DIYAQI- an Educational Framework for a Embedded, Low-Cost, and Open-Source Air Quality Sensor Package

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Abstract

In this paper, we present a fully integrated framework for distributed air quality sampling with a focus on STEM education and extensions to add more sensors. This is aimed at high-school students with an initial exposure to computer programming. Within this framework we have included a custom-designed embedded circuit integrating four discrete air quality sensors run by an ESP32 (a WiFi enabled microcontroller). The firmware is written so that it is simple to set up the sensor package yet easy to extend. The cluster is contained within a 3D printed enclosure designed to withstand both indoor and harsh outdoor environments. The framework uses a docker-based NodeJS and MySQL stack for handling and coordinating users, sensors, and data. All source files referenced in this paper are available at https://github.com/t3chy/diyaqi. We designed this project to be fully free and open source, with the software and hardware components licensed under the GNU General Public License v3 and CERN Open Hardware License v2 (Strongly Reciprocal) respectively.
