ARDUINO BASED UV CARE SYSTEM WITH GSM MODULE

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Abstract: As Ozone layer depletes in the stratosphere, the harmful ultraviolet rays are entering to the Earth's atmosphere. As the UV rays are increasing, the dangers of them are greater. So, we need to take care of ourselves much better. The system "Arduino UV Care" acts as a measurement tool and sends the information to the users. This system is designed with the use of the Arduino, the ultraviolet sensor (UVM30A), Nokia 5110 LCD is used to display the UV index from the sun being experienced in a particular place and at a particular time and GSM Sim 900 A Module for sending and receiving messages. The purpose of the system is to prevent people from the dangers caused by high UV index rays as it could lead to things like sunburn, skin cancer etc. It is also measured to guide people, so they can take adequate protective measures, like the use of sunscreens, sunglasses, hats etc. on a day out.

Keywords: Arduino Uno; UV Sensor; Nokia LCD; GSM Module

1. INTRODUCTION

Nowadays, the numbers of population are increasing day by day. According to the population more space, factor, vehicle, etc are needed for their life. Our world is protected from penetrating of the Sun's UV radiation through the atmosphere. Today the Ozone layer is getting depleted by the chemical and air pollution caused by human activities. The Ozone layer is important because it is just like sunscreen it protects us from a lot of sun.

2. OVERVIEW OF THE SYSTEM

The Arduino UV Care system is about for measuring the UV index in a particular place at a particular time to prevent people from the danger caused by high UV index rays, People are rightly concerned the UV index. It is also measured to guide people, so they can take adequate protective measures, like the use of sunscreens, sunglasses, hats etc. on a day out.

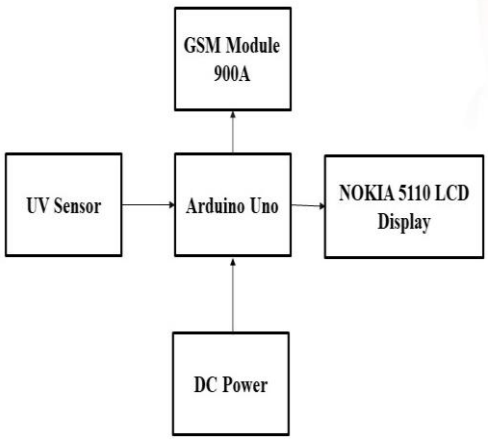

Figure 1. Block Diagram of the UV Care System

The product is connected with GSM module. By installing the item, many people can take advantages of information concurrently. This system is designed by using Arduino Uno microcontroller, GSM Module (SIM 900A), Nokia 5110 LCD and UV detection sensor. The block diagram of the UV care system is shown in Figure1.

3. SYSTEM REQUIREMENTS AND DESIGN

The components of the system are mainly divided into two types: hardware and software requirements.

3.1. Hardware Requirements

Hardware requirements of the system are shown in Table1:.

Table 1. Component Lists

No.	Components
1	Arduino Uno Microcontroller
2	UV Sensor UVM 30A
3	Nokia 5110 LCD display
4	GSM SIM 900A Module

3.2. Software Requirements

The system requires a program that must be the implement to the microcontroller. Programming language for the Arduino microcontroller is C language. To run the program to the microcontroller needed software that is Arduino IDE.

3.3. System Design

The system design includes software implementation and hardware implementation. Arduino Uno microcontroller, UV Sensor UVM 30A, Nokia 5110 LCD display, GSM SIM 900A Module are used for hardware implementation. C programming language is used for software implementation.

3.3.1. Arduino Uno Microcontroller Board

It is an open source platform used for building electronics projects. It consists of both a physical programmable circuit board and a piece of software, or IDE that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with Electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware in order to load new code onto the board you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard from factor that breaks out the functions of the microcontroller into a more accessible package. An Arduino Uno board is shown in Figure2.

