IoT Based Air Pollution Monitoring Sysytem

A Project report submitted in partial fulfilment

Of the requirements for the degree of B.E in

computer science and engineering

By

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AIR QUALITY MONITORING SYSTEM

PHASE 4: **Design the platform to receive and display air quality data sent by the IoT devices**

- **INTRODUCTION**
- **SMART AIR**
- **VOC SENSOR**
- **USING HTML**
- **USING CSS**
- **CREATE A LAYOUT AND BUILD USING HTML AND CSS**

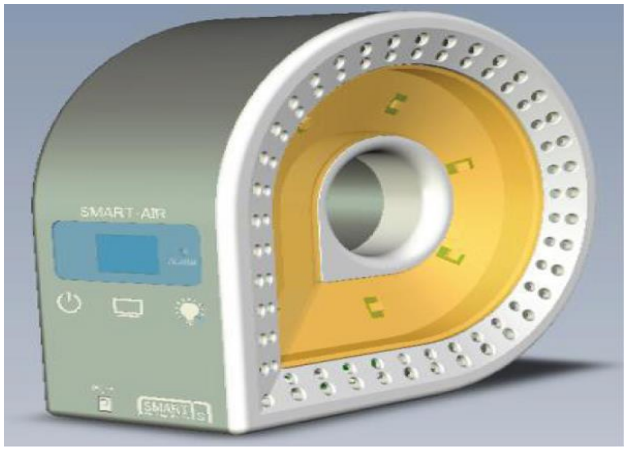
Introduction

Atmospheric conditions continue to deteriorate each year due to the growth of civilization and increasing unclean emissions from industries and automobiles. Although air is an indispensable resource for life, many people are indifferent to the severity of air pollution or have only recently recognized the problem [1–3]. Among various types of pollutants such as water, soil, thermal, and noise, air pollution is the most dangerous and severe, causing climate change and life-threatening diseases. According to the World Health Organization (WHO), 90 percent of the population now breathes polluted air, and air pollution is the cause of death for 7 million people every year [4, 5].

Smart-Air

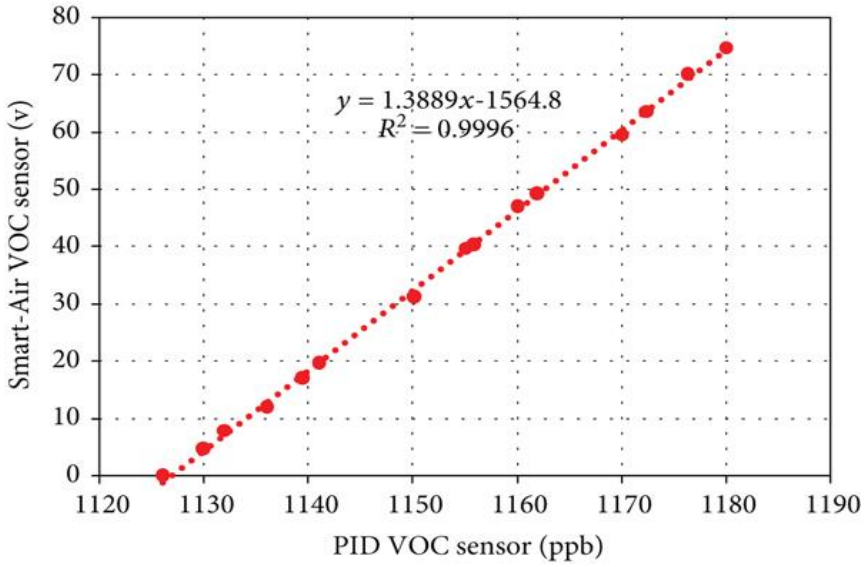
An accurate data measurement of indoor air quality is the most important factor for the platform. Thus, Smart-Air was developed to collect accurate and reliable data for indoor air quality monitoring. Because the monitoring area is not constant, the device was designed to be easily customized to an environment by using an expandable interface. Thus, various types of sensors can be installed or adjusted based on the environment. Also, a Long-Term Evolution (LTE) modem is mounted in the device to transmit detected data directly to the web server for classifying and visualizing air quality. For most IoT platforms, gateway or data loggers are installed to gather and transmit data wirelessly to the web server.

The most important purpose of Smart-Air is to precisely detect air quality in the perception layer of the platform that a primitive concept design of the device is shown in Figure 1. This device has an expandable interface such that multiple sensors can be installed simultaneously or easily added according to monitoring requirements. In the present study, the Smart-Air device consists of a laser dust sensor, a volatile organic compound (VOC) sensor, a carbon monoxide (CO) sensor, a carbon dioxide (CO_2) sensor, and a temperature-humidity sensor.



