ISME experience within the **DexROV** (H2020 2015 - 2018) project

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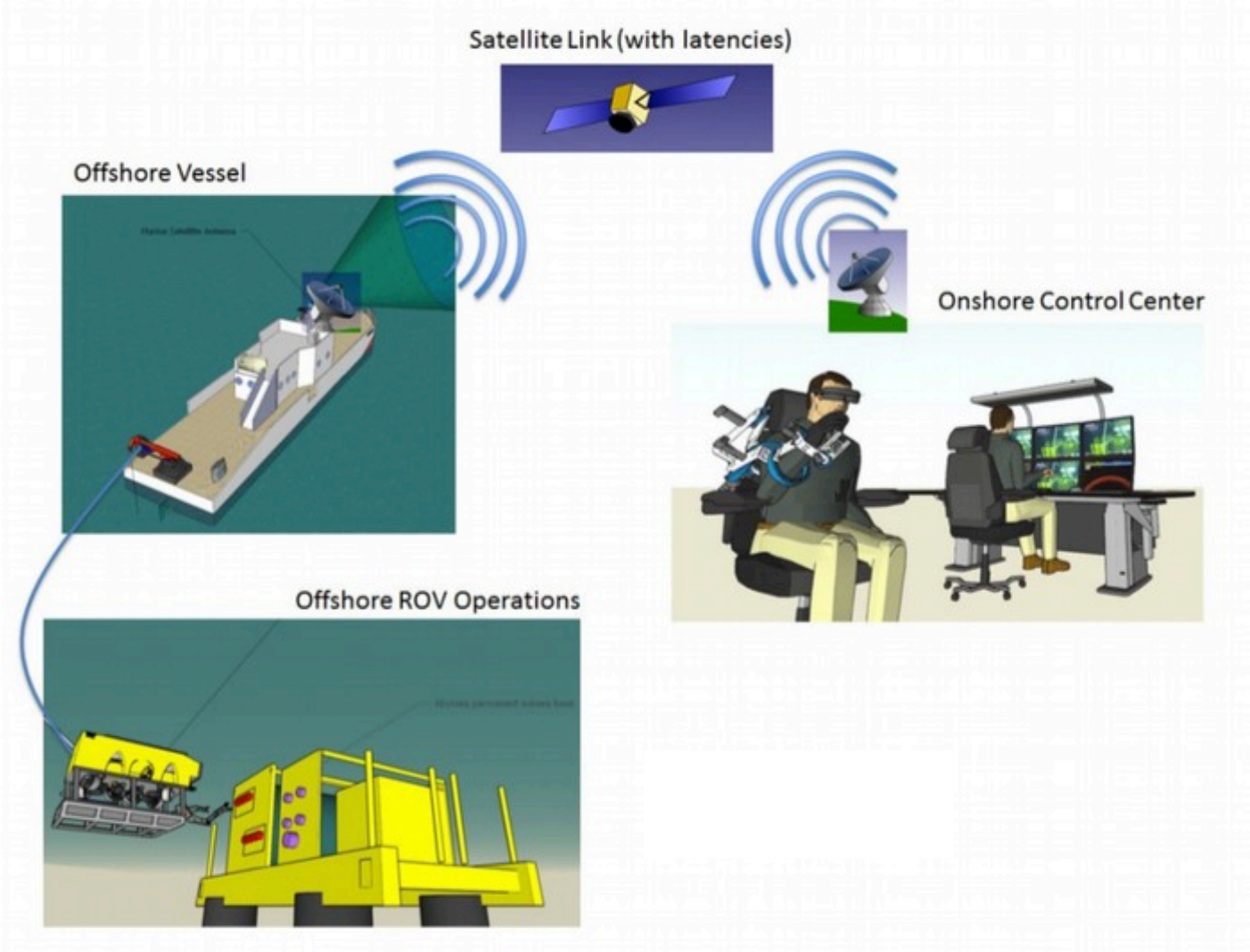
ISME - www.isme.unige.it