Figure 2. Arduino Uno Microcontroller

3.3.2. UV Sensor

The UV Sensor show in Figure3 is used for detecting 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.

Specification:
Operating voltage: DC 3-5V
Output voltage: DC 0-1V
Test accuracy: 1 UV INDEXES

Operating Current: type 0.06mA maximum value of 0.1 mA

Response wavelength: 200nm-370nm

It is designed specifically for the needs of high reliability and precision of measuring UV Index (UVI) occasion. It is suitable for measuring the total amount of sunlight UV intensity. It controls the grading standards of the World Health Organization UV Index. This UV sensor is an analog sensor with almost liner output, so it does not output the UV index directly. It's output voltage depends on the UV radiation it detects. So, the higher the UV radiation, the higher the output voltage on its output pin.

Figure 3. UV Sensor UVM 30A

3.3.3 Nokia 5110 LCD

The Nokia 5110 display show in Figure 4 is basically a graphic LCD display useful for a lot of applications. It was intended originally to be used as screen for cell phones and was used in lots of mobile phones during the 90's. It displays UV index in digit according to the detect of UV sensor. It uses a low powered CMOS LCD controller/driver PCD8544, which drives the graphic display of size 84x48. In a normal state, the display consumes about 6 to 7mA which makes it quite ideal for low power usage.

Figure 4. Nokia 5110 LCD Display

Display-Arduino Pin 1 (RST)-D12
Pin 2(CE) – D11
Pin 3(DC) – D10
Pin 4(DIN) – D9
Pin 5(CLK) – D8
Pin 6(VCC) – VCC
Pin 7(LIGHT) – GND
Pin 8(GND) – GND

3.3.4 GSM SIM 900A Module

This module is a breakout and minimum system of SIM900A Dual-band GSM/GPRS module. It can communicate with controller's vis AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands). This module supports software power and resets. It is a GSM/GPRS based device used for sending and receiving of the messages. A GSM Sim 900A Module is described in Figure 5.

Figure 5. GSM SIM 900A Module

Features
- Based on SIMCOM SIM900Achip
- Dual band GSM/GPRS module
- Serial port circuit with protection
- Control via AT command
- SMS text or PDU mode
- Signal and RING LED indicator
- Compatible with Arduino, Raspberry pi, etc
- Can be directly connected to computer via Serial Port (Use GSM Tester or write your own Software)

Rated operating voltage:5V DC
Package Included
1xSIM900A
- 1xPower Cable
- 1xAntenna

Pin out
- VCC5=5V supply in
- GND=Ground
- 3VT=TXD (Output, 3.3V)
- 3VR=RXD (Input, 3.3V)
- 5VT=TXD (Output, 5V)
- 5VR=RXD (Input, 5V)
- VCC=Unused
- DB9-2=RS232 TX(Output)
- DB9-3=RS232 RX(Input)

4. IMPLEMENTATION OF THE SYSTEM

In this paper, C Programming language is used for implementation the software program to interface the hardware circuit. Proteous Design Suite is just used to implement this paper for simulation before interfacing the C program and hardware circuit design must be interfaced practically by using Proteous compiler to test the operation of the system**.**

4.1. Flow Chart of the Software System

The "Arduino UV Care" system is a device that measure UV rays from the sensor. The sensor senses UV rays under the sunlight and display the UV Index on the LCD. So that the users can easily know how much the UV rays are increasing. If the device is placed on the public construction, the user can make a phone call to know the UV Index. And then the device can give the information that the basic ways of how to protect themselves.

