# ENSTA Bretagne Robotics Topic Group

General presentation

- The **Robotics** Topic Group of STIC Department at ENSTA Bretagne works mainly on problems found in **mobile robotics** for **marine**, **submarine**, **ground**, **aerial**, **multi-domain**, **single** or **grouped** robots
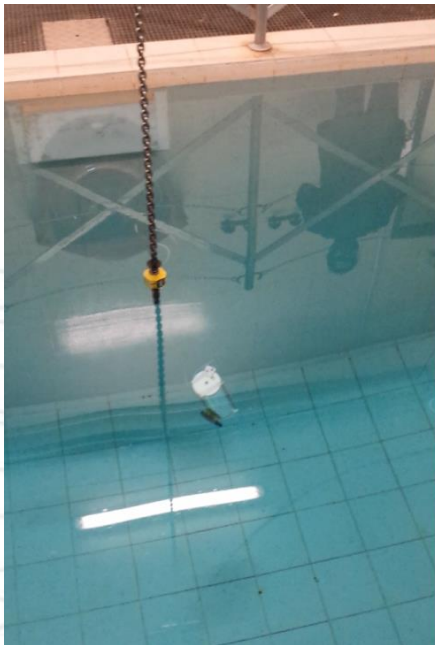

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General presentation

- This application domain enables to validate experimentally various concepts and algorithms, using academic tools such as set-membership methods, especially **interval analysis**
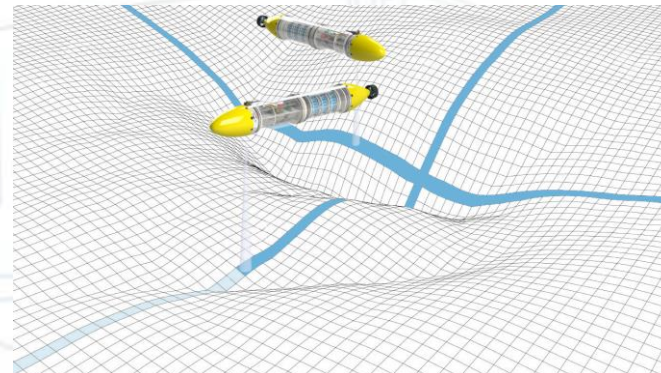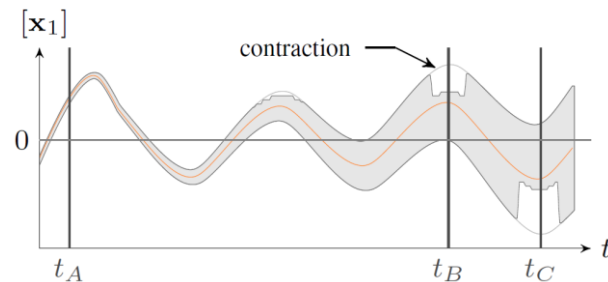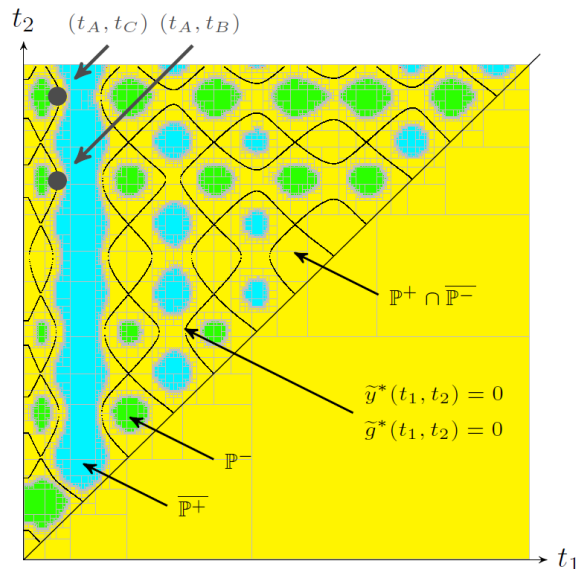
General presentation

- There are various related topics : building simple, cheap and robust robots, remote control, planification, autonomy, control, validation, robust localization, SLAM (Simultaneous Localization And Mapping), objects detection and identification, cartography, collaboration between heterogeneous robots, artificial intelligence, reliability…


