

# Ultraviolet Radiation Measurement via Smart Devices

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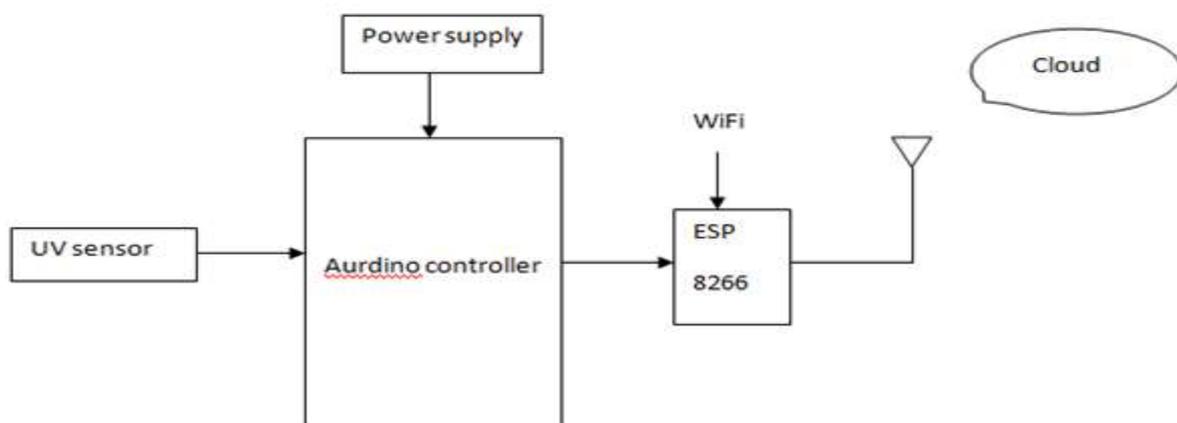
**Abstract** - Sun is an essential factor for our wellbeing, an excessive amount of introduction to daylight may cause medical issues going from sunburns to skin malignancy. Despite the fact that individuals know about these dangers, daylight related skin harms have expanded over the previous decades. These days, people in general essentially get data about UV brilliance through climate estimates. Be that as it may, they give unpleasant and normal predication to a specific vast locale. This paper presents an idea that can quantify UV brilliance by utilizing UV sensors which will distinguish the radiation. What's more, by using Arduino microcontroller we can control and show the preparatory strides to be taken. Android application is created to know the detected esteem

**Index Terms** - UV measurement, UV radiance, UV sensors, LCD display

## I. INTRODUCTION

Bright (UV) radiation is unsafe to human wellbeing. Numerous investigations have demonstrated that UV is contained in daylight and is a cancer-causing agent, which can cause skin growth. At present, the best method to square UV radiation is applying sunscreen. Be that as it may, numerous individuals disregard ensuring their skin essentially on the grounds that they don't have the foggiest idea about the power of UV radiation outside. It will be vital and supportive to give an approach to give individuals a chance to quantify UV beams advantageously and precisely. There are two noteworthy kinds of hardware, which can quantify UV radiation. The primary sort is spectroradiometers, which are essentially utilized as a part of research centers. In spite of the fact that spectroradiometers can give amazingly precise outcomes, they are very costly and complex to work. The second kind is compact advanced UV meters. There are a few varieties in this write. Some are little and simple to convey, however are not fit to give exact readings. Some have somewhat bigger size and give generally precise readings, yet are as yet costly for customers. Subsequently, the undeniable drawbacks are the promotion of customary UV estimation hardware: neither precise nor sufficiently moderate. As of late, utilizing PDAs to recognize UV radiation has developed. Since there are no advanced cells outfitted with UV sensors available, the techniques for the most part look for other UV related sources. We can actualize by utilizing UV to process the UV radiation comes about.

