

哈尔滨工业大学

<<数据库系统>>

实验报告之二

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姓名:	钟伟东
学号:	1140340116
学院:	计算机学院
教师:	高宏

实验二 使用高级语言操作 MySQL 数据库

一、实验目的

学会使用高级语言访问 MySQL 数据库，并进行查询。

二、实验环境

Win8.1 操作系统，XAMPP lite 2016 (PHP5.6, MySQL5.5.47)，DataGrip。

三、实验过程及结果

在命令行下执行 php 代码，例如 `php index.php company_query -q 1 -p P1`

这里给出对应数据库查询的结果，现场检查利用 php 查询的结果

1.

```
if ($stmt = $mysqli->prepare("SELECT ESSN FROM works_on WHERE PNO = ?;")) {  
    $stmt->bind_param("s", $ps1);  
    $stmt->execute();  
    $stmt->bind_result($ESSN);  
    $result = array();  
    while($stmt->fetch())  
    {  
        $result[] = array('ESSN'=>$ESSN);  
    }  
    // echo(json_encode($result));  
    $stmt->close();  
}
```

执行 `company_query -q 1 -p P1` 时

DataGrip 中代码执行结果：

```
Tmn07@TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 1 -p P1
array(9) (
  [0]=>
  array(1) (
    ["ESSN"]=>
    string(18) "115110938751468272"
  )
  [1]=>
  array(1) (
    ["ESSN"]=>
    string(18) "275880117842673312"
  )
  [2]=>
  array(1) (
    ["ESSN"]=>
    string(18) "281890531316145152"
  )
  [3]=>
  array(1) (
    ["ESSN"]=>
    string(18) "372250227593557440"
  )
  [4]=>
  array(1) (
    ["ESSN"]=>
    string(18) "566530408095635456"
  )
  [5]=>
  array(1) (
    ["ESSN"]=>
    string(18) "659017675955840000"
  )
  [6]=>
  array(1) (
    ["ESSN"]=>
    string(18) "857670399626567936"
  )
  [7]=>
  array(1) (
    ["ESSN"]=>
    string(18) "902222483733721088"
  )
  [8]=>
```

2.

```

if ($stmt = $mysqli->prepare("SELECT ENAME FROM employee, project, works_on WHERE
employee.ESSN = works_on.ESSN AND works_on.PNO = project.PNO AND project.PNAME
= ?;")) {
    $stmt->bind_param("s", $ps1);
    $stmt->execute();
    $stmt->bind_result($ENAME);
    $result = array();
    while($stmt->fetch())
    {
        $result[] = array('ENAME'=>$ENAME);
    }
    $stmt->close();
}

```

执行 company_query -q 2 -p SQLProject

```

Tmn07@TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 2 -p SQLProject
array(3) <
    [0]=>
        array(1) <
            ["ENAME"]=>
                string(3) "牛8"
        >
    [1]=>
        array(1) <
            ["ENAME"]=>
                string(4) "赵62"
        >
    [2]=>
        array(1) <
            ["ENAME"]=>
                string(4) "张91"
        >
    >

```

3.

```

if ($stmt = $mysqli->prepare("SELECT ENAME, ADDRESS FROM employee NATURAL JOIN
department WHERE department.DNAME = ?;")) {
    $stmt->bind_param("s", $ps1);
    $stmt->execute();
    $stmt->bind_result($ENAME, $ADDRESS);
    $result = array();
    while($stmt->fetch())
    {
        $result[] = array('ENAME'=>$ENAME, 'ADDRESS'=>$ADDRESS);
    }
    $stmt->close();
}

```

company_query -q 3 -p database

```

Tmn07@TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 3 -p database
array(11) {
  [0]=>
  array(2) {
    ['ENAME']=>
    string(4) "吴99"
    ['ADDRESS']=>
    string(2) "A1"
  }
  [1]=>
  array(2) {
    ['ENAME']=>
    string(4) "张91"
    ['ADDRESS']=>
    string(2) "B1"
  }
  [2]=>
  array(2) {
    ['ENAME']=>
    string(4) "孙70"
    ['ADDRESS']=>
    string(2) "B2"
  }
  [3]=>
  array(2) {
    ['ENAME']=>
    string(4) "牛99"
    ['ADDRESS']=>
    string(2) "C0"
  }
  [4]=>

```

4.

```

if ($stmt = $mysqli->prepare("SELECT ENAME, ADDRESS, SALARY FROM employee NATURAL
JOIN department WHERE department.DNAME = ? AND SALARY < ?;")) {
    $stmt->bind_param("sd", $ps1, $ps2);
    $stmt->execute();
    $stmt->bind_result($ENAME, $ADDRESS, $SALARY);
    $result = array();
    while($stmt->fetch())
    {
        $result[] = array('ENAME'=>$ENAME, 'ADDRESS'=>$ADDRESS, 'SALARY'=>$SALARY);
    }
    $stmt->close();
}

```

company_query -q 4 -p database 3000

```

Tmn07@TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 4 -p database 3000
array(5) {
  [0]=>
  array(3) {
    ["ENAME"]=>
    string(4) "张91"
    ["ADDRESS"]=>
    string(2) "B1"
    ["SALARY"]=>
    int(528)
  }
  [1]=>
  array(3) {
    ["ENAME"]=>
    string(4) "孙70"
    ["ADDRESS"]=>
    string(2) "B2"
    ["SALARY"]=>
    int(317)
  }
  [2]=>
  array(3) {
    ["ENAME"]=>
    string(4) "牛99"
    ["ADDRESS"]=>
    string(2) "C0"
    ["SALARY"]=>
    int(923)
  }
  [3]=>
  array(3) {
    ["ENAME"]=>
    string(4) "牛58"
    ["ADDRESS"]=>
    string(2) "A2"
    ["SALARY"]=>
    int(2837)
  }
  [4]=>

