Internet of Things Based PM2.5(SMOG) Forecasting

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ABSTRACT

Poor visibility due to SMOG(PM2.5) has triggered 30Percent increase in road accidents in INDIA in just last two days. According to MH-100, police emergency response centre, the number jumped from average 500 daily (since November 1) to 650 on November 7 and 8, 2019. In work, we propose to measure and monitor the fine dust (PM2.5) in outdoor environment to avoid road accidents and health hazards. Also, using the app of the smart phone which is the monitoring device users are not constrained to time and place, IoT (Internet of Things) technology, which is one of the most trending industrial technologies is used to measure outdoor PM2.5 Particles and airborne fine dusts using IoT devices (Fine dust sensors) and microcontroller, which is an embedded system are configured in hardware to precisely measure and collect data on fine dusts. Atmospheric particulate matter, such as PM2.5, contributes to air pollution negatively affecting human health and road accidents on highways. Many factors determine the change of PM2.5 concentration levels, which can be very sudden, nonlinear, and uncertain. Hence, traditional methods are not always suitable for predicting the exact amount of PM2.5 in the air. Effective forecasting of PM2.5 levels can tell people the air condition and support country's sustainable development; hence, forecasting PM2.5 values has an important social and long-term economic significance. This study proposes a system for detecting the amount of PM2.5 and other pollutants in the air using Internet of Things technology and a cloud-based system model.

Keywords—PM2.5, Cloud, Internet of Things, NOVA Sensor

I. INTRODUCTION

we propose to measure and monitor the fine dust (PM2.5) in outdoor environment to avoid road accidents and health hazards. Also, using the app of the smart phone which is the monitoring device users are not constrained to time and place, IoT (Internet of Things) technology, which is one of the most trending industrial technologies is used to measure outdoor PM2.5 Particles and airborne fine dusts using IoT devices (Fine dust sensors) and microcontroller.

Poor visibility due to smog(PM2.5) has triggered 30\% increase in road accidents in INDIA in just last two days. According to MH-100, police emergency response center, the number jumped from average 500 daily (since November 1) to 650 on November 7 and 8, 2019. In work, we propose to measure and monitor the fine dust (PM2.5) in outdoor environment to avoid road accidents and health hazards. Also, using the app of the smart phone which is the monitoring device users are not constrained to time and place, IoT (Internet of Things) technology, which is one of the most trending industrial technologies is used to measure outdoor PM2.5 Particles and airborne fine dusts using IoT devices (Fine dust sensors) and microcontroller, which is an embedded system are configured in hardware to precisely measure and collect data on fine dusts. PM2.5 is a particulate matter with a diameter of less than or equal to 2.5 μm. It is one of the atmospheric pollutants that can damage human respiratory, cardiovascular, and cerebrovascular systems, or even cause lung cancer, when its concentration reaches high levels. Moreover, a high-level concentration of PM2.5 can block people's eyesight, causing inconveniences or even leading to serious traffic accidents Many countries around the world are paying more attention to monitoring air quality due to its deterioration in recent years.

II. LITERATURE REVIEW

- Recent years, the technological development become faster and faster, simultaneously, which leads to serious environment pollution.[1] Meanwhile, as the damage from air pollution due to fine dust and ozone increases continu ously, interest in the atmospheric environment is increasing rapidly around the world. fine dust is mainly caused by combustion of fossil fuel, and it is known to act as a main factor causing or exacerbating various lung diseases in the human body. [2] Fine dust particles have been proven to significantly affect human health, as particles can easily penetrate the body's respiratory system. In fact, the effects of increased concentrations of fine dust range in severity from asthma to even lung cancer.[3]Internet of things or IOT is a revolution in the world of electronics. The idea is to connect all sensors and devices on a common network i.e. internet through wired or wireless means so that the user can access the data and control the devices from anywhere around the globe with an internet connection.[4]

- PM2.5 is a particulate matter with a diameter of less than or equal to 2.5 μm. It is one of the atmospheric pollutants that can damage human respiratory, cardiovascular, and cerebrovascular systems, or even cause lung cancer, when its concentration reaches high levels. Moreover, a highlevel concentration of PM2.5 can block people's eyesight, causing inconveniences or even leading to serious traffic accidents. Many countries around the world are paying more attention to monitoring air quality due to its deterioration in recent years. Acquiring the exact amount of PM2.5 in the air at any given time can inform residents and allow them to arrange their outdoor activities reasonably. In particular, PM2.5 values should be detected frequently in areas with dense population to protect people with low immunity, such as students and patients. However, simply monitoring PM2.5 values only captures the current state of the environment. Only predicting PM2.5 values in advance can allow people to plan preventive measures in advance and protect their health effectively.