## II. BLOCK DIAGRAM



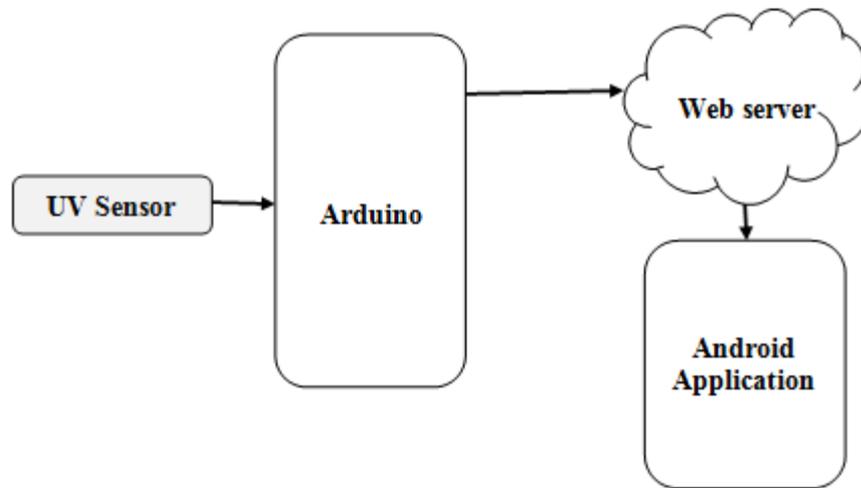


Fig1 System Architecture

Stratospheric ozone is the best bright (UV) radiation safeguard. It ensures the earth by engrossing episode radiation from the sun and in this way lessening its temperature. Since the innovation of the primary refrigerants and air fuels in the mid 1890's, the world's normal ozone shield has been progressively depleting.<sup>1</sup> Human-delivered chemicals - usually known as Chlorofluorocarbons (CFCs) - respond with the climatic gases in the stratosphere.<sup>2</sup> subsequently, ozone is expelled in a quicker rate than it is made all through its common cycle as can be found in Fig 1.

The ozone consumption brings about expanded UV radiation, which prompts a few medical issues. Researchers are for the most part worried about the increments in UV-B radiation<sup>3</sup>, which are connected to skin diseases and other natural damage.

As per the World Health Organization (WHO), overexposure to the sun may bring about intense and perpetual wellbeing consequences for the skin, eye and insusceptible system. It is essential to take note of that UV radiation has been utilized to effectively treat various infections, including rickets, psoriasis, dermatitis, jaundice, lupus vulgaris, and vitiligo. Furthermore, a little measure of UV radiation is critical to the body as it invigorates the creation of vitamin D, which is imperative for osteogenesis, resistant capacity and platelet formation. However, while there are helpful utilizations, the negative-reactions of UV radiation are significantly more extreme on a worldwide scale.

The ML8511 sensor breakout is a simple to utilize bright light sensor. The MP8511 UV Sensor yields a simple flag in connection to the measure of UV light it distinguishes. This can be convenient in making gadgets that caution the client of sunburn or distinguish the UV file as it identifies with climate conditions. This sensor identifies 280-390nm light generally viably. This is classified as a component of the UVB (copying beams) range and a large portion of the UVA (tanning beams) range.

### III. COMPONENTS DESCRIPTION

#### UV Sensor

The Variable Wavelength UV Detector utilizes a monochromatic (openings and a grinding) to choose one wavelength of light to go through the example cell. The Photodiode Array Detector passes all wavelengths of light through the example cell, and after that concentrates every wavelength on a solitary sensor component.

#### Features

- High security
- Good affectability
- Low power utilization
- Wide reaction run

UV Sensor is utilized for recognizing the force of occurrence bright radiation. This type of electromagnetic radiation has shorter wavelengths than obvious radiation.

