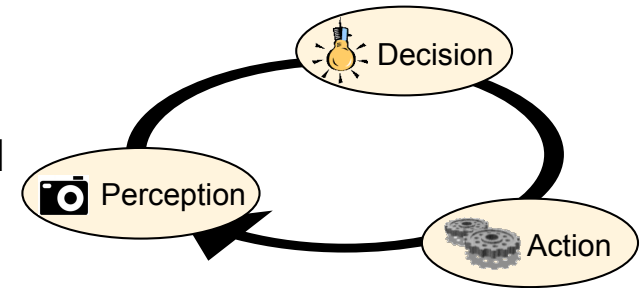


Robotics @ LAAS/CNRS

- Research topics

- Perception, planning and decision-making, control
- Plus: control architecture, interactions, ambient intelligence systems, learning

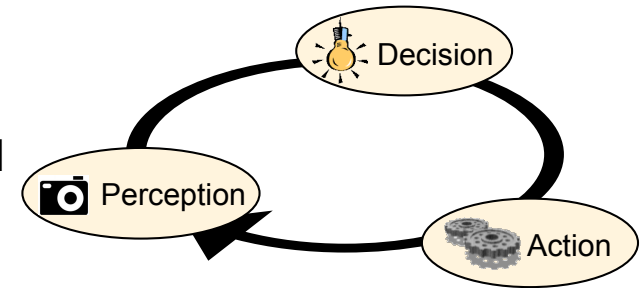


A keyword: **autonomy**

Robotics @ LAAS/CNRS

- Research topics

- Perception, planning and decision-making, control
- Plus: control architecture, interactions, ambient intelligence systems, learning



A keyword: **autonomy**

- Research domains

- Cognitive and interactive Robotics
- Aerial and Terrestrial Field Robotics
- Human and anthropomorphic motion
- Bio-informatics, Molecular motion