III. PROPOSED ARCHITECTURE

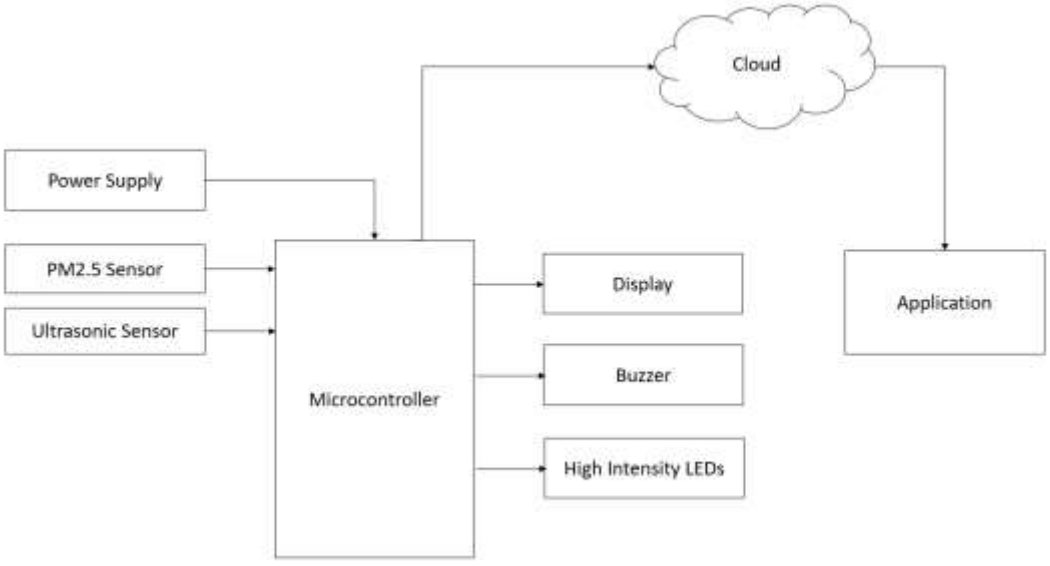

Figure 1 System Architecture

- We have built an Internet of Things-based PM2.5(SMOG) Monitoring System using Nova PM SDS011 sensor, ESP32 microcontroller, Ultrasonic sensor, LCD Display, buzzer and High intensity lights to avoid accident.
- The SDS011 Sensor is a very recent Air Quality Sensor developed by Nova Fitness. It works on the principle of laser scattering and can get the particle concentration between 0.3 to 10µm in the air. This sensor consists of a small fan, air inlet valve, Laser diode, and photodiode. The air enters through the air inlet where a light source (Laser) illuminates the particles, and the scattered light is transformed into a signal by a photodetector.
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IV. RESULT

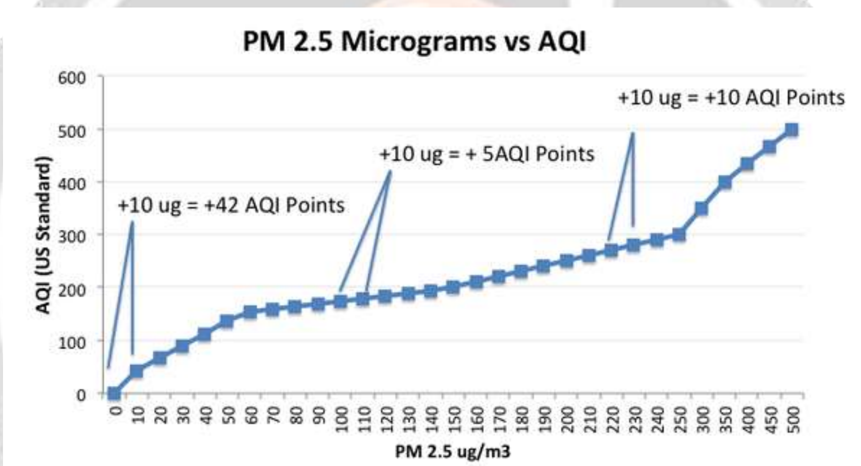

Figure 2 - PM2.5 vs AQI

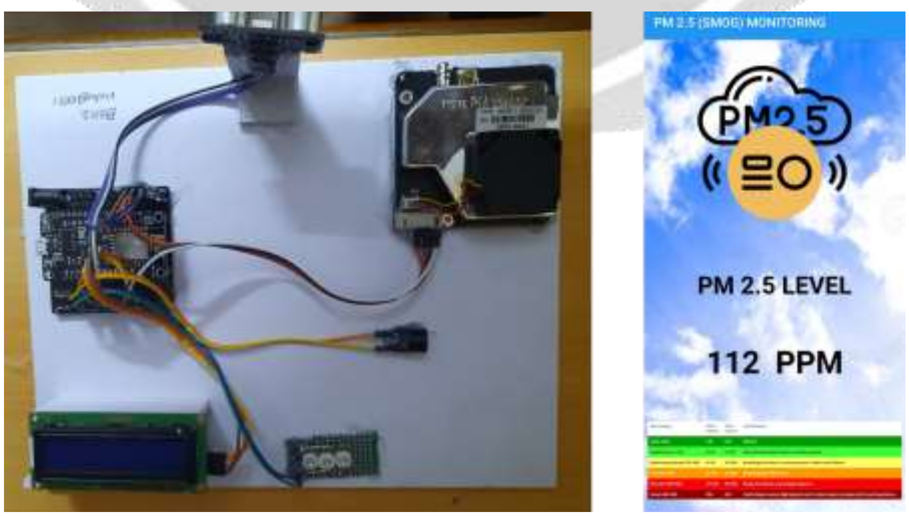

Figure 3 Result

V. CONCLUSION

We successfully built a smart system for detecting and forecasting PM2.5 values using Internet of Things technology. Being of low power and no range barrier, it satisfies the requirements of future IoT systems and provides a reliable reference for governmental work and people's lifestyle when it comes to air quality. Our experiments in a real environment demonstrated that the system is capable of accurately predicting PM2.5 values for the next few hours. In the future, the system can be used as a mobile application providing warnings about high air pollution levels in real time. we also added an ultrasonic sensor to avoid accident due to SMOG.

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