl;
        cin >> yn[0];
        if (yn[0] == 'y' || yn[0] == 'Y') {
            continue;
        }
        else break;
    }
    return 0;
}
```

这里主要涉及的就是字符串的拼接了，因为对于insert操作，我们需要向控制台输入的命令无非是

```
insert into course(cno,cname,cpno,ccredit) values('','','','');
```

这一串命令，所以单引号内部的是需要通过用户输入得到的，就不断向用户请求输入，然后进行字符串的拼接，主要要判断的其实就两个位置，一个是对于cpno的判断，因为cpno是可能为NULL的，当为null的时候就不需要添加引号,还有一处是ccredit，因为是smallint类型，所以不需要加引号，其余就直接拼接。

(3)main函数以及list函数（UI以及调试函数）

```
int main(int argc, char** argv, char** envp)
{
    char fu[2];
    mysql_init(&mysql);//获得或初始化一个MYSQL结构
    if (mysql_real_connect(&mysql, "localhost", "root", "753951", "lab6", 3306,
0, 0)) {
        for (;;) {
            printf("menu\n");
            cout << "0. Exit" << endl;
            cout << "1. Create course table" << endl;
            cout << "2. Insert rows into course table" << endl;
            cout << "3. List rows in course table" << endl;

            cin >> fu[0];
            if (fu[0] == '0') {
                exit(0);
            }
            if (fu[0] == '1') {
                create_course_table();
            }
            if (fu[0] == '2') {
                insert_rows_into_course_table();
            }
            if (fu[0] == '3') {
                list_all();
            }
        }
    }
    else {
        printf("数据库不存在");
    }

    mysql_close(&mysql);//访问完毕，关闭mysql
    result = mysql_store_result(&mysql);
    mysql_free_result(result);
    system("pause");
    return 0;
}
```

首先是main函数，主要也就是一个菜单的页面，起将所有函数调用的操作。

```
int list_all() {
    const char* query = "select cno, cname, cpno, ccredit from course;";
    int t = mysql_query(&mysql, query);
    if (t != 0) {
        return 1;
    }
```

```
    result = mysql_store_result(&mysql);
    int num = mysql_field_count(&mysql);
    auto row = mysql_fetch_row(result);
    while (row) {
        for (int i = 0; i < num; ++i) {
            switch (i) {
            case 0:
                cout << "cno: " << row[i] << "\t\t";
                break;
            case 1:
                cout << "cname: " << (row[i] ? row[i] : "null") <<"\t\t";
                break;
            case 2:
                cout << "cpno: " << (row[i] ? row[i] : "null") <<"\t\t";
                break;
            case 3:
                cout << "ccredit: " << (row[i] ? row[i]: "null") <<"\t\t";
                break;
            default:
                break;
            }
        }
        row = mysql_fetch_row(result);
        cout << '\n';
    }
    mysql_free_result(result);
    return 0;
}
```

list函数，通过select命令从mysql中读出表中的内容并在控制台上实现输出。

三、实验结果

```
D:\study\vsproject\ConsoleApplication1-slove\x64\Debug\ConsoleApplication1.exe
menu
0. Exit
1. Create course table
2. Insert rows into course table
3. List rows in course table
```

基础菜单页面

```
menu
0. Exit
1. Create course table
2. Insert rows into course table
3. List rows in course table
1
The course table already exists,Do you want to delete it?
Delete the table?(y/n):y
Drop table course successfully

create table course successfully!
Success to insert rows to student table!
```

创建表的页面，因为调试过程创建过了，所以这里进行了删除后创建，并创建成功

```
mysql> use lab6
Database changed
mysql> show tables;
+----------------+
| Tables_in_lab6 |
+----------------+
| course         |
+----------------+
1 row in set (0.01 sec)

mysql> select * from course;
+-----+------------------------------+------+---------+
| cno | cname                        | cpno | ccredit |
+-----+------------------------------+------+---------+
| 1   | DatabaseSystem               | 5    |       4 |
| 2   | MathematicalAnalysis         | NULL |       2 |
| 3   | InformationSystems           | 1    |       3 |
| 4   | OperatingSystemPrinciple     | 6    |       3 |
| 5   | DataStructure                | 7    |       4 |
| 6   | FundamentalsOfDataProcessing | NULL |       4 |
| 7   | CLanguage                    | 6    |       3 |
+-----+------------------------------+------+---------+
7 rows in set (0.00 sec)