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Research
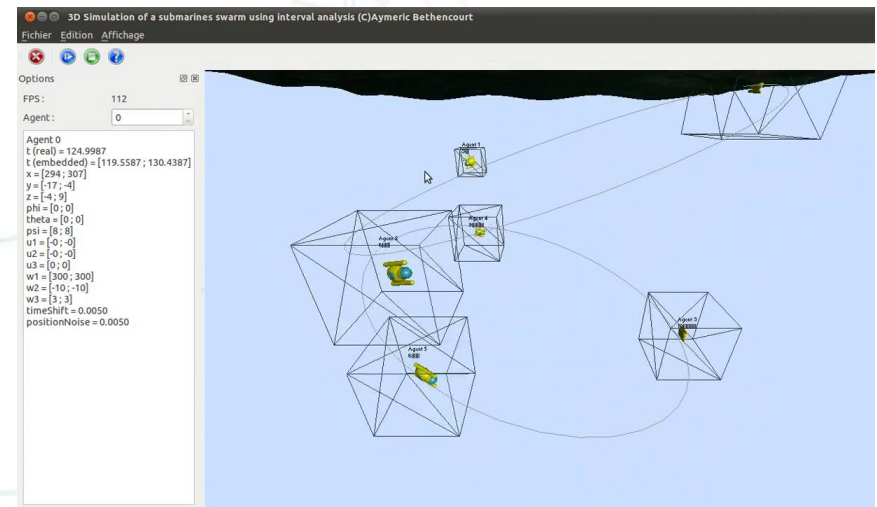
- Examples of past projects/achievements :
  - Localization of a submarine robot using interval analysis
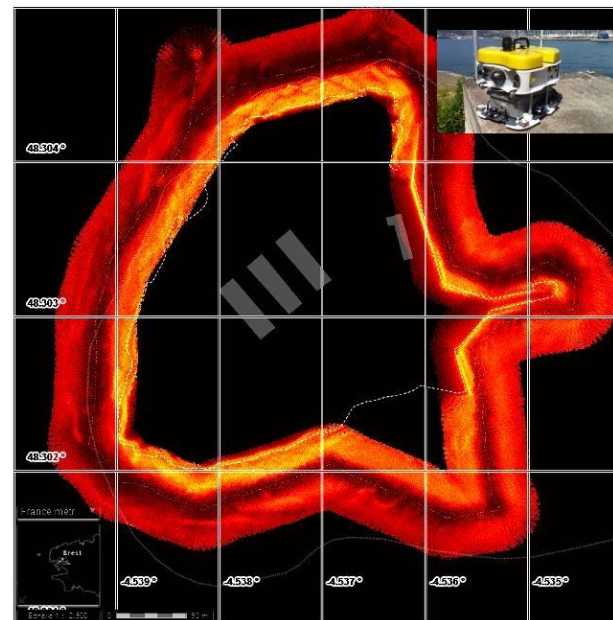 - VAIMOS autonomous sailboat (collaboration with Ifremer)
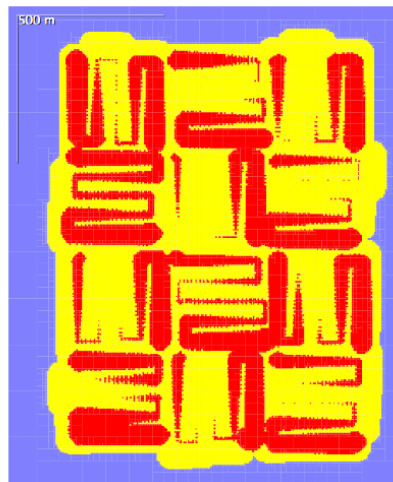
Research
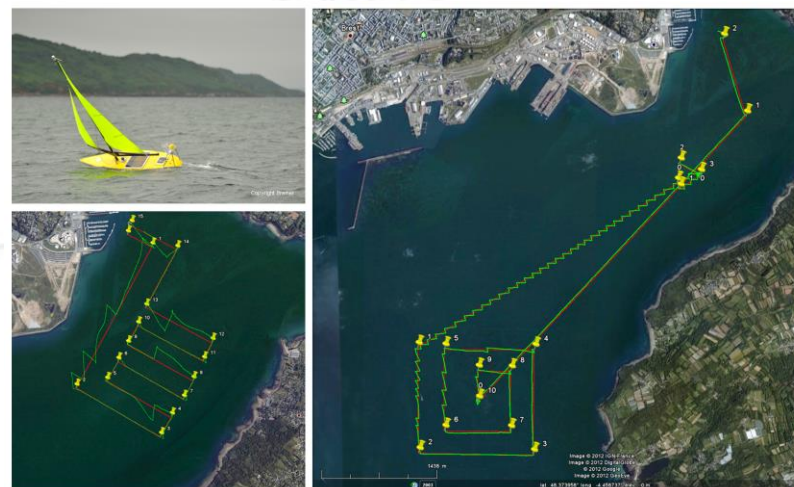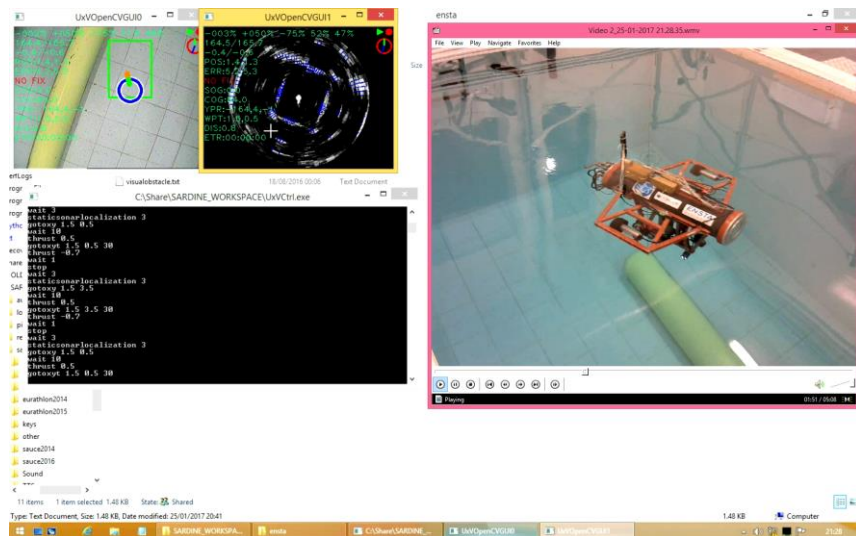
- Examples of past projects/achievements :
  - COMET : guaranteed estimation of the area explored by AUVs (Autonomous Underwater Vehicles)
  - Going around an island using an AUV


