SCIENCE · PASSION · TECHNOLOGY

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Open Thesis / Project
Demo: A Batteryless Chemical Sensor

Motivation

Powering massive number of IoT sensors is one of the grand challenges of the IoT revolution. As batteries are short-lived, hazardous, and costly, the future IoT sensing substrate must be powered by ambient energy. Although great advances have been made in supporting computation on batteryless devices, the sensing side has been entirely neglected. Most sensors, such as miniaturized chemical sensors, do not work on intermittent power. Before a sensor has warmed up and is ready to sense the power is out. To solve the problem, we developed effective predictive models to estimate the measurement from a few transient samples. We would now like to build a demonstrator which runs these models locally on an embedded device and compare the prototype batteryless sensor to its continuously outlet powered version in different settings.

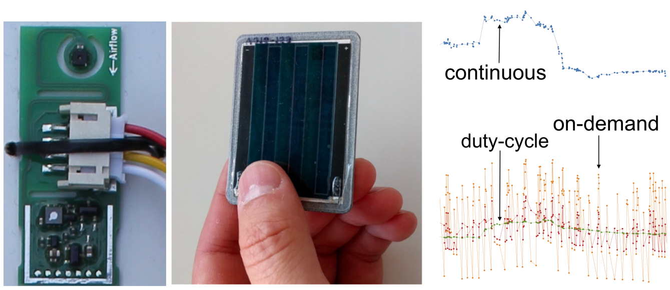
Interested? Contact us for more details!

Target Group

Students in ICE and Computer Science.

Thesis Type

Master Project / Master Thesis.



From left to right: an SGP30 gas sensor module; a batteryless hardware platform operated from ambient energy; raw sensor output when operated in continuous, duty-cycle and on-demand modes. A paper to read: A. Gomez, On-demand communication with the batteryless MiroCard, in SenSys'20.

Goals and Tasks

In our previous work we built a predictive model to compensate for chemical sensor's on-demand operation by predicting its continuously measured value from a few transient samples. In this project, we wish to build a complete prototype operated from ambient energy and running model inference locally. The prototype will then have to be tested in various indoor environments. The project includes the following tasks:

- Supported by A. Gomez (see the paper reference), assemble the hardware platform and connect an SGP30 or SGP40 sensor.
- Port the necessary drivers to communicate with the sensor over I2C. Integrate a sensor calibration routine and the predictive machine learning model to run locally and efficiently on the target hardware.
- Extend the provided smartphone app to obtain and display measured sensor values.
- Compare the obtained prototype performance to a continuously powered sensor in various environments.

Requirements / Skills:

- Affinity to assemble embedded hardware and software, building demonstrators, system tests and getting things done;
- Interest in optimizing machine learning models for operation on embedded devices;
- Programming skills in Python and C/C++.

Contact Person

- Dr. Olga Saukh (saukh@tugraz.at)
- Yun Cheng (chengyu@ethz.ch)

Networked Embedded Systems Group