Sensor implementation in envirobot locomotion segment

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Introduction

1. We wrote a generic software to interface through the CAN sensing bus the head of the robot with the sensor platforms.
2. In order to test the temperature and the conductivity sensor in a real situation, we mounted the segment on a boat which was driven from the confluence into one or the other streams.

Sensor Platform

Each segment of the robot is can be equipped with a sensor control platform and is connected to the head with two CAN busses. One is used for locomotion and the other one to communicate with the sensor platforms.

The sensor platform is based on a generic control board. On one side it interfaces with the head of the Envirobot. On the other side it carries mezzanine boards, which are specific for each sensor. This setup gives a maximal flexibility, as only the mezzanine board has to be modified when a new sensor is included in the Envirobot.

The sensor platform completely controls the sensors and communications with the head through a very simple and generic protocol.
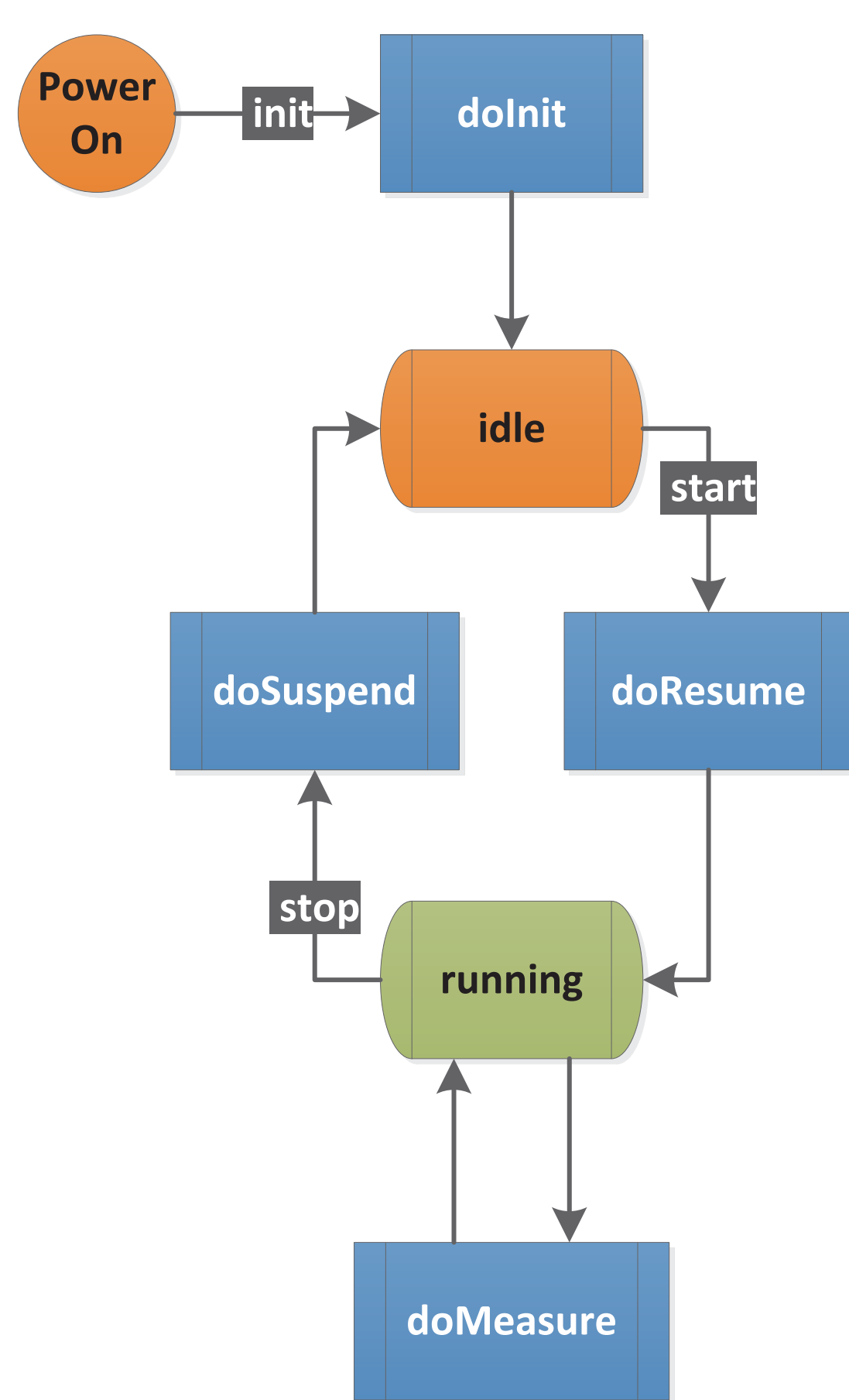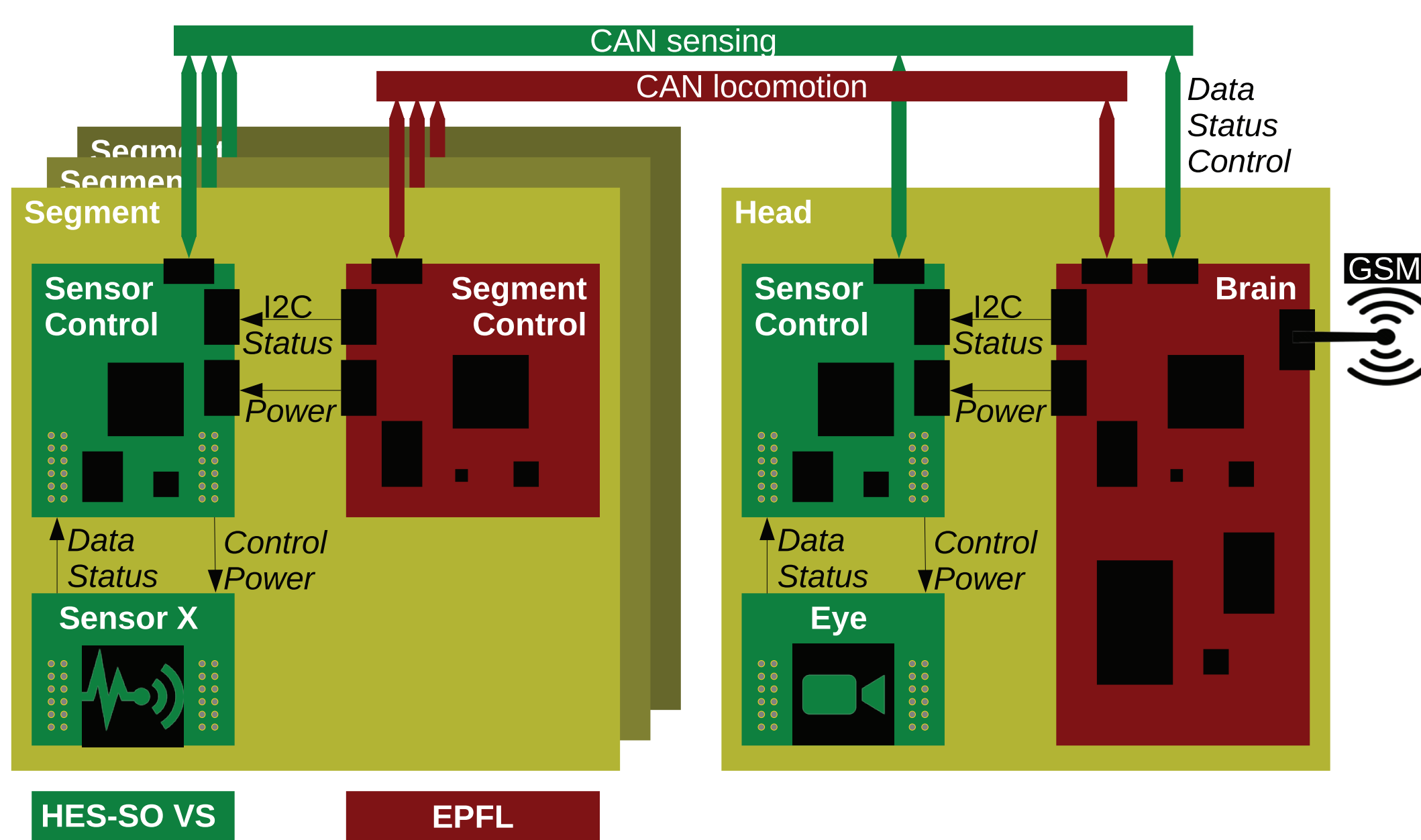
This state-diagram represents the behaviour of the sensor controls platform as it is seen by the head of the robot. The head sends the command *init*, *start* or *stop* to the sensor platform. Depending on the current state, the platform instructs the sensors to execute different tasks. In the state running, measurement results are collected and automatically transmitted to the head. Apart from that, the head can request a sensor platform to identify itself anytime. This request can be used to detect which sensors are present on the robot. Therefore sensors can be added or removed from the robot without reprogramming the head.
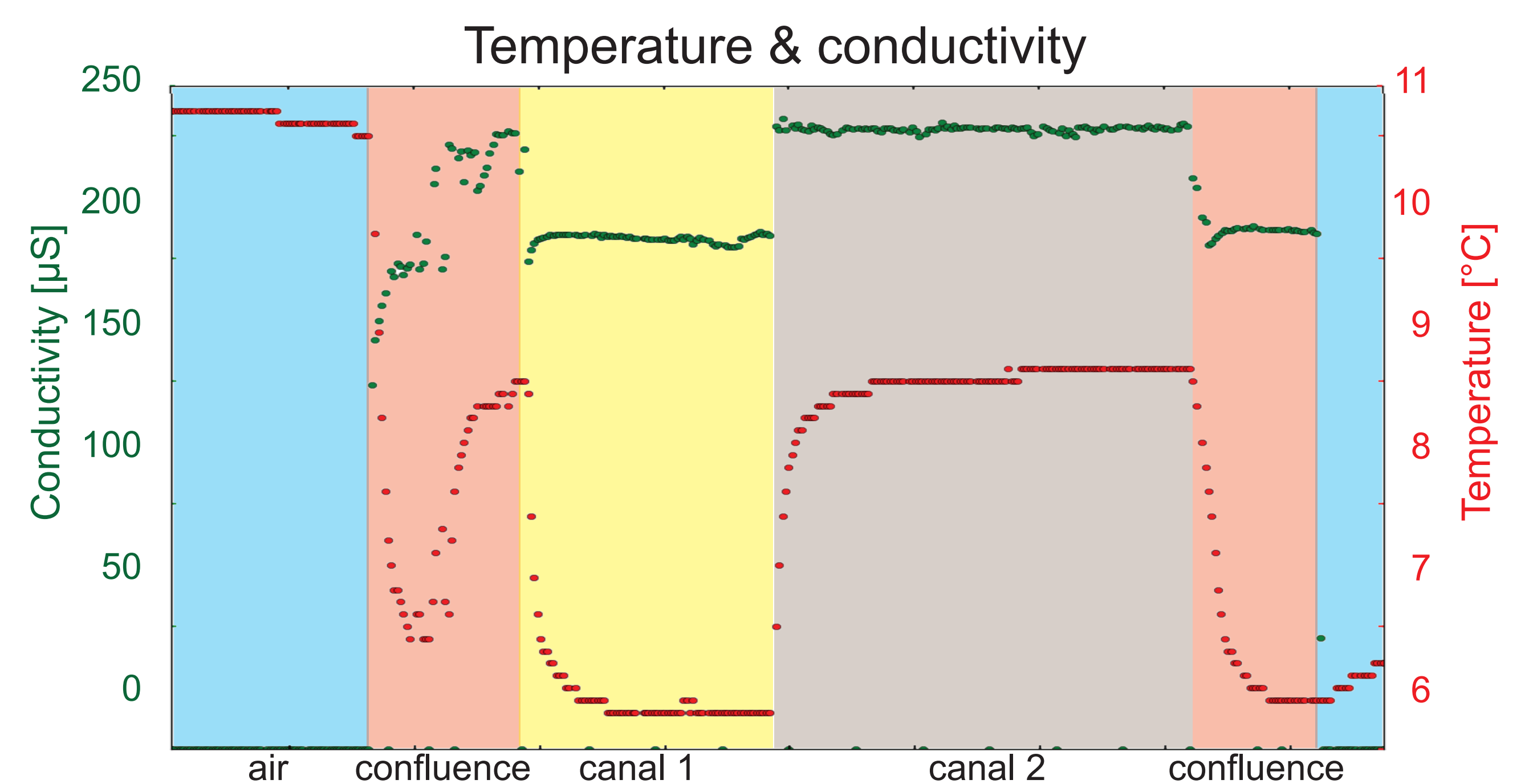
Field test

Because the robot is not always available and integrating a modified module into the Envirobot is quite time-consuming, a way had to be found to test the sensor control platform and the sensors under real-life conditions (e.g. in a water body). For this a remote-controlled boat has been equipped with an Envirobot segment. The CAN bus is replaced by a serial bus over Bluetooth and connected to a smart phone, which acts as robot head.

Test Location: Canal de Chalais: 46°15'18.5"N 7°26'57.0"E

To be able to measure a gradient in temperature and/or conductivity, a place had to be found, where two water sources meet and is accessible with our boat. We found such a place in *Sierre* near the *Lac de la Brèche* where two small canals join.

The measurement results demonstrate that all the pieces of the sensor platform work together as expected. We were able to detect a significant difference in conductivity as well as temperature in the two canals.
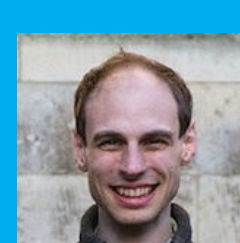

Summary

With the sensor platform we are now able to easily add any bio-sensor into the Envirobot and to interact with it. In addition field tests can be done on any sensor without the full robot.

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