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Research
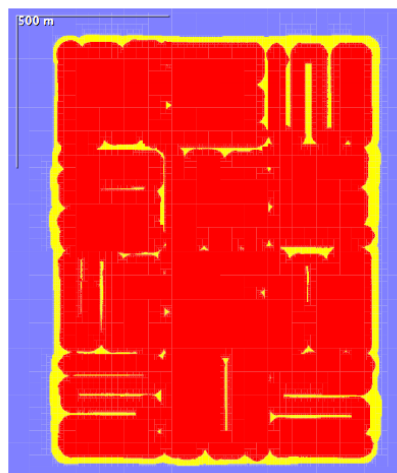
- Examples of current projects :
  - **DGA/MRIS** project about reliable complex robotic systems, in collaboration with Ecole Polytechnique and ENSTA ParisTech
  - **DGA RAPID CHIMAERA** : building a submarine robot equipped with a laser-based obstacle system, in collaboration with Thales and other companies
  - **ANR CONTREDO**, about interval analysis applied to dynamic systems, in collaboration with LIRMM, IMTA and MBDA

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Teaching and robotics club

- In parallel to its academic research activities and industrial research projects, the Robotics Topic Group tries to develop **teaching in mobile robotics** to train **robotics engineers** directly **operational in industrial fields**, from start-ups to well-established multinational companies

