BIOINSPIRED
UNDERWATER ROBOTICS
E-SENSE PLATFORM

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

E-SENSE is an underwater robotics research platform dedicated to the study of a mode of bioinspired perception called electrical sensing.

Inspired by electric fish, this sixth sense is based on the principle of emitting an electric field in the robot's environment and measuring the disturbances reflected by the environment.

Electrical sensing allows certain fish to navigate in turbid, obstacle-filled waters, recognize their prey, escape their predators, communicate, and build mental maps of their environment.

Industrial projects

- Perception in mud (for AREVA)
- Perception with force feedback in water but also in air (for CEA)

A unique platform
in the world

**Entirely dedicated to electrical sensing, the E-SENSE** platform is the only one of its kind in the world.
It enables the development of innovative sensor technologies, including sensor development, reactive navigation algorithms, shape recognition and haptic feedback.

This platform has been the linchpin of **numerous collaborations** and was at the heart of work rewarded by the La Recherche 2011 prize in the «innovative technologies» category.

Le Prix **L4Recherche** 2014

ANGELS

subCULTron

A tool for promotion
and transfer
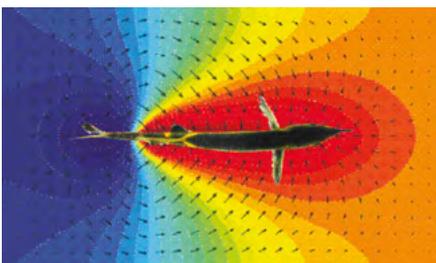
The E-Sense platform is an **ideal tool for industrial or academic promotion.** Several ANR (French National Research Agency) projects and European projects (FET FP7 and H2020) were involved in its creation, and it has been used for contractual research in the fields of oceanographic prospecting, nuclear safety and offshore remote operations.

Today the platform is part of **a joint lab with a young startup called ELWAVE,** whose aim is to ensure the transfer to industry of technologies inspired by electric sense.

A groundbreaking technology for underwater perception in opaque and congested (constrained) environments
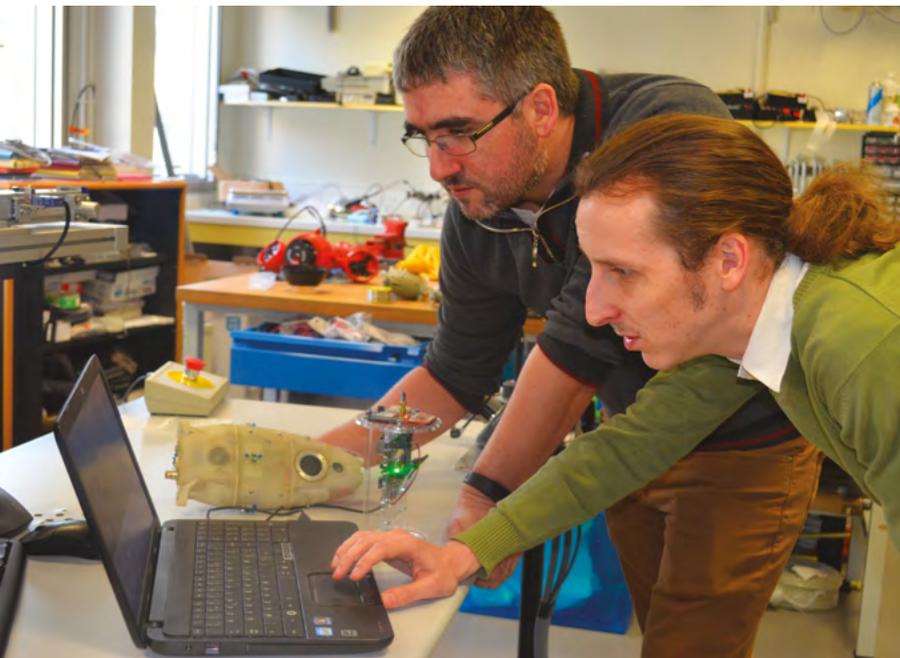
What we offer

› **This platform includes two tanks** (one in fresh water, the other in sea water) with Cartesian robots mounted on top, controlled using matlab-dspace. These robots can provide 2- and 3-dimensional controlled movement of electrical sensors or other robots equipped with electrical sensing. Equipped with numerous removable devices that can reproduce a variety of scenarios, these same tanks can also be used to test autonomous robots in a controlled manner.

› This platform is also the experimental vector for technology transfer via the ELWAVE startup, **winner of the Ilab 2019 prize.**

E-sense is a tool for academic collaboration.

Developed over the course of several multidisciplinary projects, **the E-sense platform is an ideal place for sharing and collaborating** across disciplines for the study of electric sense. In particular, it is used jointly by physicists, roboticists, automatic-control specialists and biologists.

Electrical perception is underpinned by the resolution of difficult inverse problems, which are often ill-posed or ill conditioned. For this reason, electric sense and the E-sense platform dedicated to studying it can serve respectively a benchmark and a test bench for those working on inverse problems or in Artificial Intelligence. (As seen with the fish mentioned above, electrical sensing makes it possible to recognize objects in a way that is still largely misunderstood).

High-performance equipment at your service

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Discover the platforms

Together we can figure out how E-Sense can be useful to you!

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