- European project funded by the Horizon2020 scheme

DexROV concept



DexROV concept, a closer view

Offshore Operations

Vessel

3D models

Online Data Processing

valves position

Proxy Cognitive Engine

motion primitives

desired e-e trajectory

High-Level Control

ROV

stereo camera raw data

joint position, e-e force

joint velocity

Environment Perception

Low-Level Control

Satellite Communication

Satellite Communication

Onshore Control Center

3D models

user's arm and hand position and force sensing

Simulation Framework

Haptic & Visual User Interfaces

visual & haptic information

Captured user demonstration

motion primitives

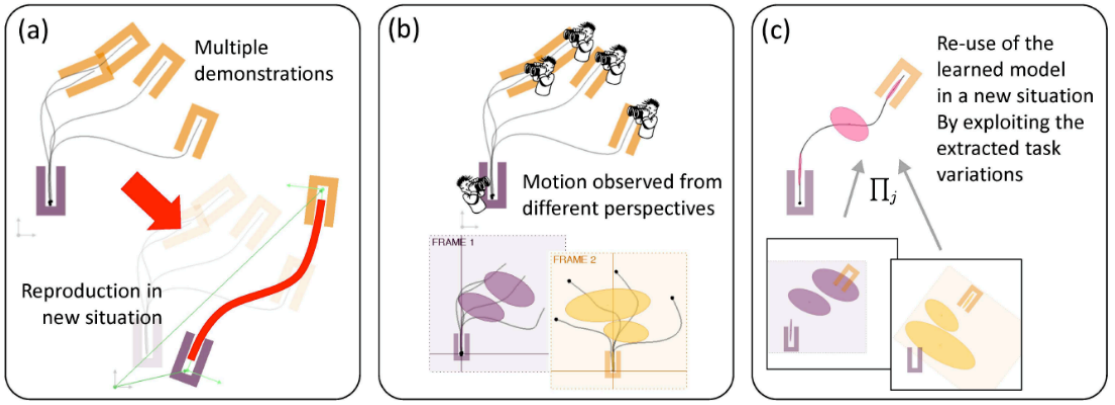
Cognitive Engine

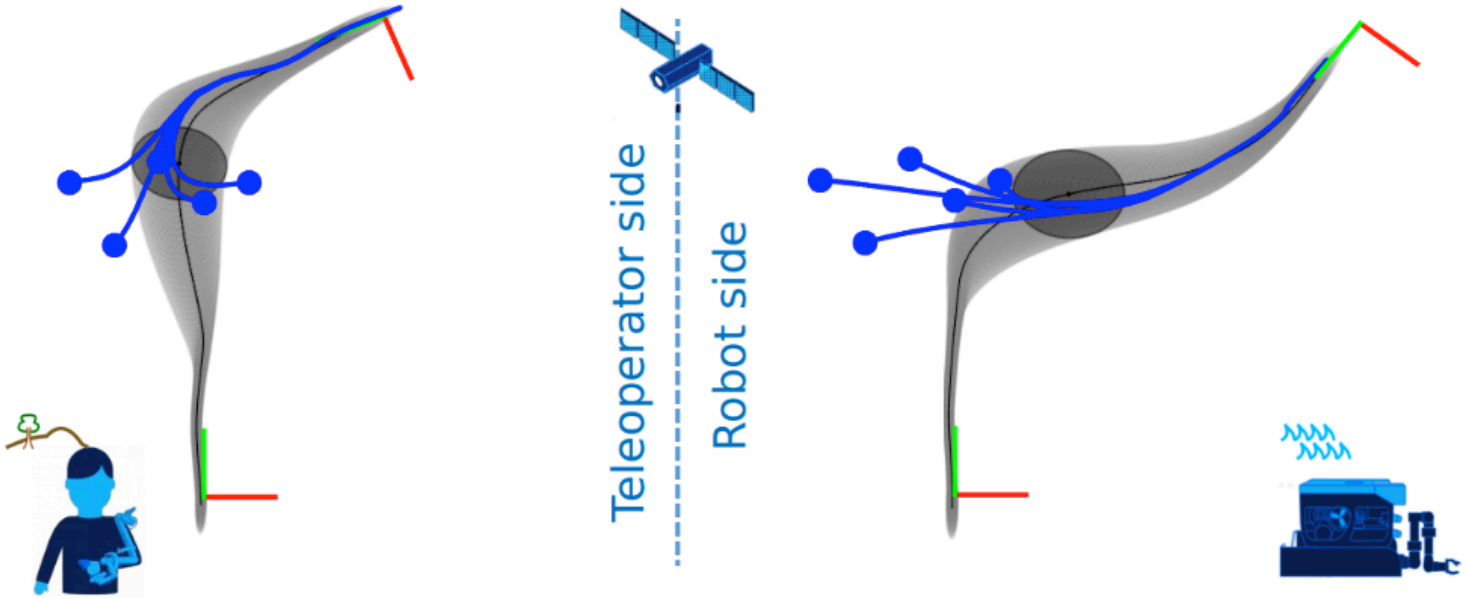
The exoscheleton and virtual reality

- developed by SpaceApps

Cognitive engine

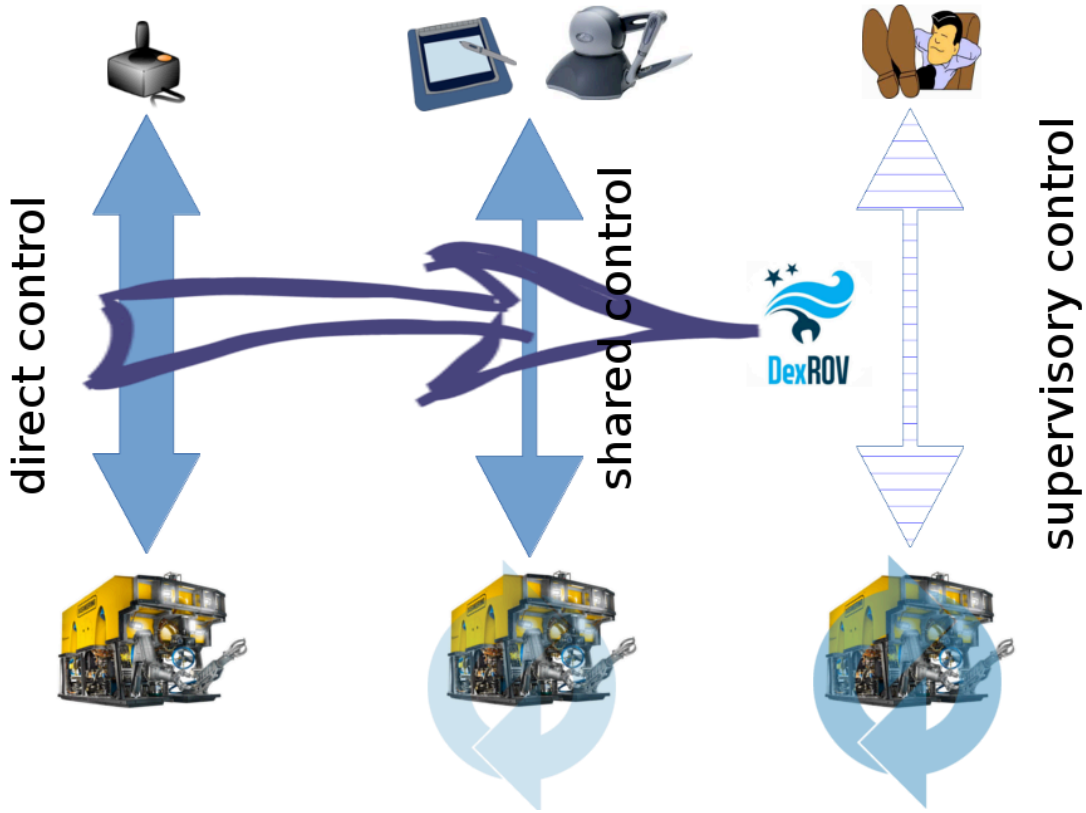
- developed by Idiap
- (http://calinon.ch)