mysql>
```

在控制台中利用mysql语句进行查询，可以看到此时course表的创建以及表中基础数据的读入全部实现成功

```
menu
0. Exit
1. Create course table
2. Insert rows into course table
3. List rows in course table
3
cno: 1          cname: DatabaseSystem           cpno: 5         ccredit: 4
cno: 2          cname: MathematicalAnalysis             cpno: null              ccredit: 2
cno: 3          cname: InformationSystems               cpno: 1         ccredit: 3
cno: 4          cname: OperatingSystemPrinciple         cpno: 6         ccredit: 3
cno: 5          cname: DataStructure            cpno: 7         ccredit: 4
cno: 6          cname: FundamentalsOfDataProcessing             cpno: null              ccredit: 4
cno: 7          cname: CLanguage                cpno: 6         ccredit: 3
```

通过list函数来读出表中内容，可以看到list函数也实现成功

```
menu
0. Exit
1. Create course table
2. Insert rows into course table
3. List rows in course table
2
Please input cno(eg: 1) :
8
Please input cname(eg: DatabasePrinciple) :
RobotLearning
Please input cpno(eg: 5) :
null
Please input ccredit(eg: 4) :
5
insert into course(cno,cname,cpno,ccredit) values('8','RobotLearning',null,5);
execute successfully!
```

进行insert操作的尝试，因为mysql和控制台的编码似乎不太一样，一个是UTF8，另一个是GBk，所以用中文的时候不时会出现乱码的情况，这里我就都用英文名来做替代，上图是insert命令时的UI，此时发现成功

```
menu
0. Exit
1. Create course table
2. Insert rows into course table
3. List rows in course table
3
cno: 1          cname: DatabaseSystem           cpno: 5         ccredit: 4
cno: 2          cname: MathematicalAnalysis             cpno: null              ccredit: 2
cno: 3          cname: InformationSystems               cpno: 1         ccredit: 3
cno: 4          cname: OperatingSystemPrinciple         cpno: 6         ccredit: 3
cno: 5          cname: DataStructure            cpno: 7         ccredit: 4
cno: 6          cname: FundamentalsOfDataProcessing             cpno: null              ccredit: 4
cno: 7          cname: CLanguage                cpno: 6         ccredit: 3
cno: 8          cname: RobotLearning            cpno: null              ccredit: 5
menu
```

调用list命令，可以看到此时创建了一个新的行

```
mysql> select * from course;
+-----+-----------------------------+------+---------+
| cno | cname                       | cpno | ccredit |
+-----+-----------------------------+------+---------+
| 1   | DatabaseSystem              | 5    |       4 |
| 2   | MathematicalAnalysis        | NULL |       2 |
| 3   | InformationSystems          | 1    |       3 |
| 4   | OperatingSystemPrinciple    | 6    |       3 |
| 5   | DataStructure               | 7    |       4 |
| 6   | FundamentalsOfDataProcessing | NULL |       4 |
| 7   | CLanguage                   | 6    |       3 |
| 8   | RobotLearning               | NULL |       5 |
+-----+-----------------------------+------+---------+
8 rows in set (0.00 sec)

mysql>
```

控制台中也得到了相同的结果，说明本次实验成功。

附录（源代码）

```
#include<mysql.h>
#include<stdio.h>
#include<stdlib.h>
#include<winsock.h>
#include<iostream>
using namespace std;
MYSQL mysql;//声明为全局变量，待会在主函数，功能函数中都能对它访问
#pragma warning(disable:4996)
MYSQL_RES* result;

int create_course_table() {
    char yn[2];
    result = mysql_list_tables(&mysql, "course");//判断是否存在相同表
    unsigned long long num_row = mysql_num_rows(result);
    mysql_free_result(result);

    if (num_row) {
        printf("The course table already exists,Do you want to delete it?\n");
        printf("Delete the table?(y/n):");
        cin >> yn[0];
        if (yn[0] == 'y' || yn[0] == 'Y') {
            if (!mysql_query(&mysql, "drop table course;")) {//如果有，删除表
                cout << "Drop table course successfully\n\n";
            }
```

