A Holistic Approach to Low-Cost Air Quality Sensor Evaluation: The AIRLAB Microsensors Challenge

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1. SUMMARY:

Responding to an ever increasing demand for independent evaluation of low-cost air quality sensing platforms, Airparif launched the AIRLAB Microsensors Challenge – a periodic, holistic performance evaluation event that seeks to empower potential users to make informed decisions regarding what sensor to use for a given application. The first edition of the Challenge has been a success with 31 different sensor solutions from 21 manufacturers competing in eight usage categories.

2. MOTIVATION and RESULTS:

Remarkable progress in sensor technologies over the last two decades has opened the door to a wide range of potential new applications based on air quality measurements. This has in turn led to the emergence of a very dynamic and arguably volatile market of integrated air quality monitoring solutions, based on low-cost sensors. In the absence of norms and performance standards, the large array of commercially available devices can lead to confusion even in the ranks of expert users when faced with the challenge of choosing an appropriate measurement platform for a particular application.

Seeking to meet the growing demand from potential users for an independent and objective evaluation of microsensor based devices, Airparif, through its innovation initiative – AIRLAB, launched in 2018 the Microsensors Challenge. Differently from previous work [1], which focused solely on the quality of the measurements, the AIRLAB Microsensors Challenge goes beyond metrological criteria to also consider the ergonomics, portability, pertinence, and cost of the considered platforms.

Moreover, the AIRLAB Microsensors Challenge is designed as a periodic event in which all candidate sensing platforms are evaluated in parallel. Therefore, the Microsensors Challenge provides a snapshot of the state of the art of commercially available microsensor platforms at a given moment in time.

Finally, at the core of the Microsensor Challenge evaluation process stands the principle of evaluating a given sensing platform in conjunction with its intended use, in order to empower potential users to take informed decisions as to what sensor to employ for a specific application. To this end, we build on previous work in classification of air quality sensor applications [2] and provide a comprehensive list of usage categories for candidate sensor solutions to be evaluated for. In this context, we define eight usage categories grouped into three large classes based on the application domain – Outdoor Air (OA), Indoor Air (IA), Citizen Air (CA) (see Figure 1), with different performance requirements for each category.

Different evaluation sites are used for these usage categories, including an official monitoring station for outdoor air, Airparif's metrology laboratory for indoor air, and a vehicle set-up for mobile evaluations (see Figure 2). A detailed presentation of the Challenge evaluation criteria as well as the associated measurement protocols is given in [3].

The first edition of the Microsensors Challenge has been a very successful one with 31 different microsensor solutions being evaluated from 21 manufacturers, generating more than 52 million measurements. All the results of the 2018 edition are freely available on the AIRLAB website

(www.airlab.solutions). Building upon this success, we have recently launched the 2019 edition of the AIRLAB Microsensors Challenge which will place a larger emphasis on the evaluation of microsensors solutions for mobile applications, by diversifying evaluation scenarios beyond vehicle-based mobility.

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FIGURES:

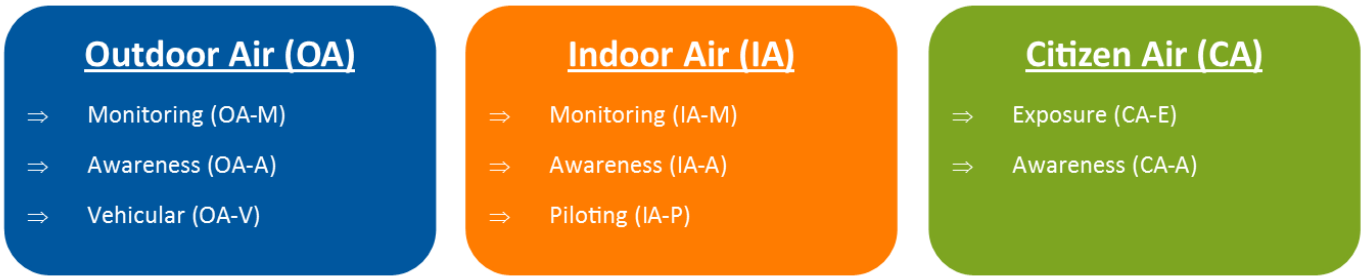

Figure 1: The eight Challenge categories grouped by their application domain.

Figure 2: Microsensors Challenge candidate solution being tested, from left to right: at the Boulevard Périphérique Est monitoring station, inside Airparif's Metrology Laboratory, and using one of Airparif's vehicles.