

Air Quality Monitoring Mesh

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Abstract

Air pollution is one of the largest environmental health risk in Europe and impacts the health of the European population, particularly in urban areas. Based on the EU and WHO latest reports about the air pollution, [1] and [2], my research group works on a cost-effective monitoring mesh to measure and forecast the quality of the air in a city.

The five most important air pollutants in Europe are the: particulate matter (PM2.5 and PM10), nitrogen dioxide (NO₂), ozone (O₃), sulphur dioxide (SO₂) and benzo[a]pyrene (BaP). There are sensors available for purchase, some of them are easy to integrate, fully calibrated digital output sensors, but most of them are electrochemical raw sensors. In this case the first step is to develop readout electronics and calibration setups to use them. A readout electronics was therefore design and assembled for the electrochemical sensors and a readout board using I²C communication buses. The board can collect the sensor data via I²C buses and can communicate with wifi, bluetooth, Thread and Zigbee. The last two communications can build up a mesh without any preconfiguration, adding or removing a unit from the mesh can be managed by the STM32WB35 microcontroller is used in the board. The board read out the sensors and send the results to a router using Thread and the router insert the them into a MySQL database.

At residential, industrial areas, they can be operated outside using batteries, therefore they have to be water-proof and energy efficient. The units have 4 I²C connectors for the sensors, 3D-printed prototype housing with one 18650 li-ion battery see Fig. 1a, 1b and 1c.

The unites will be placed in the area at first using a simple simulation of the spread of the air pollution. The data will move in a database and analysed, the

