**[Arduino Sensors for Everyone]**

In this book, you will learn how to use the PMS7003, GP2Y1010AU0F, PPD42NS, SDS011 Fine Dust Sensor, DHT22 temperature/humidity sensor, MH-Z19B carbon dioxide sensor, ZE08-CH2O formaldehyde sensor, CCS811 total volatile organic compound (TVOC) sensor , GDK101 radiation (gamma ray) sensor, MQ-131 ozone (O3) sensor, MQ-7 carbon monoxide sensor, MICS-4514 nitrogen dioxide sensor, MICS-6814 ammonia sensor, DGS-SO2 sulfur dioxide (SO2) sensor, BME280 atmospheric pressure sensor, GUVA-S12SD ultraviolet (UV) sensor, MD0550 airflow sensor, and QS-FS01 wind speed sensor.

**[Our Goals]**

This book was written to help you and your family breathe easier and live healthier lives.

Fine dust is taking away our right to clean air. However, with sensors and Arduino, we can measure the air quality both indoors and outdoors and find out how we can improve the air we breathe. This book will guide you through 18 environmental sensors used with Arduino. Four projects can be used to measure the atmospheric environment.

This book uses Arduino and air quality measurement sensors to measure the conditions of our surroundings. By the end of the book, you will be able to understand and use 18 Arduino environmental sensors. Chapter 2 covers the fine dust sensor, Chapter 3 indoor air environmental sensors, Chapter 4 outdoor air environmental sensors, and Chapter 5 covers how air environmental sensors can be calibrated to check air quality. Finally, Chapter 6 goes over four projects to measure the atmospheric environment. You will make simple fine dust and temperature-humidity sensors and find applications for them. In each project, you will be able to display air quality data on LCD, OLED screens and by connecting to Wi-Fi, Bluetooth, or RD, create your own IoT in your house.

I hope that with this book, you will acquire the knowledge to use, prototype, and create various environmental sensors.

**[A good start is half the battle.]**

Anyone can handle Arduino and sensors in a fun and easy way!

**Prepare: Getting Started with Sensors and Arduino**

Choose the right sensor for your situation and learn the basic knowledge you need to know to handle it properly. Learn about the various characteristics that determine the performance of the sensor, the interface method, and precautions for use. Install the program to run Arduino and check how to use the library to be used for practice, and you are ready!

**Practice: Measuring the pollutants that harm your body**

From simple temperature and humidity to fine dust, ultraviolet rays, formaldehyde, and radiation, we will cover 18 sensors that can measure air pollutants and atmospheric conditions that affect the human body. We will explore the specifications, features, and operating principles of each sensor and connect them with Arduino to accurately measure the value.

**One more step!: Take on a sensor project**

If you have studied how each sensor works and measured the air environment around you, you can now apply the sensor to various projects. In this book, we will make a simple ‘fine dust & temperature and humidity meter' and use LCD, Bluetooth, Wi-Fi, and RF communication to display the results of the project.

**[Expectations]**

Sensors are also seeing increased use in all aspects of our lives. They must be small, robust, durable. inexpensive, and have low power consumption.

As IoT begin to dominate our interactions with one another (Hyper Connected Society), an estimated 100 billion objects will be connected and able to communicate through the Internet. Additionally, trillions of sensors will be installed, and the global sensor market is expected to reach a value of 220 trillion won. Smart tools are also being developed that can connect with IoT and make our lives more convenient. The Fourth Industrial Revolution all starts with robust sensors that can quickly and accurately measure data.

**[Ronnie Kim]**

We are in an era of economical and societal revolution. Information and communication technologies such as sensors, artificial intelligence (AI), Internet of Things (IoT), Metaverse, Big Data, mobile and cloud networks, and robotics will be combined to create a new hyper-connected society. We will live as Digital Nomads, using various technologies to help create a lifestyle where we can work and enjoy freely.

Ronnie Kim is a 16-year software developer in the IT field. He majored in Robotics and has won many competitions related to software and hardware (Korea Intelligence Robot Competition, Embedded Software Contest, etc.). Ronnie Kim pursues STEAM: STEAM stands for Science, Technology, Engineering, Arts and Mathematics. His goal is to make science and technology more engaging and presenting learning situations that allow students to improve their design and problem-solving skills.

**[Words from Beta Testers]]**

Through this book, I was able to build some experience with Arduino and sensors. Detailed instructions on how to use each sensor are provided, and the GitHub library the author has published makes it very easy to implement a sensor. Also, Chapter 6 shows how to monitor sensors remotely using Wi-Fi, Bluetooth, etc. and it was very interesting. Through this book's unique concept of applying sensors to practical use, I've been able to learn new things about the places that I just used to pass by without a second thought. I became much more interested in the environment by measuring temperature and humidity, as well as carbon dioxide, gamma radiation, sulfur dioxide, ozone, and nitrogen dioxide gas content in the air.

Operating system: Windows 10, Arduino IDE 1.8, Arduino Uno, Arduino Nano

Shin Ji-Hoo/Freelancer

I've messed around with Arduino before. I connected a breadboard to Arduino and plugged in various parts to measure some values, turned on the lights according to the measured values, and even turned on a motor. I didn't know Arduino well enough to understand everything, but it was amazing seeing something spinning and turning on. At that time, I thought it was cool, but not really practical. However, when I started learning from this book, I felt that Arduino and coding are actually helpful to my life. Now I can hyper-ventilate after measuring that the carbon dioxide content in my room is high!

Learning was not difficult. The code library is all prepared. All you have to do is download the and put it in the correct file path (Make sure to have the correct file paths!) Then, you can activate the sensor. This book also covers small sensors operation, correct use of sensors, and the datasheets produced by sensors. I was never curious about the how these small parts worked, but now I am very interested in learning more about them.

I had a very good learning experience, and I recommend this book because it is a good reference for when you’re learning Arduino and doing projects.

Operating system: Windows 10, Arduino IDE 1.8, Arduino Uno, Arduino Nano

Lee/Freelancer

**[Book Organization]**

This book consists of six chapters.

Chapter 1 Getting started with Sensors and Arduino Sensors, Arduino, source code libraries

Chapter 2 Fine dust sensor

201 Introduction to fine dust and the fine dust sensor

202 PMS7003 Fine Dust Sensor

203 GP2Y1010AU0F Fine Dust Sensor

204 PPD42NS Fine Dust Sensor

205 SDS011 Fine Dust Sensor

Chapter 3 Indoor air environmental sensors

301 DHT22 Temperature-humidity sensor

302 MH-Z19B Carbon dioxide gas sensor

303 ZE08-CH2O Formaldehyde gas sensor

304 CCS811 TVOC sensor

305 GDK101 Gamma radiation sensor

Chapter 4 Outdoor air environmental sensors

401 MQ-131 Ozone gas sensor

402 MQ-7 Carbon monoxide gas sensor

403 MiCS-4514 Nitrogen dioxide gas sensor

404 MiCS-6814 Ammonia gas sensor

405 DGS-SO2 Sulfur dioxide sensor

Chapter 5 Atmospheric environmental sensors

501 BME280 Atmospheric pressure (Barometric) sensor

502 GUVA-S12SD Ultraviolet light sensor

503 MD0550 Airflow sensor

504 QS-FS01 Wind speed sensor

Chapter 6 Fine dust and temperature-humidity meter project

601 16X2 LCD Monitoring with LCD screen

602 HC-06 Smartphone App Monitoring with Bluetooth

603 ESP01 Remote Monitoring with Wi-Fi

604 nRF24L01 Remote Monitoring with RF Communication