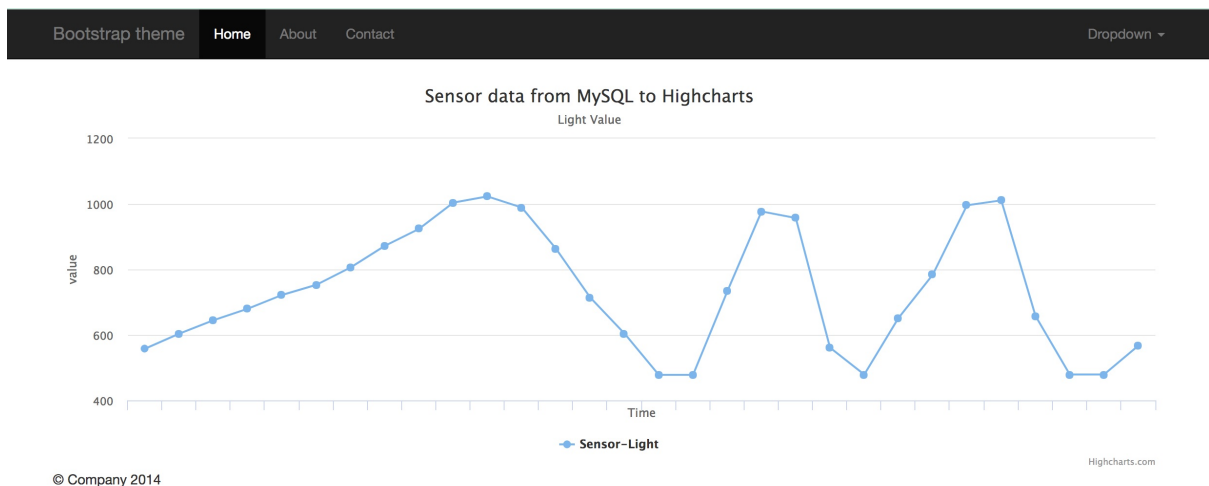


# 物聯網應用與資料分析 Assignment1 - MySQL+Arduino+Java Web+Highchart

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## 1 目標

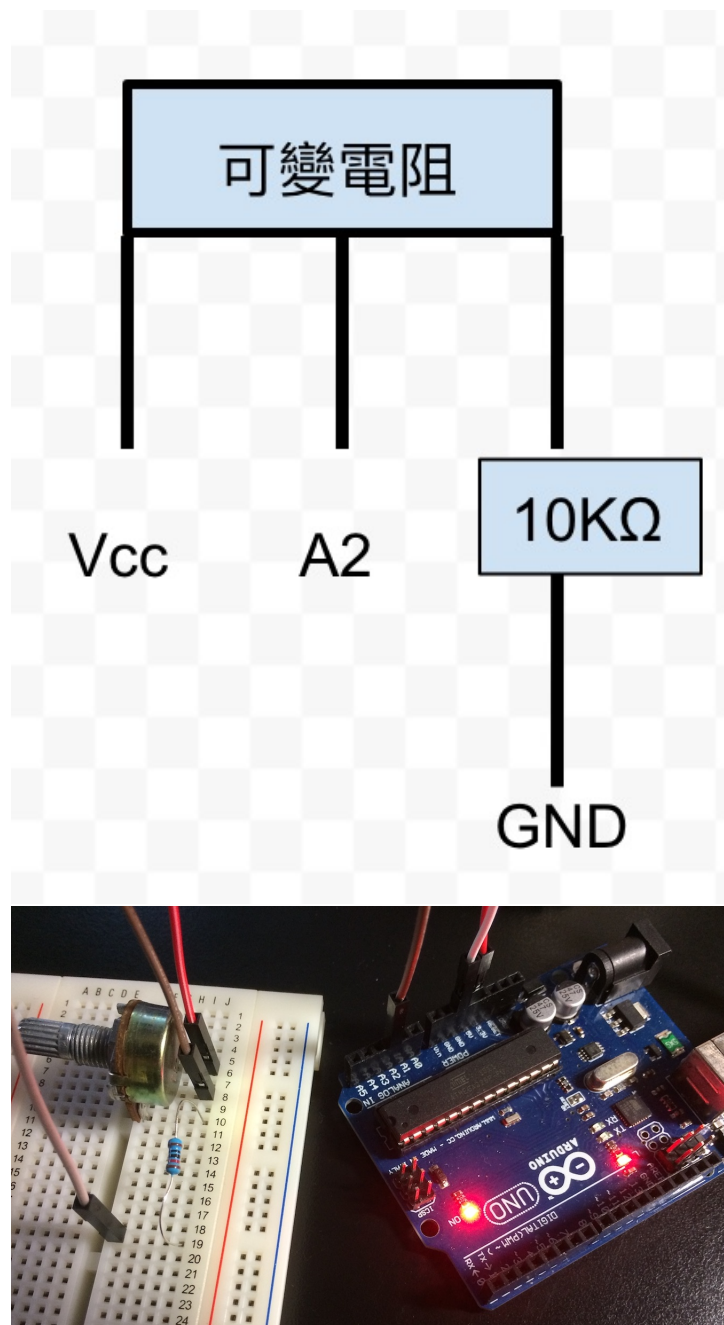
利用 Arduino 輸出數值，透過 Java 讀值後寫入 MySQL，最後再透過 PHP 跟 MySQL 取得數值並畫出曲線產生在網頁上。



