

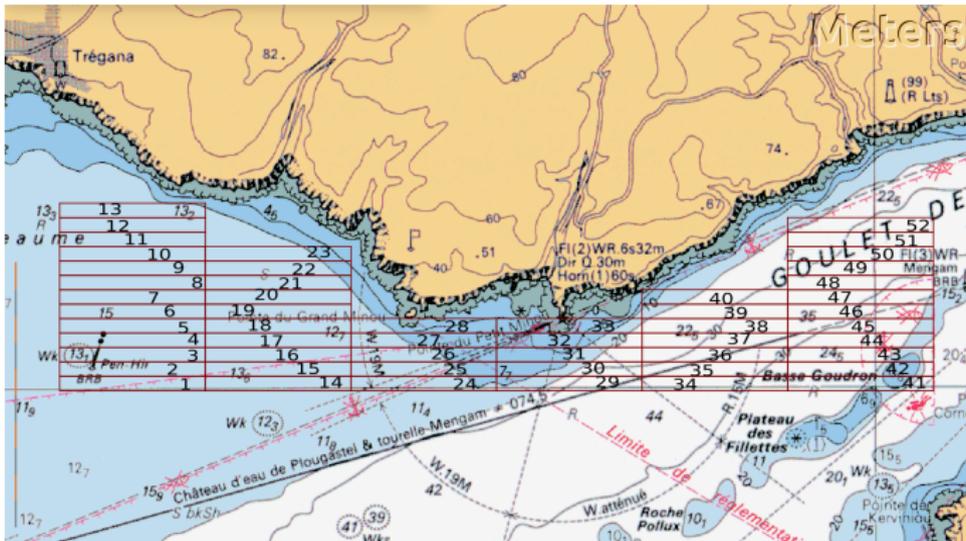
# Ocean exploration with robots

L. Jaulin

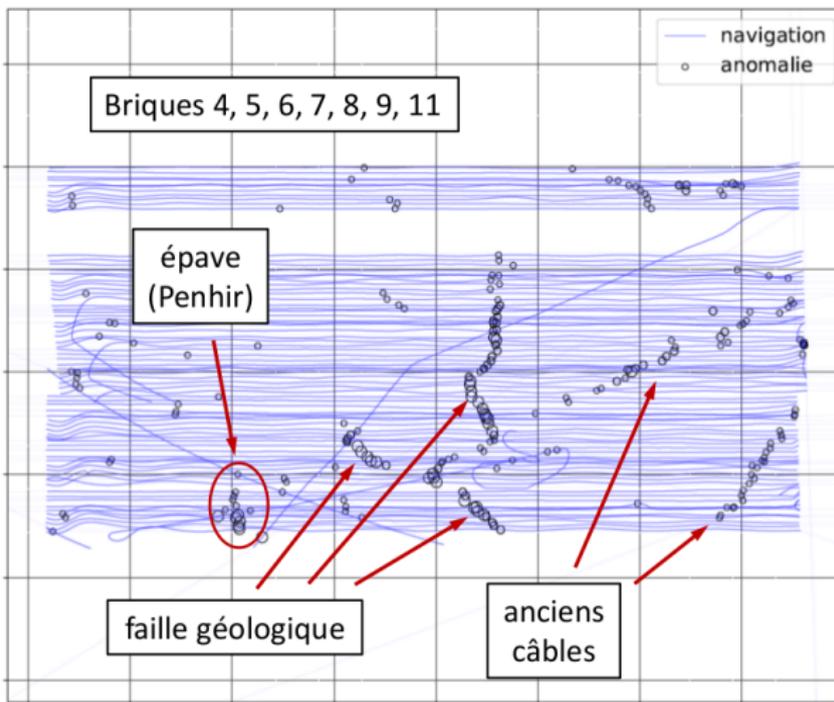
September 28, 2023,  
Visite SIREHNA



# 1. Marine robots to build maps





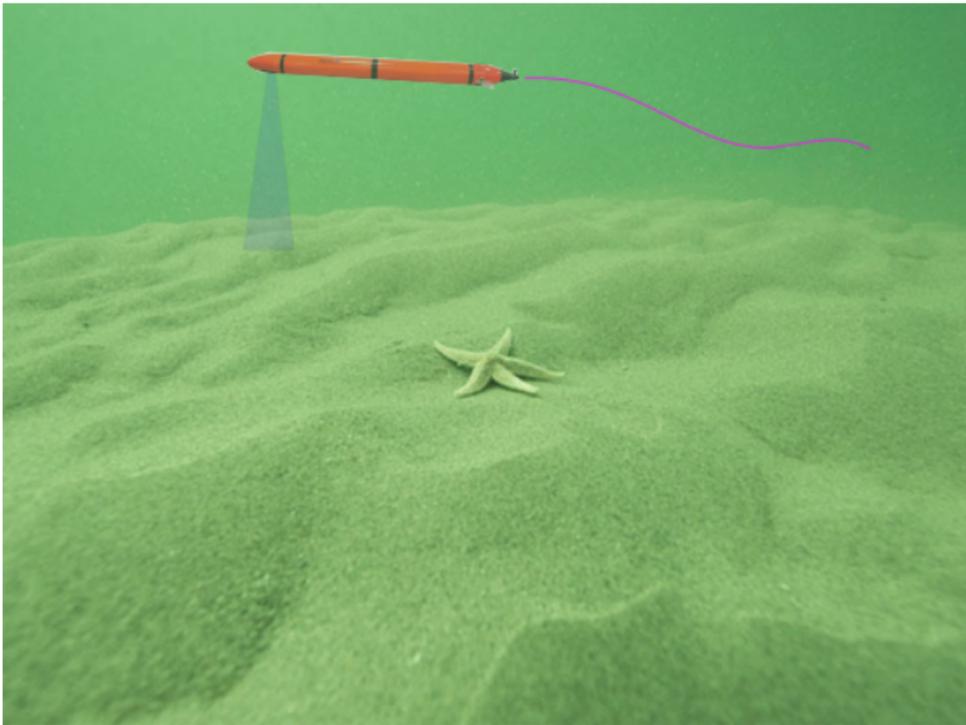


Magnetic map built in 2018

## 2. Cycle-based navigation

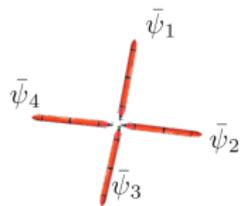
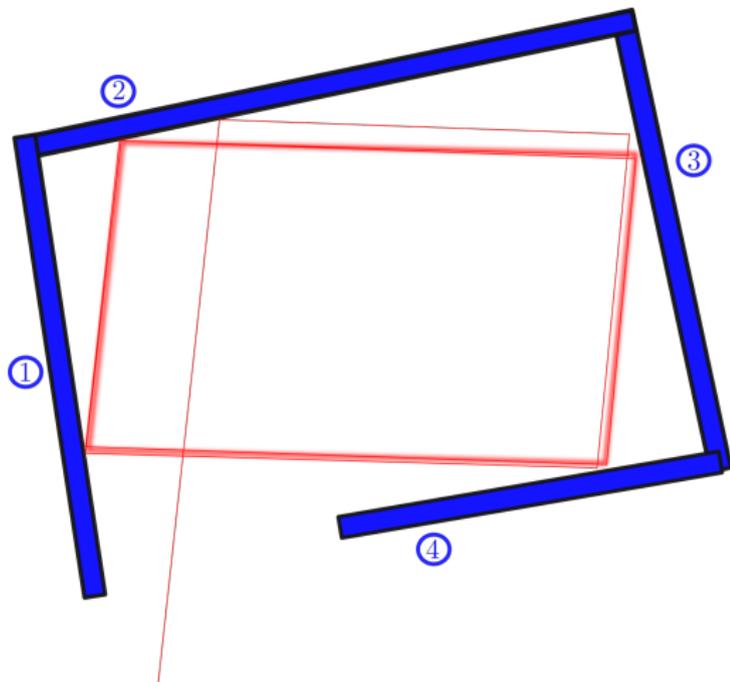


## Submeeting 2018





[youtu.be/TsvEUGa-XAs](https://youtu.be/TsvEUGa-XAs)



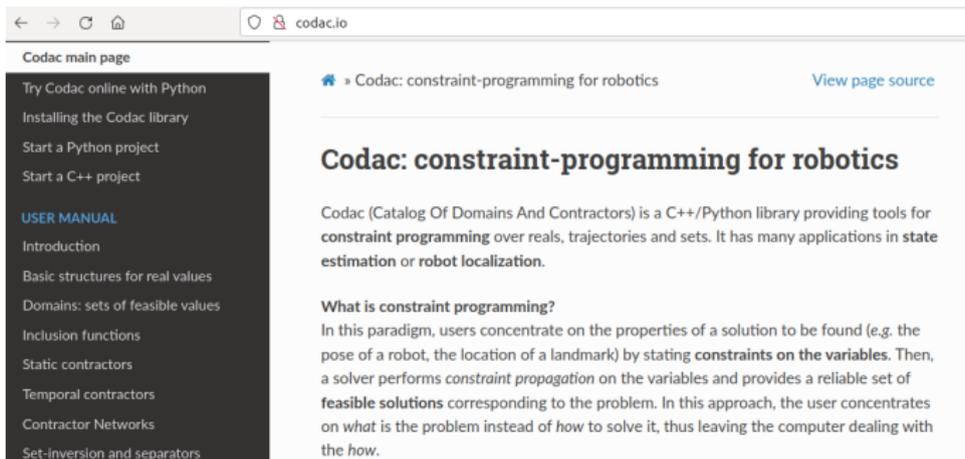
Find the route without GPS, compass and clock

# 3. Tools for validation

Given

$$\begin{cases} \dot{\mathbf{x}} = \mathbf{f}(\mathbf{x}) \\ \mathbf{x}_0 \in [\mathbf{x}_0] \end{cases}$$

Interval methods allow us to find an envelope for  $\mathbf{x}(t)$ .



The screenshot shows a web browser window with the URL `codac.io`. The left sidebar contains a navigation menu with the following items: "Codac main page", "Try Codac online with Python", "Installing the Codac library", "Start a Python project", "Start a C++ project", "USER MANUAL", "Introduction", "Basic structures for real values", "Domains: sets of feasible values", "Inclusion functions", "Static contractors", "Temporal contractors", "Contractor Networks", and "Set-Inversion and separators". The main content area displays the title "Codac: constraint-programming for robotics" with a "View page source" link. Below the title is a paragraph describing Codac as a C++/Python library for constraint programming over reals, trajectories, and sets, used for state estimation and robot localization. A section titled "What is constraint programming?" explains the paradigm where users define constraints on variables, and a solver performs constraint propagation to find feasible solutions.

An interval based library for verification in robotics