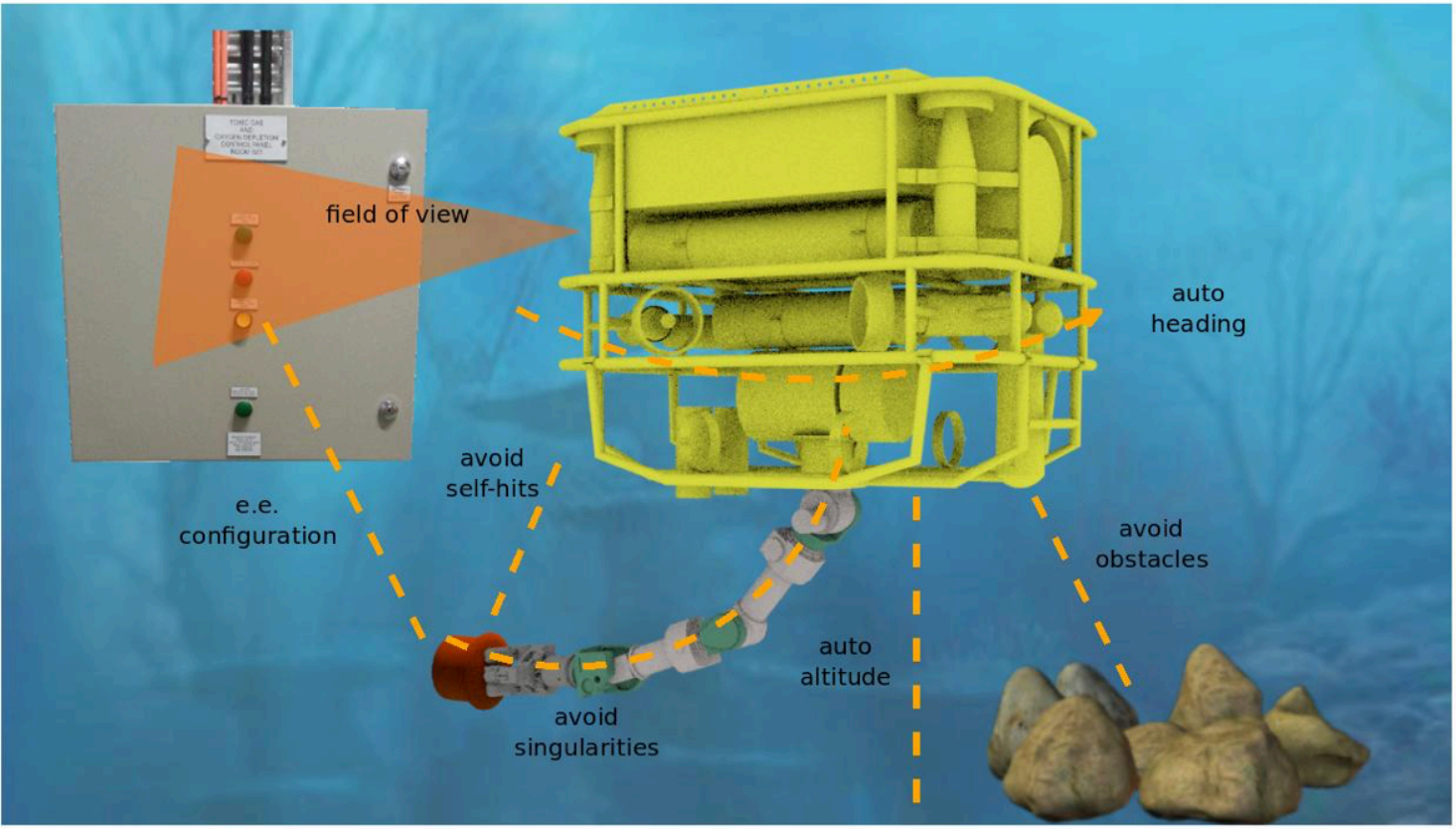
Vehicle-arm control

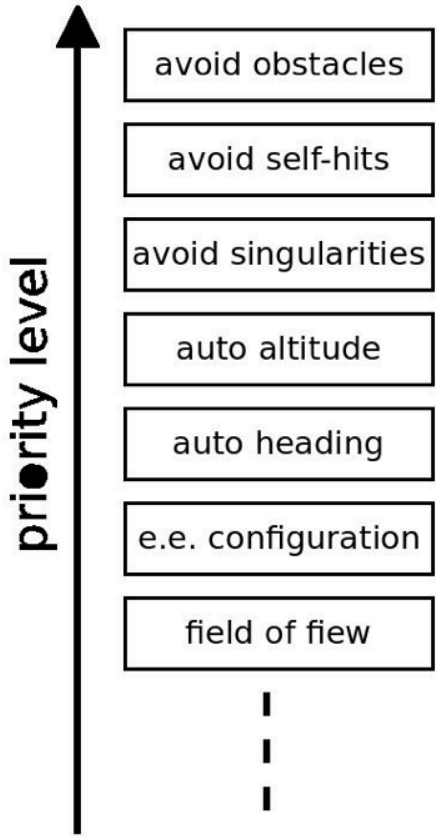
- developed by ISME (Cassino, Genova & Lecce nodes)