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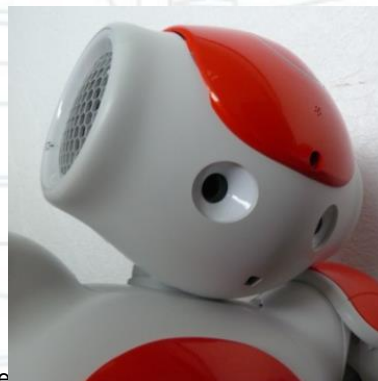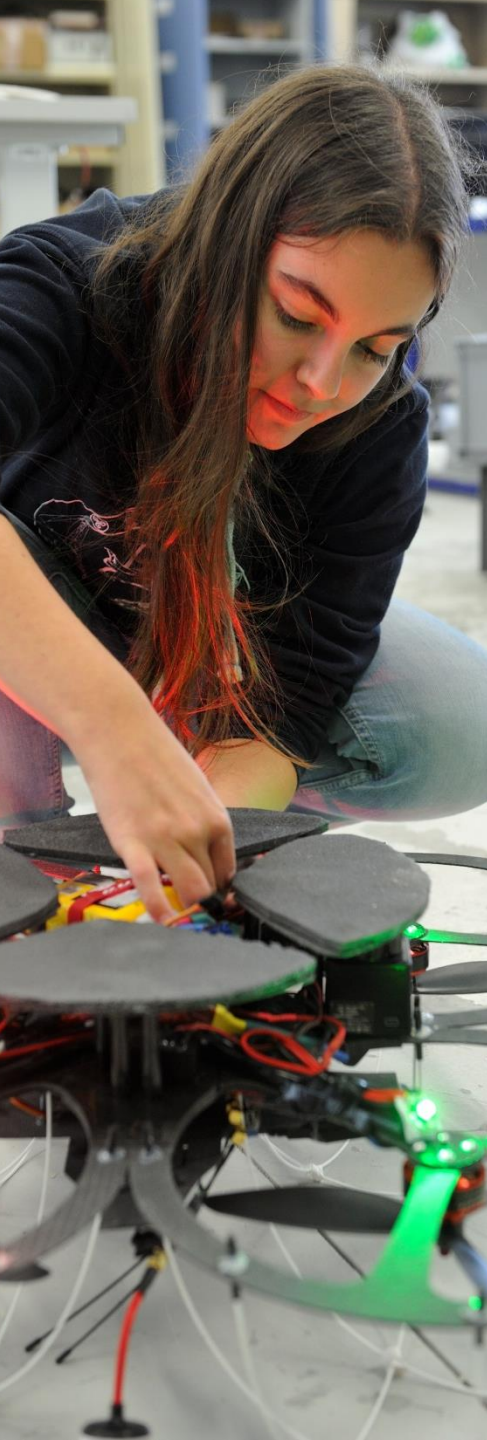
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- For that purpose, teaching covers **theoretical domains**
  - E.g. robots localization using probabilistic or set-membership methods, decision, control, SLAM, path planning, inverse kinematics...

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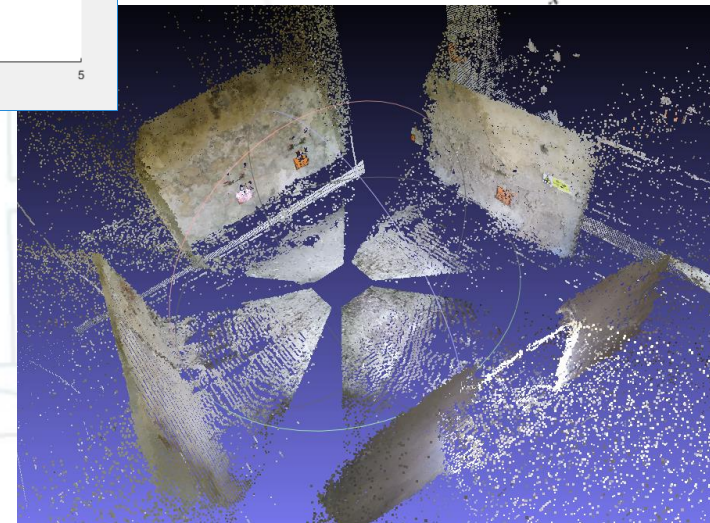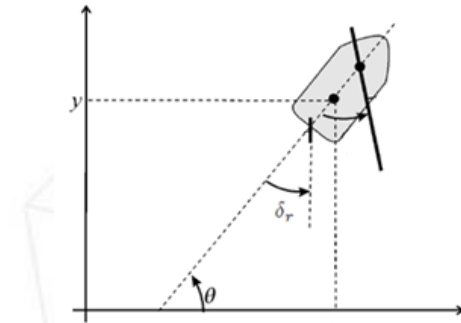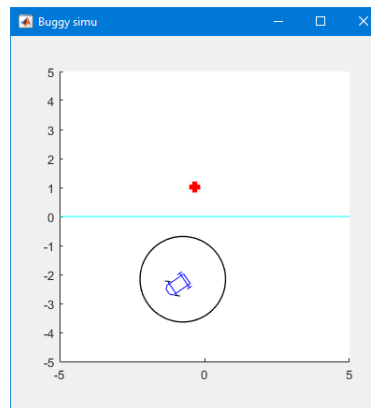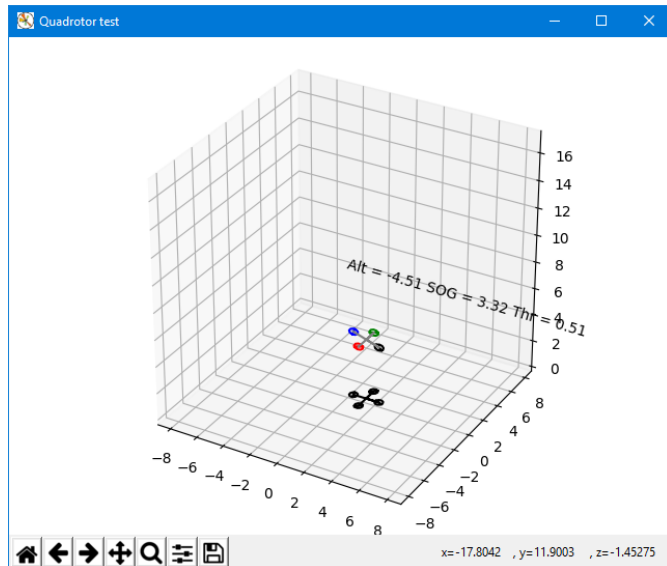
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- … as well as **practical domains**
  - DART ground and NAO humanoids robots
  - Design and building of prototypes
  - Middleware and CAD
  - Field experiments at Guerlédan lake