#### Ultraviolet Rays

1. Ultraviolet C (UVC, 100-290 nm) are the briefest and most lively part of the UV range. These profoundly lively wavelengths. The critical wavelengths in the UVC are evacuated inside the environment, primarily by retention in the ozone layer and not achieve the world's surface in any amount [5].
2. Ultraviolet B(UVB, 290-320nm) is the most harming piece of UVR that we experience. UVB are wavelengths for the most part hindered by thick mists, firmly woven attire and glass window sheets. Huge sums are transmitted from blue sky amidst the day in summer. It is less risky when the sun is low in the sky, at high scope in winter, and in early mornings and late nights in summer [5].
3. Ultraviolet A(UVA, 320-400nm) is around 1000 times less harming to the skin than UVB as estimated by sunburn (Erythema) or harm to cell DNA. Then again, 20 times more UVA than UVB achieves the earth amidst a mid year's day. It isn't enormously influenced by retention and scrambling in the air when the sun is low in the sky, and is currently known to contribute essentially to the aggregate presentation at direct levels all through the entire day and year

UVA enters further into the skin and prompts further harm than UVB does. It infiltrates overcast cover, light garments and untainted glass moderately effortlessly, and may actuate a level of proceeding with skin harm over long stretches, notwithstanding when UVR introduction isn't evident.

*Arduino microcontroller*

The ML8511 is an UV sensor, which is appropriate for procuring UV power inside or outside. The ML8511 is outfitted with an inner intensifier, which changes over photograph current to voltage contingent upon the UV power. This one of a kind element offers a simple interface to outside circuits, for example, ADC. In the shut down mode, run of the mill standby current is 0.1  $\mu$ A, therefore empowering a more extended battery life. Highlights • Photodiode touchy to UV-A and UV-B • Embedded operational intensifier • Analog voltage yield • Low supply current (300  $\mu$ A typ.) and low standby current (0.1  $\mu$ A typ.) • Small and thin surface mount bundle (4.0mm x 3.7mm x 0.73mm, 12-stick clay QFN) APPLICATIONS • Smart telephone, Watch, Weather station, Bicycle route, Necessary Gaming.

**PIN CONFIGURATIONS**

Pin	Symbol	I/O	Function
7	VDD	PW	Supply voltage. Decouple this pin to ground with 0.1 $\mu$ F capacitor.
5	GND	PW	Ground
4	EN	I	Active high enable pin. (High: Active mode, Low: Standby mode)
8	OUT	O	Output (Low in power down or standby mode)
9	TP	I/O	Test pin. Do not connect.
10	TR	I/O	Internal reference voltage. Decouple this pin to ground with 1 nF capacitor.
1,2,3, 6,11,12	NC	-	No Connection. Do not connect.

Table1 Pin Configuration

*Block Diagram*

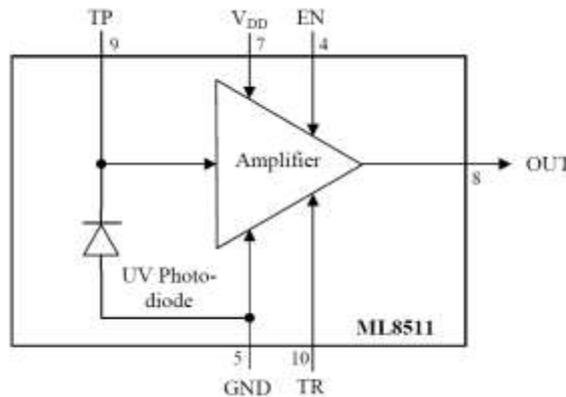


Fig2 Block diagram of UV sensor

The sensor ML8511 has a UV photodiode and Internal Amplifier which will converts photo current to voltage output depending on the UV light intensity. Through the voltage output it is easy to interface with external micro controllers and ADC.