```

5.

```

if ($stmt = $mysqli->prepare("SELECT ENAME FROM employee WHERE ESSN NOT IN ( SELECT
    ESSN FROM works_on WHERE PNO = ? );")) {
    $stmt->bind_param("s", $ps1);
    $stmt->execute();
    $stmt->bind_result($ENAME);
    $result = array();
    while($stmt->fetch())
    {
        $result[] = array('ENAME'=>$ENAME);
    }
    $stmt->close();
}

```

company_query -q 5 -p P1

```
Tmn07@TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 5 -p P1
array(44) {
  [0]=>
  array(1) {
    ['ENAME']=>
    string(4) "吴99"
  }
  [1]=>
  array(1) {
    ['ENAME']=>
    string(4) "马20"
  }
  [2]=>
  array(1) {
    ['ENAME']=>
    string(4) "王24"
  }
  [3]=>
  array(1) {
    ['ENAME']=>
    string(4) "张73"
  }
}
```

6.

```
if ($stmt = $mysqli->prepare("SELECT ENAME, DNAME FROM employee NATURAL JOIN
department WHERE SUPERSSN = ?;")) {
    $stmt->bind_param("s", $ps1);
    $stmt->execute();
    $stmt->bind_result($ENAME, $DNAME);
    $result = array();
    while($stmt->fetch())
    {
        $result[] = array('ENAME'=>$ENAME, 'DNAME'=> $DNAME);
    }
    $stmt->close();
}
```

company_query -q 6 -p 263155610568965632

```

Tmn07@TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 6 -p 263155610568965632
array(5) {
  [0]=>
  array(2) {
    ["ENAME"]=>
    string(3) "钱3"
    ["DNAME"]=>
    string(8) "database"
  }
  [1]=>
  array(2) {
    ["ENAME"]=>
    string(4) "钱78"
    ["DNAME"]=>
    string(8) "database"
  }
  [2]=>
  array(2) {
    ["ENAME"]=>
    string(4) "牛58"
    ["DNAME"]=>
    string(8) "database"
  }
  [3]=>
  array(2) {
    ["ENAME"]=>
    string(3) "赵8"
    ["DNAME"]=>
    string(8) "database"
  }
  [4]=>
  array(2) {
    ["ENAME"]=>
    string(4) "关29"
    ["DNAME"]=>
    string(8) "database"
  }
}

```

7.

```

if ($stmt = $mysqli->prepare("SELECT essn FROM employee NATURAL JOIN works_on WHERE
    pno = ? AND essn IN ( SELECT essn FROM employee NATURAL JOIN works_on WHERE
    pno = ? );")) {
    $stmt->bind_param("ss", $ps1,$ps2);
    $stmt->execute();
    $stmt->bind_result($essn);
    $result = array();
    while($stmt->fetch())
    {
        $result[] = array('ESSN'=>$essn);
    }
    $stmt->close();
}

```

company_query -q 7 -p P1 P2


```

Tmn070TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 7 -p P1 P2
array(4) {
  [0]=>
  array(1) {
    ['ESSN']=>
    string(18) "281890531316145152"
  }
  [1]=>
  array(1) {
    ['ESSN']=>
    string(18) "372250227593557440"
  }
  [2]=>
  array(1) {
    ['ESSN']=>
    string(18) "659017675955840000"
  }
  [3]=>
  array(1) {
    ['ESSN']=>
    string(18) "857670399626567936"
  }
}

```

8.

```

if ($stmt = $mysqli->prepare("SELECT DNAME FROM department NATURAL JOIN employee
GROUP BY department.DNO HAVING avg(SALARY) < ?;")) {
    $stmt->bind_param("d", $ps1);
    $stmt->execute();
    $stmt->bind_result($DNAME);
    $result = array();
    while($stmt->fetch())
    {
        $result[] = array('DNAME'=>$DNAME);
    }
    $stmt->close();
}

```

company_query -q 8 -p 3000

```

Tmn07@TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 8 -p 3000
array(3) {
    [0]=>
    array(1) {
        ["DNAME"]=>
        string(8) "frontend"
    }
    [1]=>
    array(1) {
        ["DNAME"]=>
        string(19) "Research Department"
    }
    [2]=>
    array(1) {
        ["DNAME"]=>
        string(6) "server"
    }
}

```

9.

```

if ($stmt = $mysqli->prepare("SELECT ENAME FROM employee, works_on WHERE employee.
    ESSN = works_on.ESSN GROUP BY works_on.ESSN HAVING sum(HOURS) < ? AND count(*)
    >= ?;")) {
    $stmt->bind_param("dd", $ps1, $ps2);
    $stmt->execute();
    $stmt->bind_result($ENAME);
    $result = array();
    while($stmt->fetch())
    {
        $result[] = array('ENAME'=>$ENAME);
    }
    $stmt->close();
}

```

company_query -q 9 -p 108 1

```
Imn07@TMN07 d:\xampp\htdocs\dbc\class
# php index.php company_query -q 9 -p 108 1
array(7) {
  [0]=>
  array(1) {
    ["ENAME"]=>
    string(3) "牛8"
  }
  [1]=>
  array(1) {
    ["ENAME"]=>
    string(4) "李90"
  }
  [2]=>
  array(1) {
    ["ENAME"]=>
    string(4) "周73"
  }
  [3]=>
  array(1) {
    ["ENAME"]=>
    string(4) "张红"
  }
  [4]=>
  array(1) {
    ["ENAME"]=>
    string(4) "张91"
  }
  [5]=>
  ...
}
```

四、实验心得

学会使用高级语言访问 MySQL 数据库，并进行查询。封装得当的话，可以省下很多冗余代码。