## 2 Arduino

### 2.1 接腳圖

利用 Arduino、麵包板、可變電阻、10K $\Omega$  電阻



## 2.2 取得 Arduino 輸出的數值

程式碼：

```
int pin = A2;

void setup()
{
    Serial.begin(9600);
}

void loop()
{
    int value = analogRead(pin);
    Serial.println(value);
    delay(1000);
}
```

輸出情況：



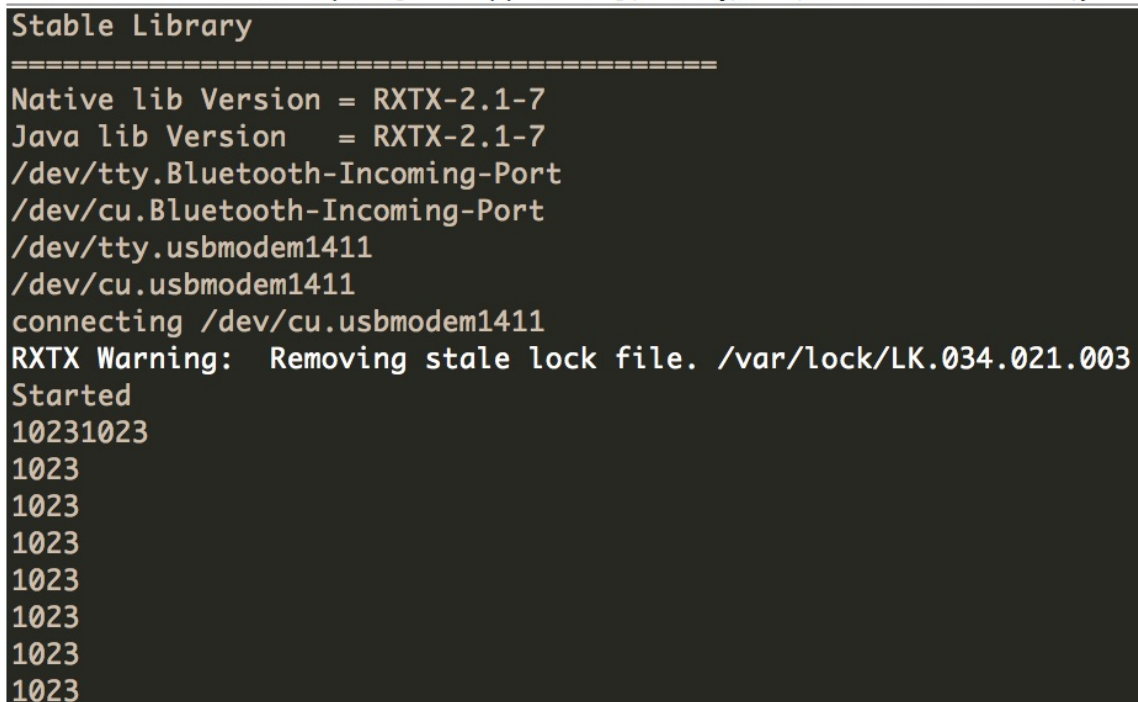
## 2.3 利用 Java 讀取 Arduino 數值

此次使用的平台是 MacOS，所以 port ID 是"/dev/cu.usbmodem1411"，另外，要知道如何在 MacOS 上實作可以參考我寫的另外一篇 [RXTX, Serial ports on macOS](#)

擷取部分重要程式碼：

```
// 掃過所有的 port
while (portEnum.hasMoreElements()) {
    // 定義 currPortId
    CommPortIdentifier currPortId =
        (CommPortIdentifier)portEnum.nextElement();
    // 設定 arduino serial port
    if (currPortId.getName().equals("/dev/cu.usbmodem1411")) {
        portId = currPortId;
        break;
    }
}
```

