IoT (Internet of Things) Connected Air Quality Monitor to Detect and Measure Particulate Matter Concentration

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Air pollution is a major worldwide concern. Particulate Matter (PM) pollutant equal or smaller than 10 micron can get lodged into the lungs causing respiratory problems. Monitoring equipment used by professional agencies is too expensive for households. Therefore there is a need of a low cost personal device which detects air pollutants and alerts the user of any unsafe levels. To address the need, I designed and constructed a device labeled PIQA. PIQA consists of a low cost sensor which detects PM concentration and sends low digital pulses to a microcontroller's sampling program. PIQA is calibrated against ambient air monitors of a local Clean Air Agency. Their Air Quality Index calculator is used to decide high, medium and low thresholds. The microcontroller's software is updated for threshold detection logic. When PM concentration levels exceed programmed thresholds, visual and auditory alerts are raised through different LEDs and buzzer alarm. The data is forwarded to an Internet of Things (IoT) host server to be logged and monitored remotely through connected computers and mobile devices. When subjected to different test conditions, PIQA detected average PM concentrations in the range from 91 (units pcs/0.01cf) in a room with purifier, to 2661 outdoors. Due to low cost, millions around the globe can afford such device for their personal use as well as stream real-time air quality data to the web. Such data when mined should greatly enhance the global monitored footprint and alert governments and environmental agencies about any pollution hotspots.

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