**ML8511 Breakout Board**

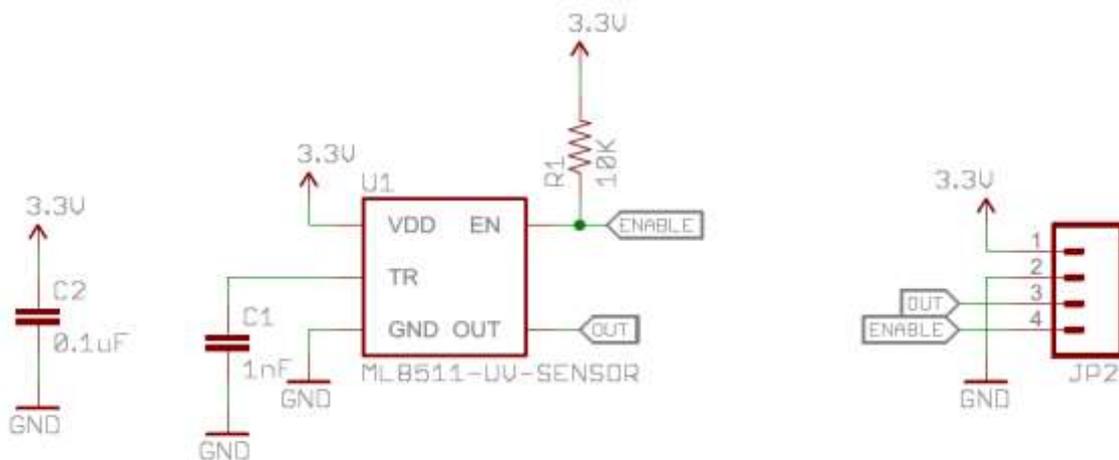


Fig3 ML8511 Breakout Board



Fig4 UV sensor

The sensor ML8511 is very handy to use in breakout board and it requires 3.3V with low supply current  $300\mu\text{A}$ , and gives output in Analog signal variation. This breakout board can be easily interfaced with all kind of micro controllers(which having ADC) and Arduino boards.

#### IV. WORKING

##### Collecting UV rays details

Ultraviolet radiation, regularly known as ultraviolet beams, similar to every other wave, is vitality voyaging through space. This sort of electromagnetic radiation contains more vitality than unmistakable light as it has a shorter wavelength than the last mentioned. In particular, the wavelength of bright radiation is between 100 nanometers to 400 nanometers. Gathering subtle elements through the sensor

The ML8511 sensor breakout is a simple to utilize bright light sensor. The MP8511 UV Sensor yields a simple flag in connection to the measure of UV light it recognizes. This can be convenient in making gadgets that caution the client of sunburn or recognize the UV list as it identifies with climate conditions. This sensor distinguishes 280-390nm light generally successfully. This is ordered as a major aspect of the UVB (copying beams) range and a large portion of the UVA (tanning beams) range.

##### Decision making on UV rays

The ML8511 is an UV sensor, which is reasonable for gaining UV power inside or outside. The ML8511 is outfitted with an interior enhancer, which changes over photograph current to voltage contingent upon the UV force. This special component offers a simple interface to outer circuits, for example, ADC. In the shut down mode, commonplace standby current is  $0.1\mu\text{A}$ , in this way empowering a more drawn out battery life.