Set-based-task-priority Inverse Kinematics

DexROV





Tasks classification

Mechanical joint limits
Obstacle avoidance
Virtual walls
Self-hits

Set-based, safety-related tasks

e.e. position
e.e. orientation

Mission-oriented tasks

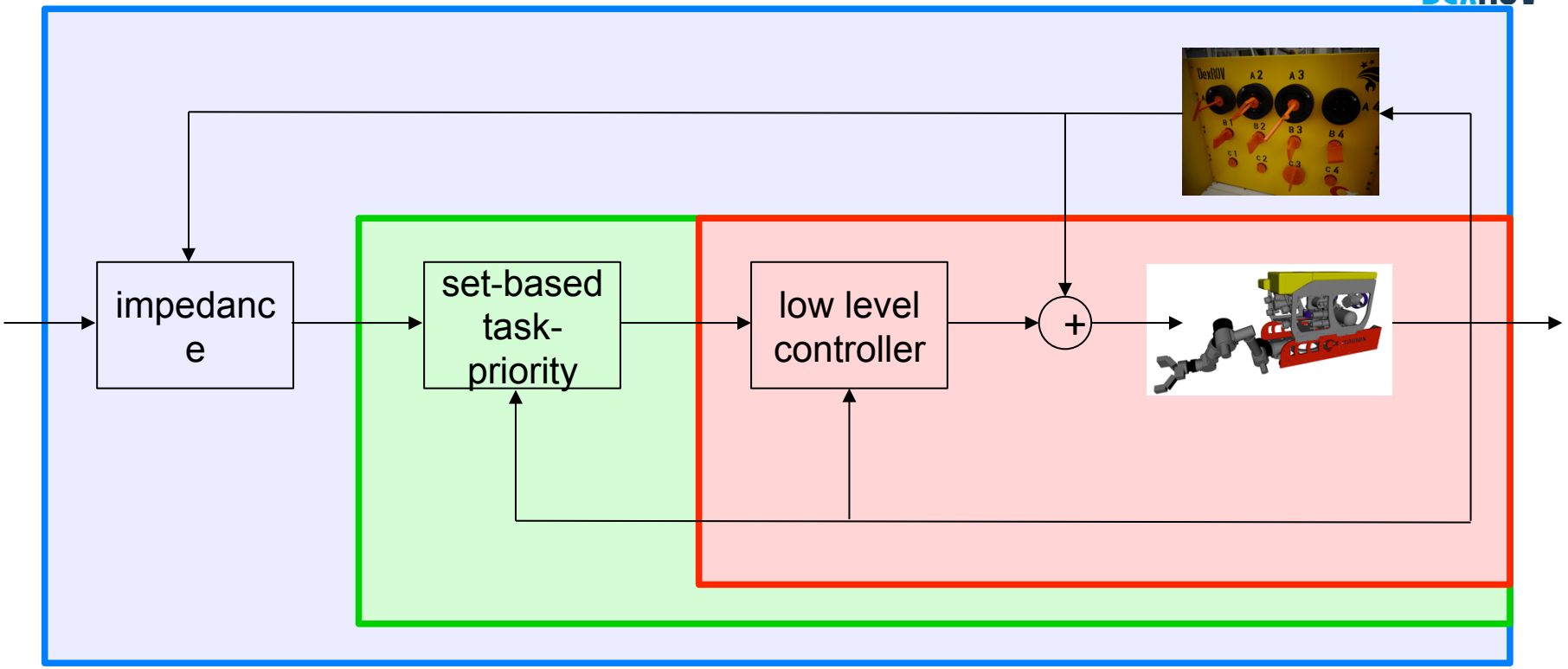
Manipulability
Field of view
Directional sensors

Optimization tasks

PRIORITY

- (inerithed by similar work done at POLIMI or DLR)

Admittance within set-based-task-priority



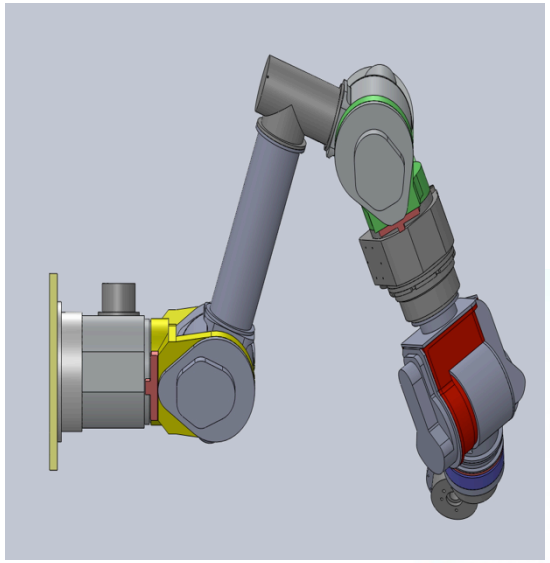
Off-the-shelf dynamic controller (vehicle, arm & hand)