數值顯示在 Console：



```
Stable Library
=====
Native lib Version = RXTX-2.1-7
Java lib Version   = RXTX-2.1-7
/dev/tty.Bluetooth-Incoming-Port
/dev/cu.Bluetooth-Incoming-Port
/dev/tty.usbmodem1411
/dev/cu.usbmodem1411
connecting /dev/cu.usbmodem1411
RXTX Warning: Removing stale lock file. /var/lock/LK.034.021.003
Started
10231023
1023
1023
1023
1023
1023
1023
1023
1023
```

## 3 MySQL

### 3.1 建立資料庫資料

利用 XAMPP，用網頁連接到 <http://localhost/phpmyadmin> 並建立此次作業需要的資料庫



#	名稱	型態	編碼與排序	屬性	空值	預設值	備註	額外資訊	動作
<input type="checkbox"/> 1	id	int(11)		UNSIGNED	否	無		AUTO_INCREMENT	<a href="#">修改</a> <a href="#">刪除</a> <a href="#">更多</a>
<input type="checkbox"/> 2	time	timestamp		on update CURRENT_TIMESTAMP	否	CURRENT_TIMESTAMP		ON UPDATE CURRENT_TIMESTAMP	<a href="#">修改</a> <a href="#">刪除</a> <a href="#">更多</a>
<input type="checkbox"/> 3	value	double			否	無			<a href="#">修改</a> <a href="#">刪除</a> <a href="#">更多</a>

### 3.2 Java 寫值進 MySQL

在 Java 上設定資料庫的資料

```
// 設定 server IP, 帳號, 密碼

// 設定 JDBC driver
static final String JDBC_DRIVER = "com.mysql.jdbc.Driver";
// server IP 後接資料庫名稱
static final String DB_URL = "jdbc:mysql://192.168.1.111/iot";
static final String USER = "iot";
static final String PASS = "iot";
```

Console :

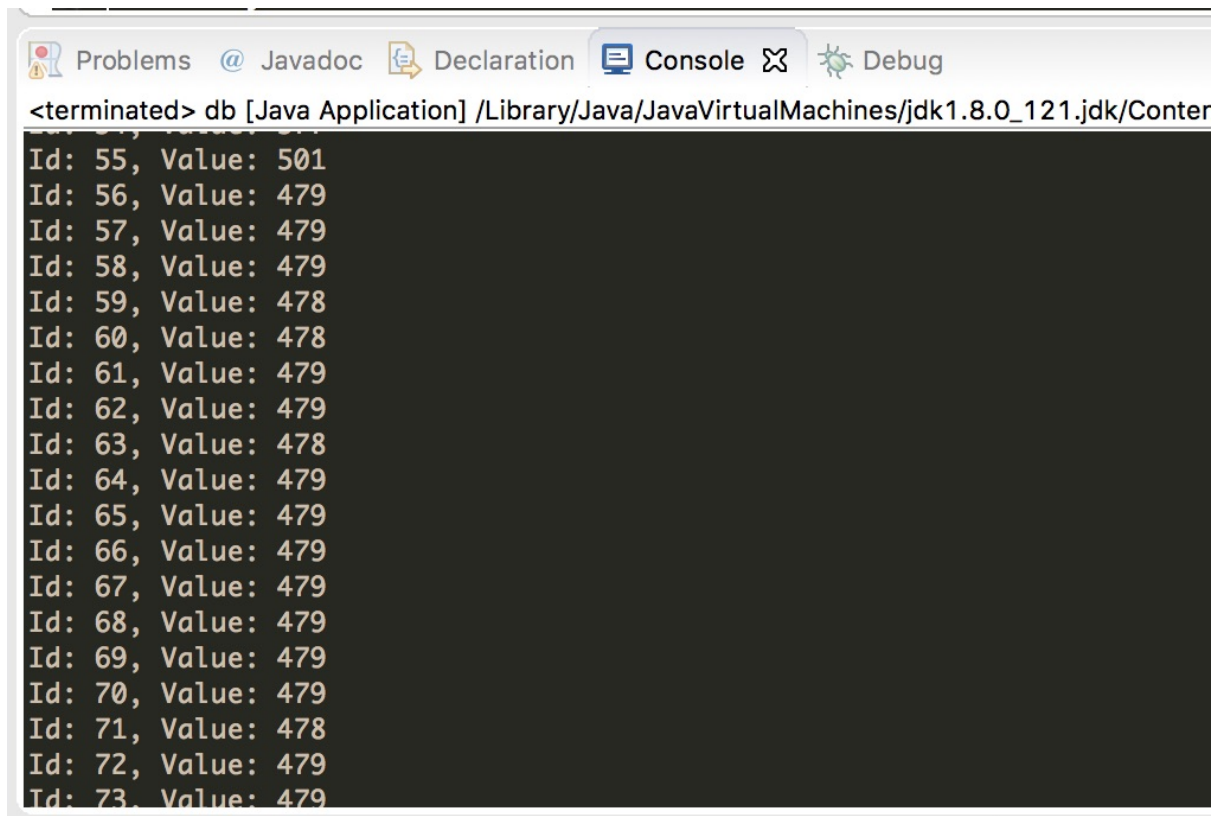
```
Stable Library
=====
Native lib Version = RXTX-2.1-7
Java lib Version   = RXTX-2.1-7
RXTX Warning: Removing stale lock file. /var/lock/LK.034.021.003
Started
SQL Connection to database established!
6
Connection closed !!
SQL Connection to database established!
665
Connection closed !!
SQL Connection to database established!
665
Connection closed !!
SQL Connection to database established!
665
Connection closed !!
SQL Connection to database established!
```