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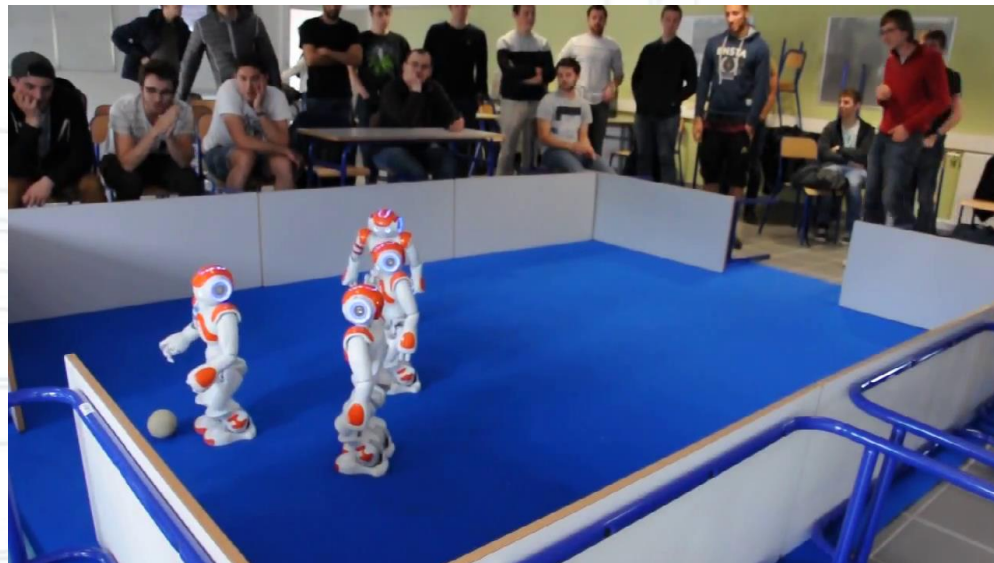
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- As examples, the following student projects gather researchers, teachers, Ph.D students, postdocs and engineers from the Robotics Topic Group around research and development topics often proposed by partner companies or universities, in collaboration with the school robotics club (https://www.youtube.com/user/ensietarobotics) :
    - **Hydro-Rob Guerlédan project** (http://hydrob.ensta-bretagne.fr/)
    - **Cordelière project** (https://www.ensta-bretagne.fr/jaulin/cordeliere.html)
    - **SHEPHERD project** (https://www.ensta-bretagne.fr/jaulin/shepherd.html)
    - **SAUC-E** (http://sauc-europe.org/), **WRSC** (http://www.roboticsailing.org/), **euRathlon** (http://www.eurathlon.eu/), **ERL Emergency** (https://eu-robotics.net/robotics_league/erl-emergency/) international robotics competitions

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- **Hydro-Rob Guerlédan project** : students projects at Guerlédan lake, some of them proposed by companies, with also a participation of other students groups from Ecole Polytechnique and UPMC, companies robots demonstrations, etc.