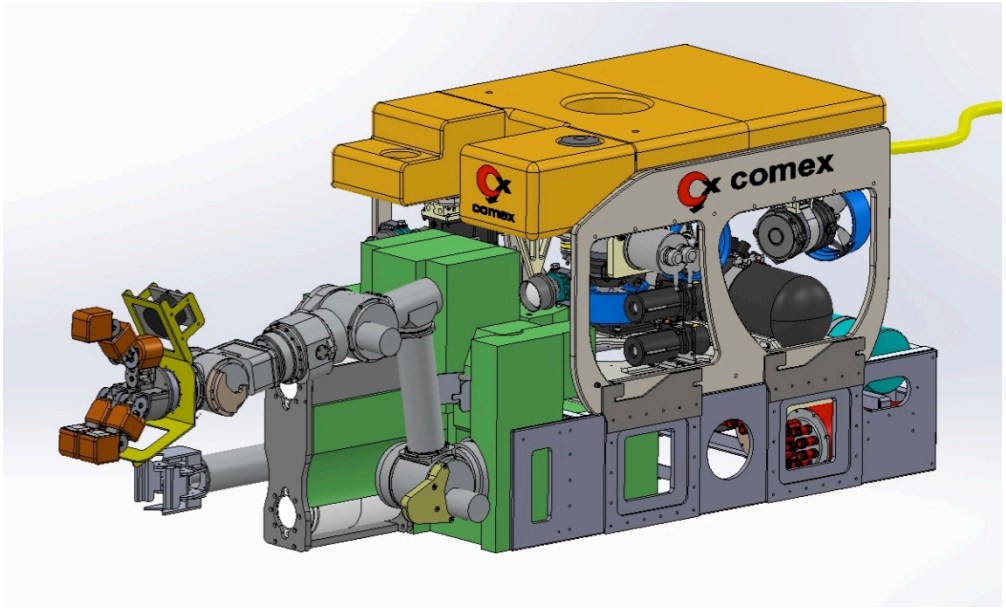
Whole-body kinematic control

Interaction control loop

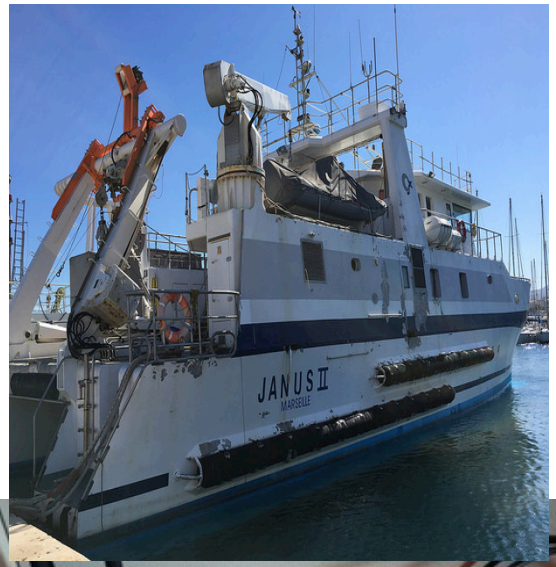
The Hardware

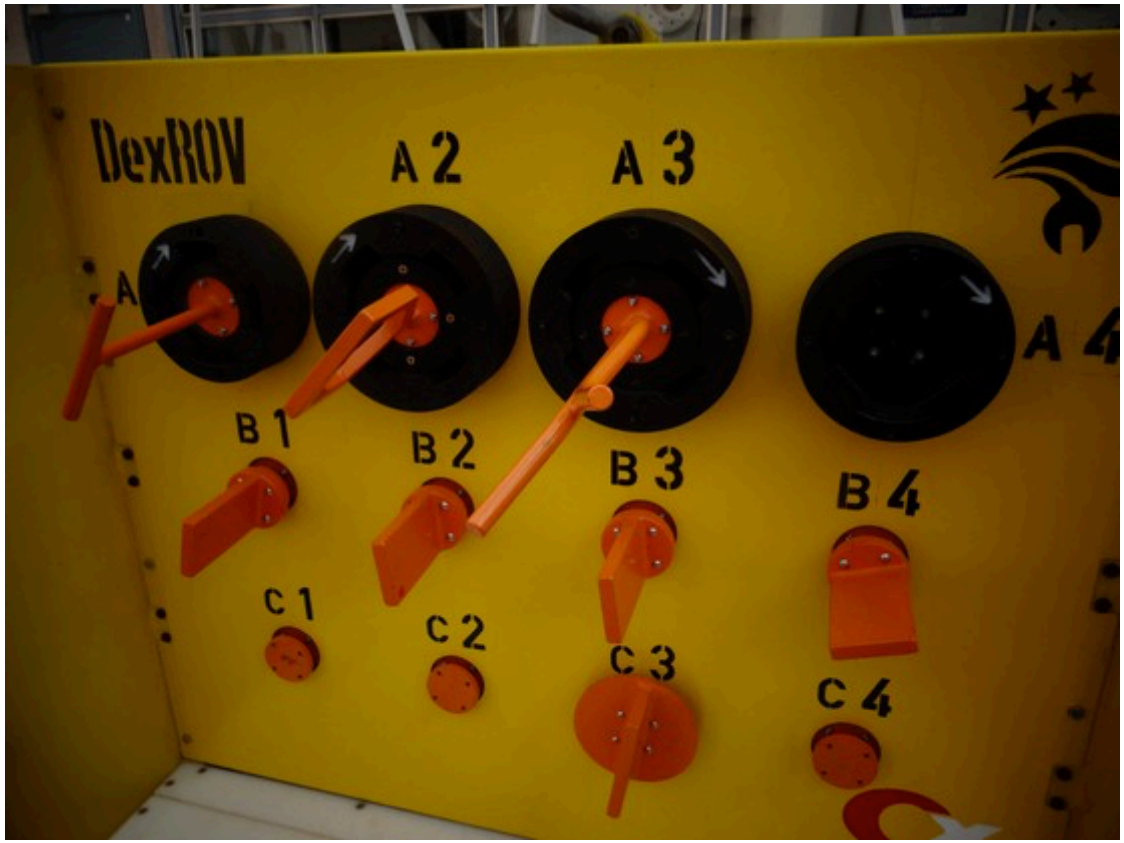
- Comex+GT+Jacobs





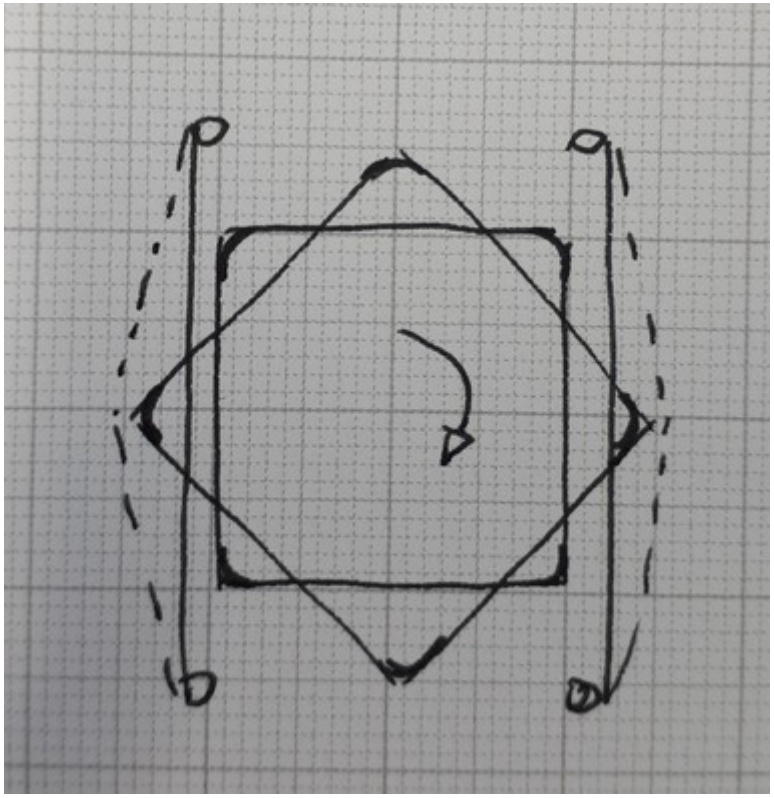
The Hardware





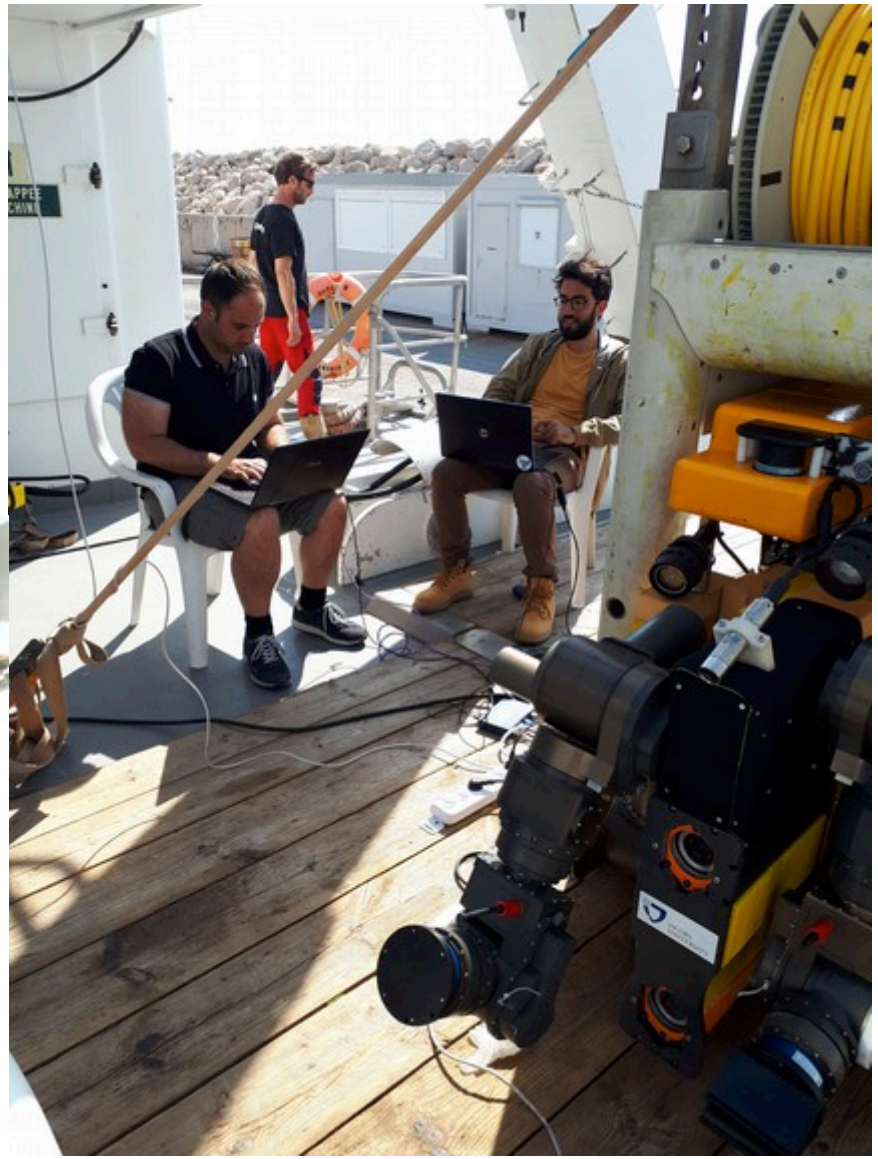
The valve