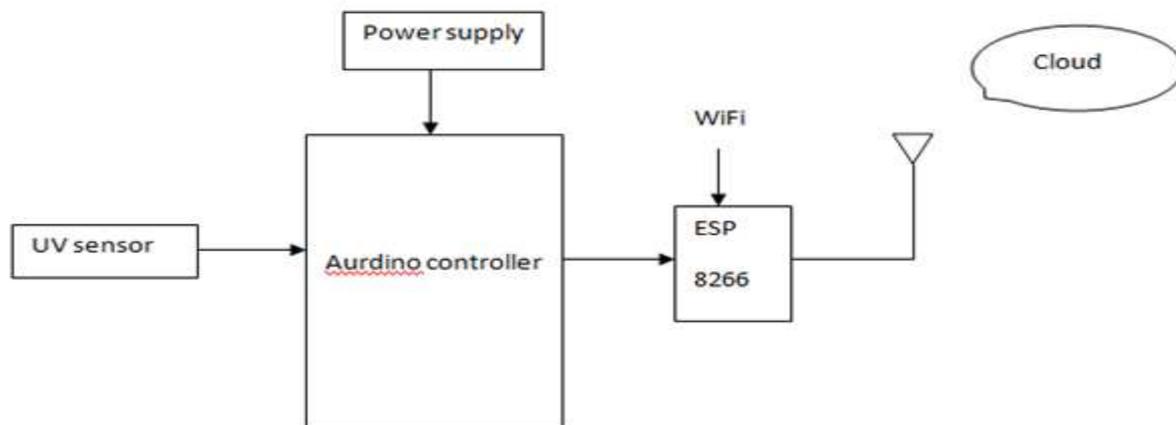


Fig5 At Transmission end

##### Sending information to web server

The information gathered will be put away in the web server for examining

##### Collect and show information on android application

The put away information will be break down and through the android application the message will be shown.

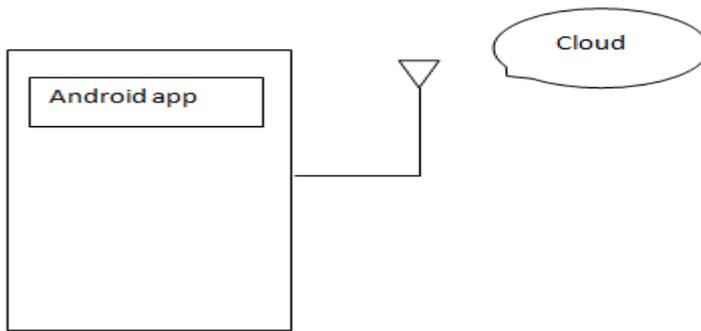


Fig6 Android app to display the condition at the receiving end

IV. SOFTWARE

Useful Requirement characterizes an element of a product framework and how the framework must carry on when given particular information sources or conditions. These may incorporate estimations, information control and handling and other particular usefulness. In this framework following are the useful prerequisites. Measuring the UV rays through sensor

- Calculated signals are sent to microcontroller
- The signal is sent to web server
- The message is displayed through the mobile application

VI. RESULTS

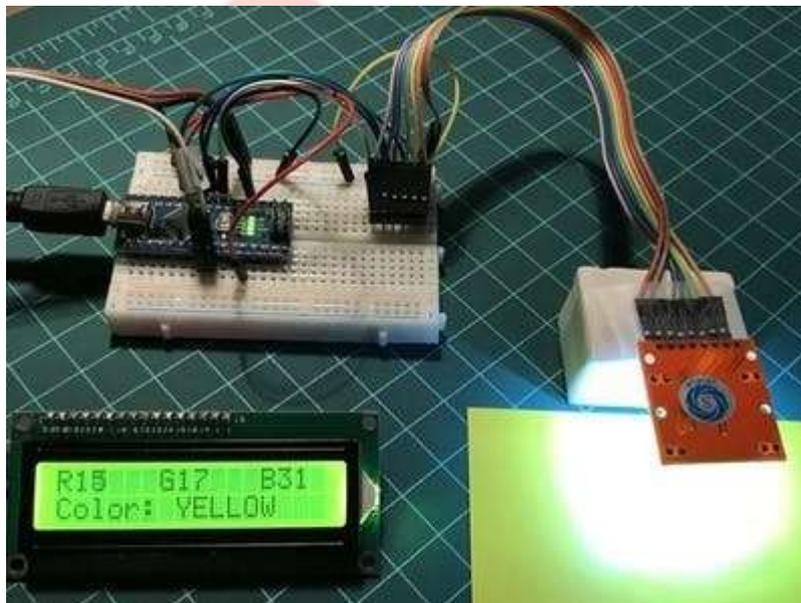


Fig:7 Snapshot of arduino and sensor



Fig:8 Snapshot of controllers and mobile



Fig:9 Snapshot of mobile app

## VII. CONCLUSION

In this project, we proposed a methodology which could legitimately quantify UV radiation at a particular area by utilizing UV sensors. The technique specifically used readings from sensors for constant calculation, implying that it can be utilized on all the savvy gadgets available. Moreover, we acquainted how with exploit Aurdino to enhance the outcome exactness progressively. Besides, the created UV android application was powerful.

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