ULTRAVIOLET RADIATION
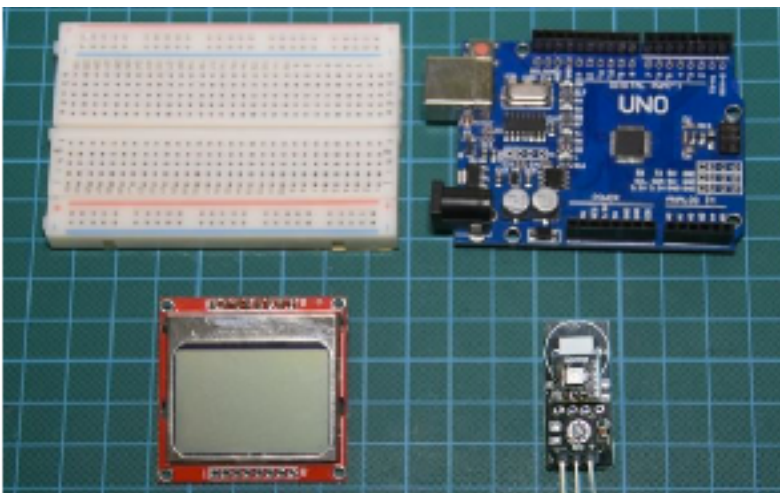# CONSTRUCTION OF A UV METRE

Interdisciplinary Bilingual Project

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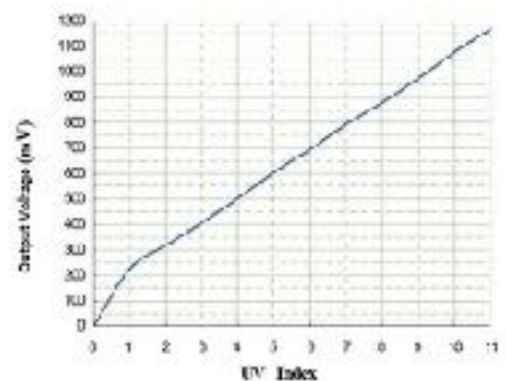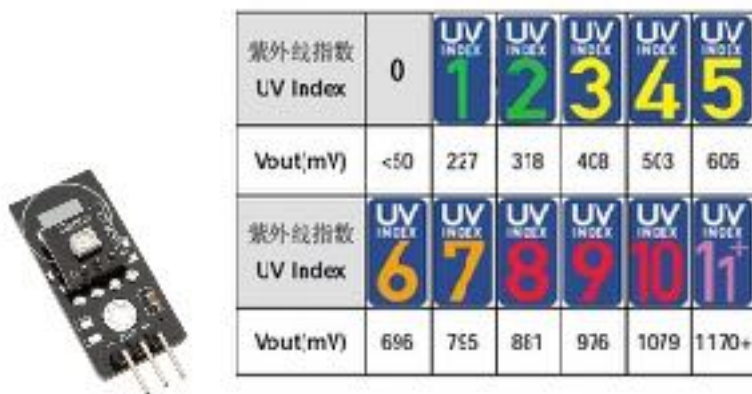**Step 1:** Get All the Parts

The parts needed in order to build this project are:

1. An Arduino Uno
2. A UV sensor
3. A Nokia 5110 LCD display
4. A small breadboard
5. Some wires

The cost of the project is very low - about $18.

Step 2 : The UV Sensor - UVM-30A

紫外线指数 UV Index	0	1	2	3	4	5
Vout(mV)	<50	227	318	408	503	606
紫外线指数 UV Index	6	7	8	9	10	11+
Vout(mV)	696	795	881	976	1079	1170+

The UV Sensor is used to detect the intensity of incident ultraviolet (UV) radiation. This form of electromagnetic radiation has shorter wavelengths than visible radiation. This module is based on the sensor UVM-30A, which has a wide spectral range of 200nm-370nm. The module outputs electrical signal which varies with the UV intensity, which suggests whether it is a good idea to go under the sun today.

Specification

Operating voltage: DC 3-5V

Output voltage: DC 0-1V

Test accuracy: 1 UV INDEX

Operating Current: typ 0.06mA maximum value of 0.1mA

Response wavelength: 200nm-370

Job stability: -20 C~85 C

1. Designed specifically for the needs of high reliability and precision of measuring UV Index (UVI) occasion;
2. Suitable for measuring the total amount of sunlight UV intensity;
3. Control the grading standards of the World Health Organization UV Index;
4. Detection UV wavelength: 200-370nm;

This UV sensor is an analog sensor with almost liner output, so it does not output the UV index directly. Its output voltage depends on the UV radiation it detects. So, the higher the UV radiation, the higher the output voltage on its output pin. The datasheet offers a graph and the values that we need in order to calculate the UV index (see the attached images).

Step 3: Nokia 5110 LCD Display

The Nokia 5110 is a basic graphic LCD screen which was originally intended as a cell phone screen. It uses the PCD8544 controller which is a low power CMOS LCD controller/driver. Because of this, this display has an impressive power consumption. It uses only 0.4mA when it is on but the backlight is disabled. It uses less than 0.06mA when in sleep mode! That's one of the reasons that make this display my favourite.

The PCD8544 interfaces to microcontrollers through a serial bus interface. That makes the display very easy to use with Arduino. You only need to connect 8 wires and use the following library:

Step 4: Building the UV Metre

Let's now connect all the parts together.
First we connect the UV sensor module. It only has 3 pins.

Connecting the Voltage Sensor

- Pin goes to Arduino's GND

+ Pin goes to Arduino's 3.3V

S Pin goes to Analog Pin 0

The next step is to connect the Nokia 5110 LCD display.

Now that we have connected all the parts together, all we have to do is load the code. A Splash screen is displayed for a couple of seconds and then we can start measuring UV Index in Real Time!

Step 5: The Code of the Project

The code of the project consists of 3 files.

1. splash.c

2. ui.c

3. UVMeter.ino

splash.c Code - Splash Screen Image

In the first file splash.c, there are the binary values of the splash screen that is displayed on the Nokia 5110 LCD display when the project boots up.

ui.c Code - The User Interface

In the file ui.c, there are the binary values of user interface that appear after the project shows the splash screen.

UVMeter.ino Code - Main Program

The main code of the project is very simple. We need to include the Nokia 5110 library. Next we declare some variables. We initialize the display and we display the splash screen for 3 seconds. After that, we print the ui icon once, and we read the analog value from the sensor every second.

This function reads the analog value from the sensor and converts that value into a UVIndex String according to the datasheet. It is a simple if-else loop. Then all we have to do is to display that value on the display.

Connecting the UV Module - ML 8511

Next, connect the following ML8511 breakout board to Arduino:

```
ML8511 / Arduino
3.3V = 3.3V
OUT = A0
GND = GND
EN = 3.3V
Arduino 3.3V = Arduino A1
```