### 3.3 Java 連接 MySQL 讀值

透過 Java 連接 MySQL，並取出剛剛寫入的數值

```
// 建立一個物件傳送 SQL statement 到 database
statement = (Statement) connection.createStatement();
String sql= "SELECT * FROM light";
//執行 sql 語法，回傳語法結果
ResultSet rs = statement.executeQuery(sql);
    while(rs.next()){
        // 檢索每行的欄位
        int id  = rs.getInt("id");
        int value = rs.getInt("value");
        //將 value print 出來
        System.out.print("Id: " + id);
        System.out.println(", Value: " + value);
    }
```

Console :



The screenshot shows an IDE's Console window with the following tabs: Problems, Javadoc, Declaration, Console, and Debug. The Console window displays the output of a Java application, which is a list of database records. The records are formatted as "Id: X, Value: Y". The records start with "Id: 55, Value: 501" and end with "Id: 73, Value: 479". The records are as follows:

Id	Value
55	501
56	479
57	479
58	479
59	478
60	478
61	479
62	479
63	478
64	479
65	479
66	479
67	479
68	479
69	479
70	479
71	478
72	479
73	479

### 3.4 產生 light.jar 檔

把 Java 寫數值入 MySQL 的 class 匯出 (此處是把老師提供的 datatomysql 這份專案匯出)，產生 light.jar 檔案。並從 Terminal 執行 jar 檔，並持續的寫值進入 MySQL 中。

開啟 Terminal，並輸入以下指令

```
java -jar light.jar
```

下圖可以看到，Terminal 上顯示 light.jar 一直在把數值寫入 MySQL

```
Lecture3 — -bash — 80x30
/home/.../Lecture3
$ java -jar light.jar
Experimental: JNI_OnLoad called.
Stable Library
=====
Native lib Version = RXTX-2.1-7
Java lib Version   = RXTX-2.1-7
RXTX Warning: Removing stale lock file. /var/lock/LK.034.021.003
Started
SQL Connection to database established!
73734
Connection closed !!
SQL Connection to database established!
911
Connection closed !!
SQL Connection to database established!
1023
Connection closed !!
SQL Connection to database established!
949
Connection closed !!
SQL Connection to database established!
718
Connection closed !!
SQL Connection to database established!
678
Connection closed !!
SQL Connection to database established!
932
Connection closed !!
```



## 4 Web

### 4.1 PHP

填入 MySQL 的一些重要資訊。需注意原本提供的程式碼是使用新版已經被 deprecated 的 function 所以執行上會有錯誤，基本上是把 mysql 改成 mysqli，並調整帶入的參數即可

```
<?php
    //user information
    $host = "192.168.1.111";
    $user = "iot";
    $pass = "iot";

    //database information
    $databaseName = "iot";
    $tableName = "light";

    //Connect to mysql database
    $con = mysqli_connect($host,$user,$pass);
    $db = mysqli_select_db($con, $databaseName);

    //Query database for data
    $result = mysqli_query($con, "SELECT * FROM $tableName");

    //store matrix
    $i=0;
    while ($row = mysqli_fetch_array($result)){
        $employee[$i]=$row;
        $i++;
    }

    //echo result as json
    echo json_encode($employee);
?>
```

## 4.2 High Chart

畫曲線圖的部分需要注意資料庫比數，因為程式上需要大於 30 筆，才會顯示所以當你一開始資料筆數不夠的話會造成曲線圖出不來

```
var time = [];  
var val = [];  
//for (var i = 0, len = data.length; i < len; i++)  
for (var i = 30, len = data.length; i > 0; i--)  
{  
    time.push(data[len-i][1]);  
    val.push(parseInt(data[len-i][2])); //將每筆光敏值放入陣列val中  
}
```

## 4.3 執行結果

最後都完成後，從網頁進入 <http://localhost/iot/highchart.html> 就可以看到下圖這時候只要轉動可變電阻，即可看到曲線變化

