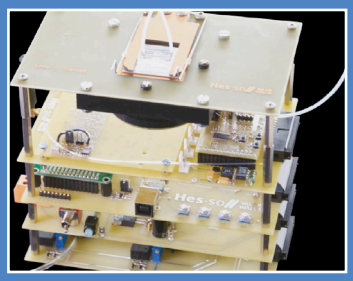
Prof. Philippe Renaud, EPFL

LiveSense

INTEGRATED SENSING PLATFORM FOR GASES AND LIQUIDS IN THE NEAR AND MID-INFRARED RANGE



Prof. Martial Geiser, HESSO-VS

Prof. Hubert Girault, EPFL

Dr. Martha Liley, CSEM

Dr. Michael Riediker, IST

Prof. Nico de Rooij, EPFL

Prof. Jan van der Meer, UNIL

Prof. Viola Vogel, ETHZ

What it's about…

Building an early-warning system for environmental monitoring using cell-based sensors

Context and project goals

Environmental monitoring is crucial to preserve the health of humans and animals. The project goal was to develop semi-autonomous sensing nodes that sense water quality and rely results to a remote risk management center. The idea was to rapidly detect any potential threat in the environment, thus the consortium prioritized high selectivity over high specificity.

How the project differentiates from similar competition in the field

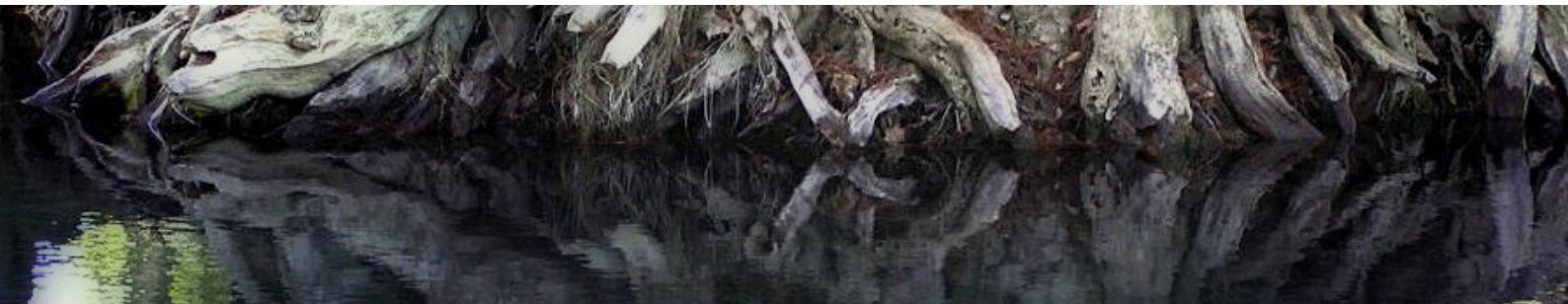
The team built from the bottom up a semi-autonomous platform that supports cell-based sensing and sends results over the cellular network to a remote user. Most, if not all, competitors have so far only demonstrated cell-based sensing in a laboratory setup. Here, the project engineered a system for field application.

Quick summary of the project status and key results

The bioreactors with cell models are functional and have been integrated to the environmental sensing system. The module to automatically adjust the osmolality of the water sample before introducing it in the bioreactor is also functional. The secondary sensors: fluorescence, electrochemical, impedance, mechanical and trans-epithelial electrical resistance; are functional and characterized using the cell models. The modular system to be used in actual environmental monitoring has been built according to specifications and validated by characterizing the relation between the fluorescence intensity and the concentration of arsenic in a sample. Basic remote control of this system using a smart phone has also been demonstrated. The project developed as expected. Detection techniques to monitor the signal emitted by the cell-based sensors were all validated in the lab. Conditioning of the water sample has also been achieved. Next three selected detection techniques were integrated into the demonstrator prototype and established the final control routines of all modules featured in the demonstrator. The functionality with distance control by means of SMS was also demonstrated.

Patent

LMIS considers filing a patent for a method of drug resistance screening for cancer biopsy.



Success stories

The collaboration between SAMLAB and CSEM-Neuchatel is continued as well. Seeding the epithelial cells and providing cell-culture medium samples for the metabolism measurements is performed by CSEM.
In the HES-SO//Valais, two institutes were involved, and about 30 persons have contributed to the project. This was the first project that so many collaborators were working together. This ranged from analog electronics, to optimization of bacteria culture by passing through computer programming, mechanical design and fabrication, microfluidic and optics.

ETHZ started collaborations with Edna Cukierman (Fox Chase Cancer Center, Philadelphia, USA) and Martin Schwab, (UZ/ETH D-HEST); the Schwab collaboration resulted in a PNAS 2013 publication.

Presence in the media

- Newspaper Le Nouvelliste, 4.09.2013 : Traquer les eaux polluées
- Brochure International Innovation, August 2013 : pollution solutions
- Online magazine Artemis, April 2013: The Right Dose for Oncology

Main publications

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