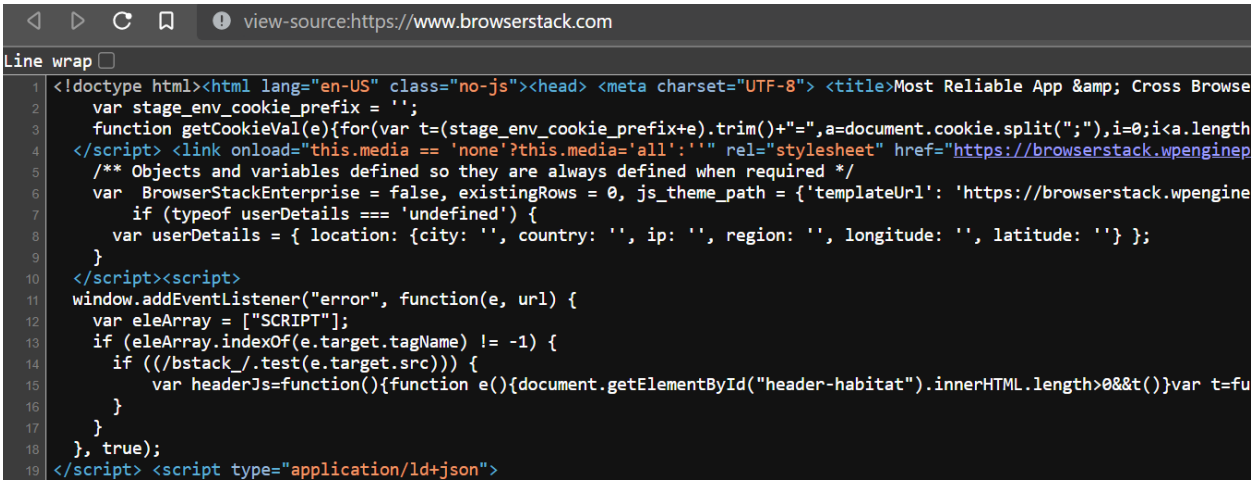
VOC Sensor

The VOC sensor used in the study was selected based on an investigation by the Ministry of Environment, Korea. The sensor is a semiconductor type that can have a small diffusion effect and requires data verification. Accordingly, calibration and a chamber test were conducted to test the reliability of the VOC sensor. To calibrate the sensor, Smart-Air was placed in an acrylic chamber with a PID-type VOC sensor, i.e., MiniRAE 3000 from RAE Systems. The PID type VOC sensor was the most accurate and reliable type to detect VOCs. After the sensors were placed, about 1 inch of incense was burned to create a VOC compound to measure. The collected data from Smart-Air were calibrated against those from the PID-type VOC sensor. After calibration, a chamber test was performed to test the reliability of the VOC sensors, a common procedure adopted by the Ministry. After placing the Smart-Air in the chamber, N_2 was injected to clean the chamber. To test the accuracy of the measurement sensor, toluene gas was injected at different concentrations. In this study, three values of concentrations were selected and injected in ascending order: 480 μg/m^3, 1000 μg/m^3, and 1600 μg/m^3. After each injection, the data observed from the device were compared to the actual injected concentration to confirm the reliability of the measurement.



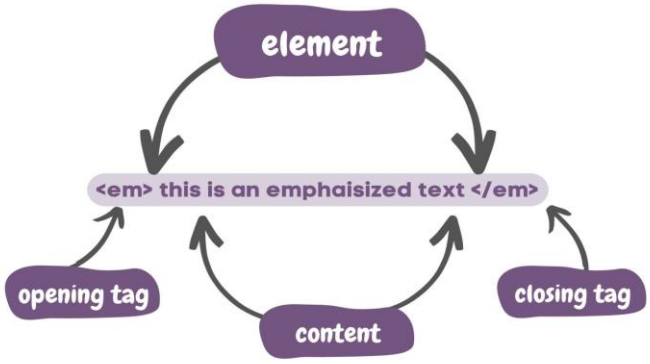
using HTML

You must be aware of all the basic concepts and techniques associated with HTML before compiling all of it to create a website using HTML and CSS. There are multiple actions you are going to perform while writing code in HTML.



Understanding and using HTML Elements

In HTML, elements are the building blocks for an HTML document. It usually contains an opening tag, a closing tag, and the content between them. It helps browsers to interpret in classifying the content, such as headings, images, paragraphs, and more.



using CSS

Understanding and Creating CSS Rules

CSS rules also known as rulesets and are a combination of one or more CSS properties that you can apply to one or more HTML elements. It consists of a CSS selector and CSS properties. It determines what to style to a targeted HTML element.

```
div {

border-color: brown;

font-size: 2rem;

font-family: 'Times New Roman';

}
```

In this instance, it creates a CSS rule targeting the div element and creating CSS properties, border–color, and font-size to be the style for the div element.

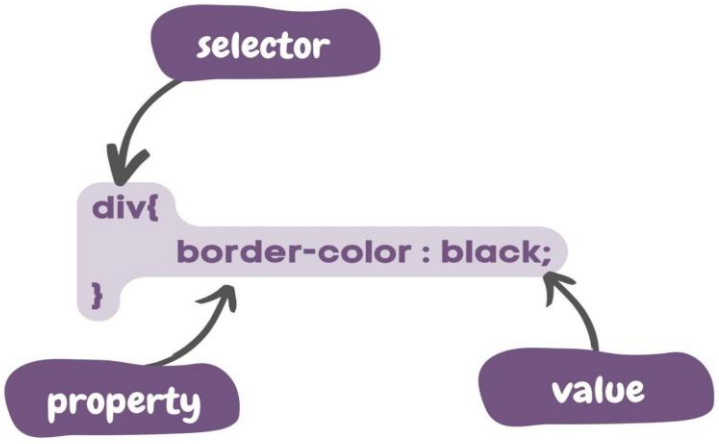


diagram of a CSS rule

Create A Layout And Build A Website Using HTML And CSS

In this section, let’s create a full-fledged website using only HTML and CSS. Most of the users have a question today – Can you create a website just using HTML and CSS?
It is quite possible to create a good-looking website with the help of only HTML and CSS. HTML stands for Hypertext markup language and provides the skeleton for our website. However, CSS (Cascading Style Sheet) allows the skeleton to be more good-looking. Let us use seven steps to create a good-looking website from scratch.

- **Step 1: Create a Layout**
  First create a basic structure of your website as a rough sketch. There are a lot of free online services that will help you design your website. Nonetheless, you must have a basic structure of the website ready.

- **Step 2: Set up the boiler code**
  Create a new project folder and create an empty index.html file inside the folder. Here, add the boilerplate code to the HTML file.