- configuration-dependent spring



Integration

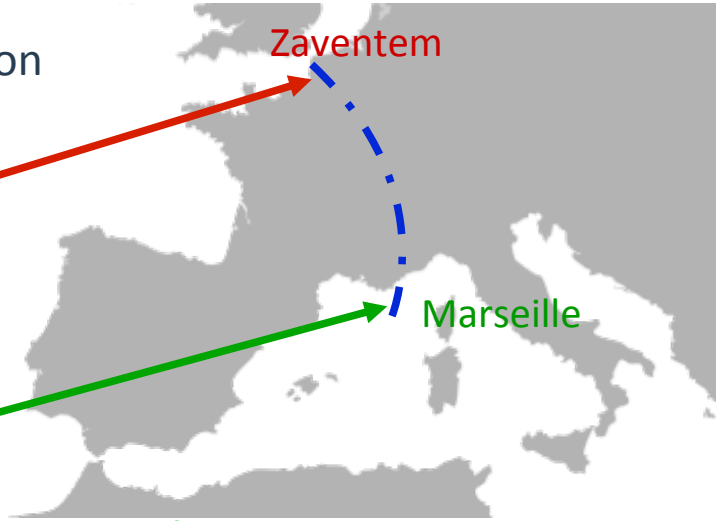
- few weeks of full HW at disposal
- hard work of partial preliminary integration



The turn valve operation

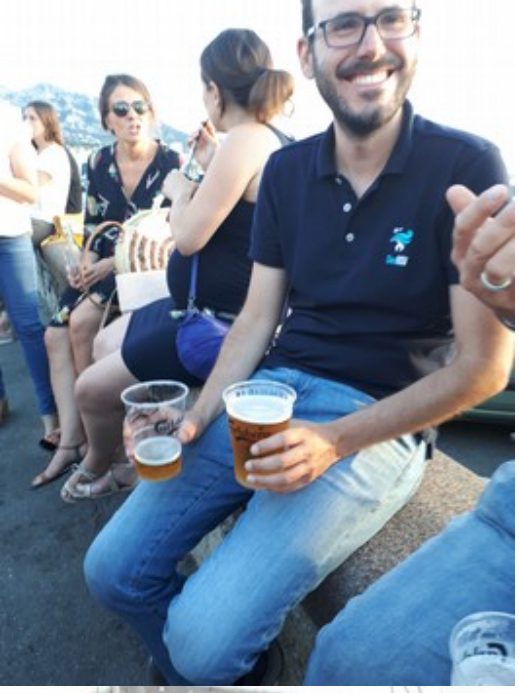
- june 2018

- 30m depth
- 1 arm + grabber configuration
- *dummy* hand :(
- Tested pipeline
  - exoscheleton
  - learning node
  - satellite comm
  - vision
  - reconstruction node
  - inverse kinematics
    - full implementation: admittance, safety, e.e position-orientation
- operation repeated
- crash tests with intentional impact tested



Play Video

https://youtu.be/lferwbHWLOI?list=PLZmkWoYr9d4zA7liIUC_OML4ThJ4BCt_H

THANKS

DexROV