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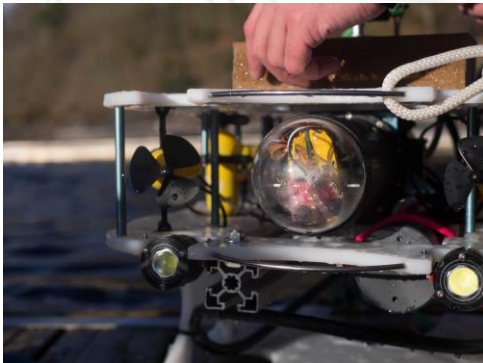
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- **euRathlon/ERL competitions** : collaboration between heterogeneous robots to explore areas that would be too dangerous for humans

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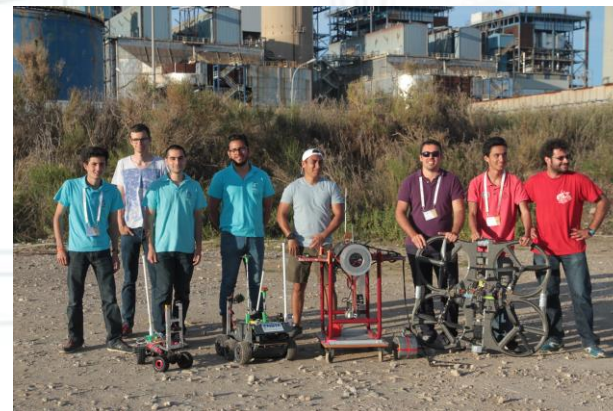
Devices recently bought to help for the creation of groups of drones