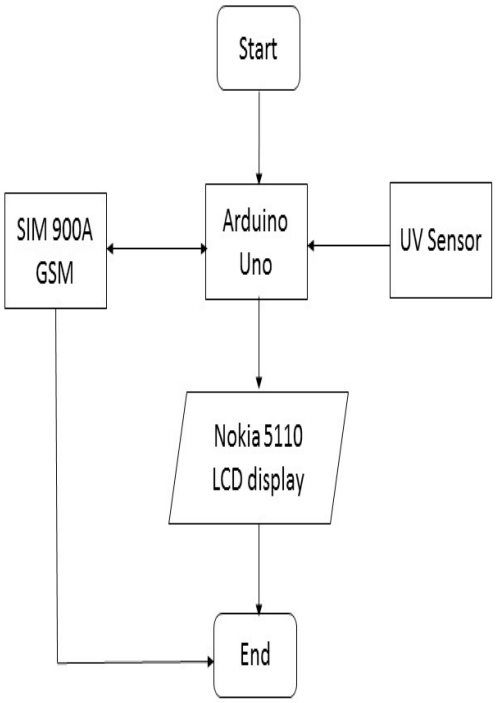

Figure 6. Flow Chart of the Arduino UV Care System

4.2 Implementation System Design

To build a circuit, we connect Arduino pin 12 to RST pin, pin 11 to CE pin, pin 10 to DC pin, pin 9 to DIN pin, pin 8 to CLK pin of the Nokia LCD. We give 5V to VCC pin of the Nokia LCD.

The BL pin and GND pin of the Nokia LCD are connected to the GND pin of the Arduino. And then we connect GND pin of the UV Sensor to the GND of the Arduino and VCC pin join to the 5V of the Arduino. The A out pin of the UV Sensor is connected to the A0 of the Arduino. Finally, we connect GSM Module (RX, TX) pin to the Arduino pins of 5 and 6. The schematic diagram of the system is shown in Figure 7 using the simulation tool Protecus.

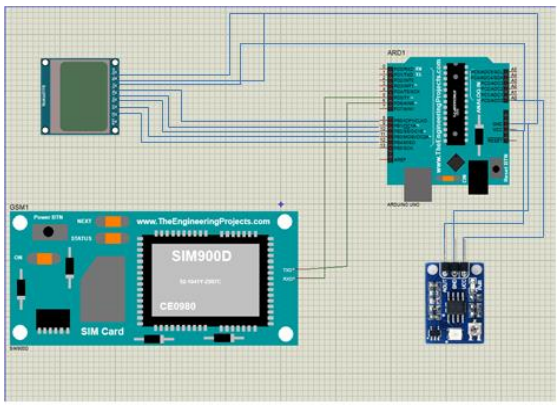

Figure 7. Schematic Diagram for Arduino UV Care

When the user desires to know the UV index, they make the phone call to the device. The current UV index is replied with the SMS message to user's mobile phone as shown in Figure 8.

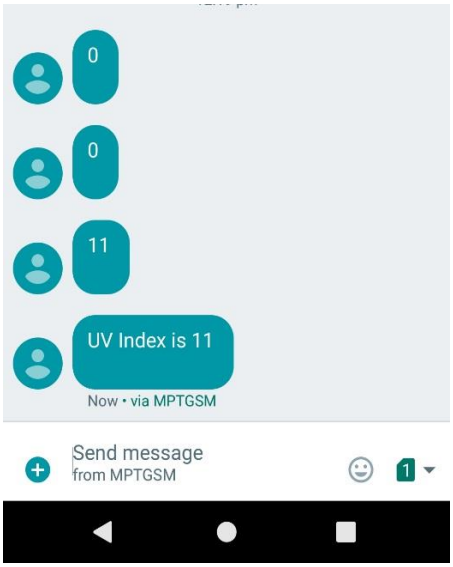

Figure 8. SMS Message in User's Mobile Phone

5. CONCLUSION

It's a good choice to design UV care to prevent from UV's dangers. By using this system, we can be aware of skin cancer, corneal damage, muscular degeneration, suppression of immune system to diseases and DNA damage etc. By using our system, they can take necessary precaution before going out in the UV rays. Health is the most important part for human. Our system is about using with GSM SIM 900A module, which can send message to our users.

6. ACKNOWLEDGEMENTS

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