```
            else {
                cout << "ERROR: drop table course\n\n";
            }
        }
    }
    //创建
    int createflag = 1;//按照mysql格式来创建表
    if (mysql_query(&mysql, "create table course (cno char (2) not null primary
key,cname char (30)null,cpno char(2) null, ccredit smallint null,foreign
key(cpno) references course(cno) ) engine = innodb; ") == 0) {
        cout << "create table course successfully!" << endl;
    }
    else {
        cout << "ERROR: create table student" << endl;
    }
    //预输入一些数据来建表
    if (mysql_query(&mysql, "insert into course
values('2','MathematicalAnalysis',null,2);")==0 && \
        mysql_query(&mysql, "insert into course
values('6','FundamentalsOfDataProcessing',null,4);")==0 && \
        mysql_query(&mysql, "insert into course
values('4','OperatingSystemPrinciple','6',3);") == 0 && \
        mysql_query(&mysql, "insert into course values('7','CLanguage','6',3);")
== 0 && \
        mysql_query(&mysql, "insert into course
values('5','DataStructure','7',4);") == 0 && \
        mysql_query(&mysql, "insert into course
values('1','DatabaseSystem','5',4);") == 0 && \
        mysql_query(&mysql, "insert into course
values('3','InformationSystems','1',3);") == 0){

        printf("Success to insert rows to student table! \n\n");
    }
    else {
        printf("ERROR: insert rows\n\n");

    }

    return 0;

}
int insert_rows_into_course_table() {
    //设定字符串初值
    char tcno[] = "1";
    char tcname[] = "DatabasePrinciple";
    char tcpno[] = "5";
    char tccredit[]= "4";
    char strquery[100] = "insert into course(cno,cname,cpno,ccredit)
values('";//基础的语句格式
    char yn[2];
    while (1) {
        cout << "Please input cno(eg: 1) :" << endl;//UI中的输入引导
        cin >> tcno;
        strcat(strquery, tcno);
        strcat(strquery, "','");//不断做相同的拼接
```

```
        cout << "Please input cname(eg: DatabasePrinciple) :" << endl;
        cin >> tcname;
        strcat(strquery, tcname);
        strcat(strquery, "',");
        cout << "Please input cpno(eg: 5) :" << endl;
        cin >> tcpno;
        if (strcmp(tcpno, "null")==0|| strcmp(tcpno, "NULL") == 0) {//0为相等，1为
不相等
            strcat(strquery, "null");
        }//特殊情况判断，如果为NULL就不加引号
        else {
            strcat(strquery, "'");
            strcat(strquery, tcpno);
            strcat(strquery, "'");
        }
        strcat(strquery, ",");
        cout << "Please input ccredit(eg: 4) :" << endl;
        cin >> tccredit;
/*      int end = 0;
        end=strlen(strquery);
        strquery[end] = tccredit;*/
        strcat(strquery, tccredit);
        strcat(strquery, ");");
        cout << strquery << endl;
        if (mysql_query(&mysql, strquery) == 0) {
            cout << "execute successfully!" << endl;
        }
        else {
            cout << "ERROR: execute" << endl;
        }

    }
    return 0;
}
int list_all() {
    const char* query = "select cno, cname, cpno, ccredit from course;";//主体格式
    int t = mysql_query(&mysql, query);
    if (t != 0) {
        return 1;
    }
    result = mysql_store_result(&mysql);
    int num = mysql_field_count(&mysql);
    auto row = mysql_fetch_row(result);
    while (row) {
        for (int i = 0; i < num; ++i) {//每一行都要进行是否为null的判断
            switch (i) {
            case 0:
                cout << "cno: " << row[i] << "\t\t";
                break;
            case 1:
                cout << "cname: " << (row[i] ? row[i] : "null") <<"\t\t";
                break;
            case 2:
                cout << "cpno: " << (row[i] ? row[i] : "null") <<"\t\t";
                break;
```

```
            case 3:
                cout << "ccredit: " << (row[i] ? row[i]: "null") <<"\t\t";
                break;
            default:
                break;
            }
        }
        row = mysql_fetch_row(result);
        cout << '\n';
    }
    mysql_free_result(result);
    return 0;
}
int main(int argc, char** argv, char** envp)
{
    char fu[2];
    mysql_init(&mysql);//获得或初始化一个MYSQL结构
    if (mysql_real_connect(&mysql, "localhost", "root", "753951", "lab6", 3306,
0, 0)) {
        for (;;) {
            printf("menu\n");//菜单
            cout << "0. Exit" << endl;
            cout << "1. Create course table" << endl;
            cout << "2. Insert rows into course table" << endl;
            cout << "3. List rows in course table" << endl;

            cin >> fu[0];
            if (fu[0] == '0') {
                exit(0);
            }
            if (fu[0] == '1') {
                create_course_table();
            }
            if (fu[0] == '2') {
                insert_rows_into_course_table();
            }
            if (fu[0] == '3') {
                list_all();
            }
        }
    }
    else {
        printf("数据库不存在");
    }



    mysql_close(&mysql);//访问完毕，关闭mysql
    result = mysql_store_result(&mysql);
    mysql_free_result(result);
    system("pause");
    return 0;
}
```