- Acoustic underwater imaging sensors (BlueView sonars)
- **CNC machine**, to be able to build specific robot parts
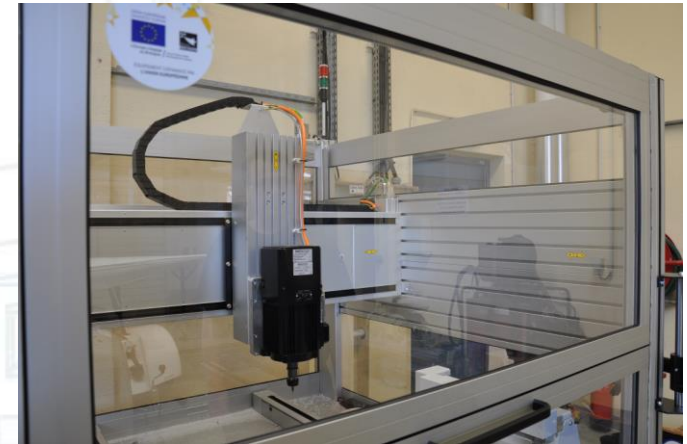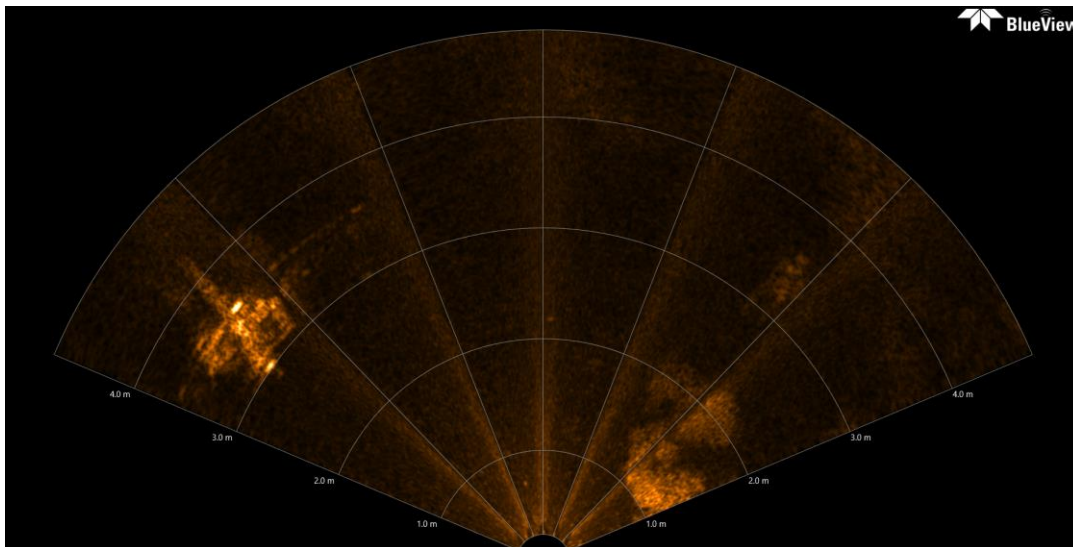
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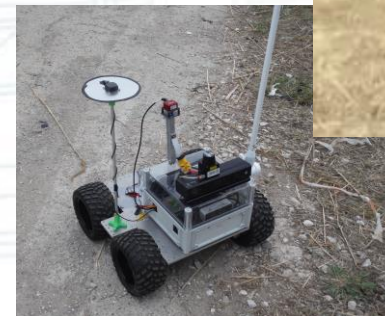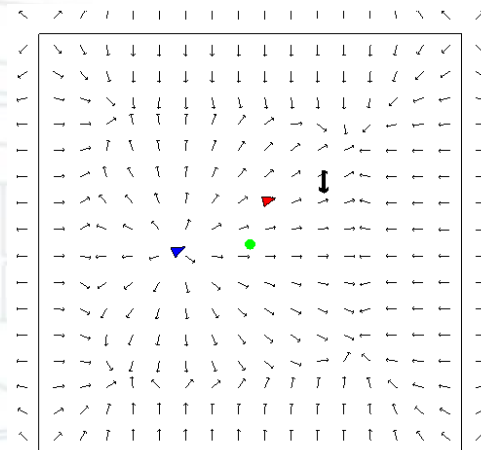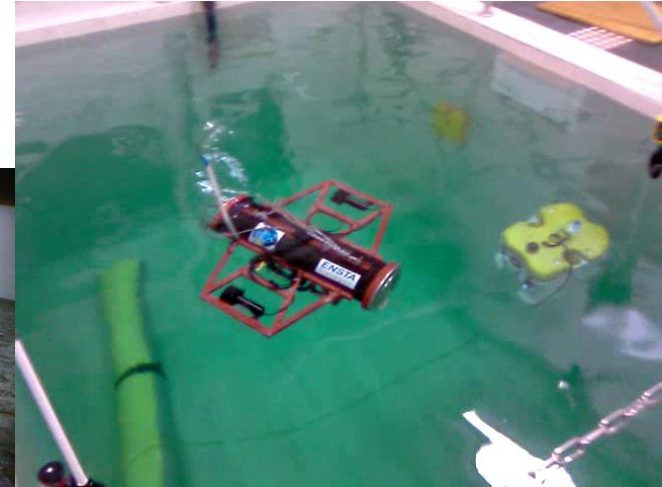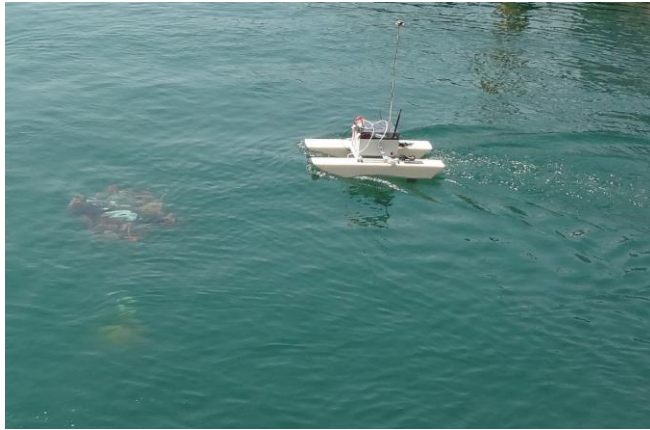- Acoustic sensors for speed measurements underwater (DVL)

Nortek DVL 1 MHz

TRDI Pathfinder

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The end