15 full time researchers

13 faculty members

61 PhD students

9 engineers

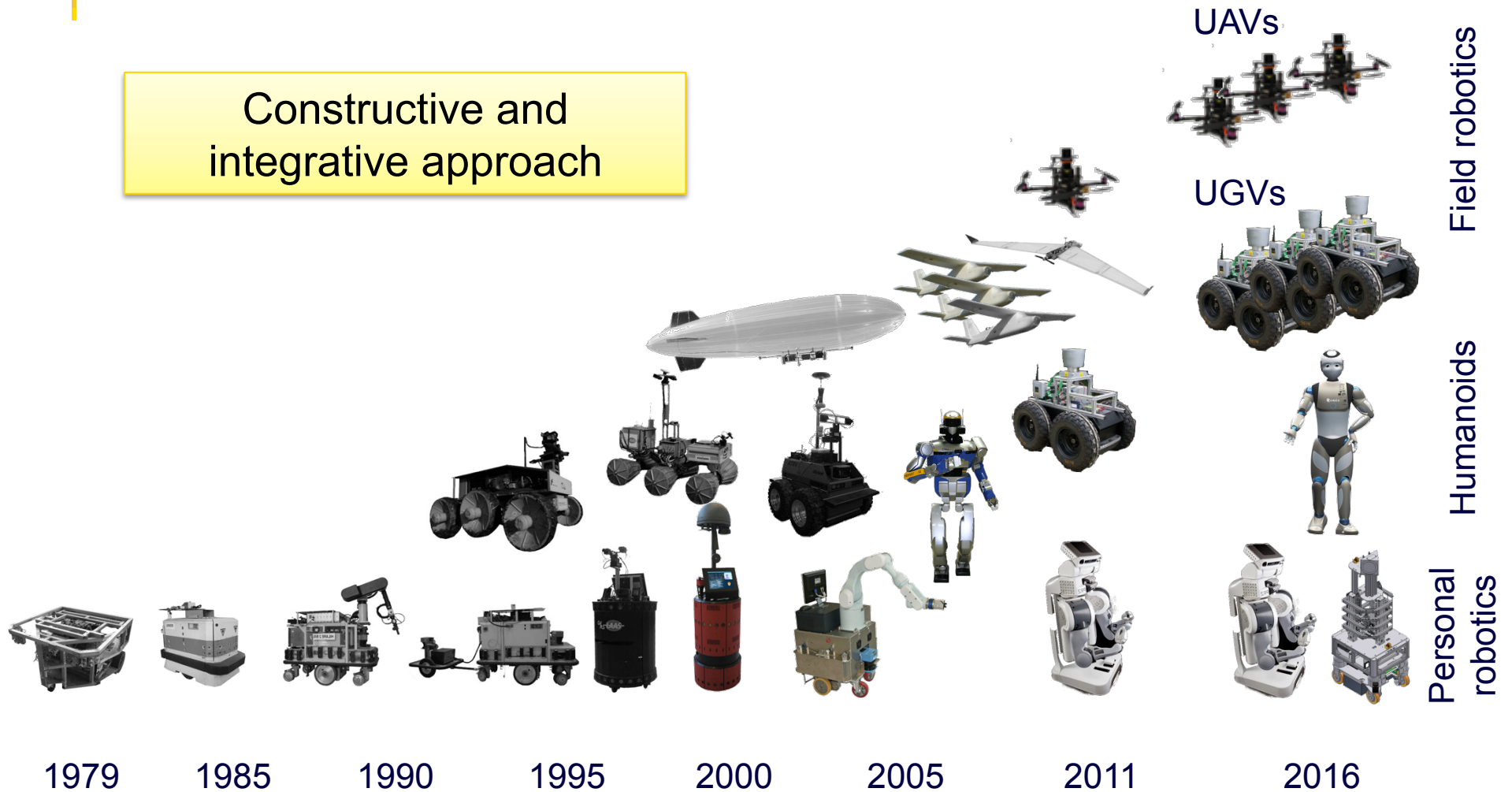
9 post-docs

19 visitors and sabbaticals

- Considered applications: Service and personal robotics, cobots, virtual worlds and animation, biochemistry, embedded systems, transport, planetary exploration, defense, civil safety

Robotics @ LAAS/CNRS

Constructive and
integrative approach



Open source software tools: www.openrobots.org

Researches on drones @ LAAS/CNRS

- In the “Robotics and InteractionS” group:
 - Antonio Franchi, Juan Cortes, Simon Lacroix

Researches on drones @ LAAS/CNRS

- In the “Robotics and InteractionS” group:

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- Two different perspectives:

- Large scale observation missions: observation drones

Scientific focus on environment mapping and adaptive information gathering (decision making and task planning)

- Drones that physically interact with their environments: aerial robots

Scientific focus on motion control and planning, and on design of innovative platforms

Outdoor large scale observation missions

- Cooperative air/ground robots
 - Patrolling missions over known areas
 - Backbone project: Action (DGA, 2007-15 – joint work with Onera)
 - Researches on
 - Mission planning and supervision
 - Environment modelling
 - Distributed localization



Outdoor large scale observation missions

- “Fleet of enduring drones to probe atmospheric phenomena within clouds”
 - SkyScanner project (RTRA, 2014-16), nurtured within the MAV-RC

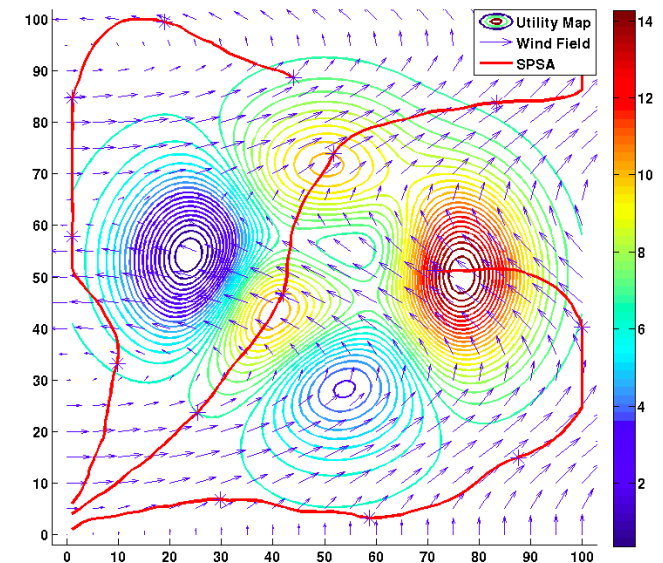
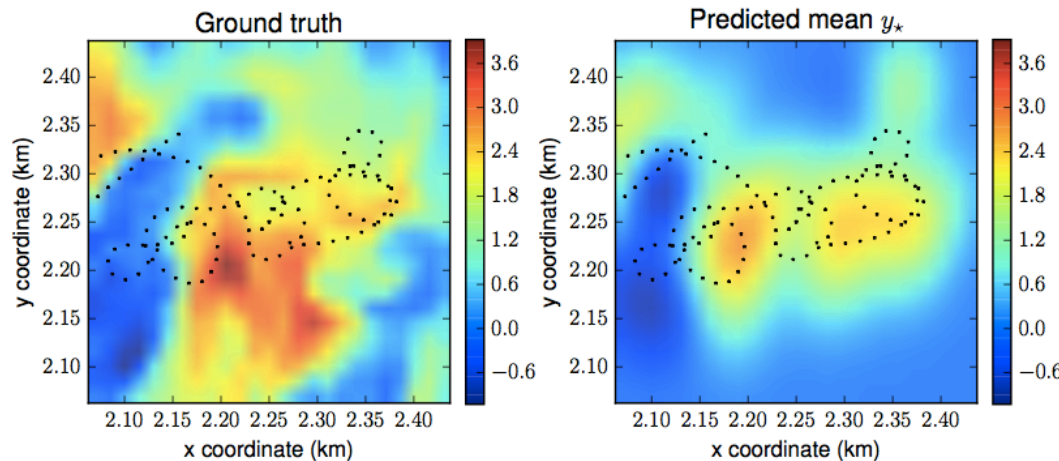


Outdoor large scale observation missions

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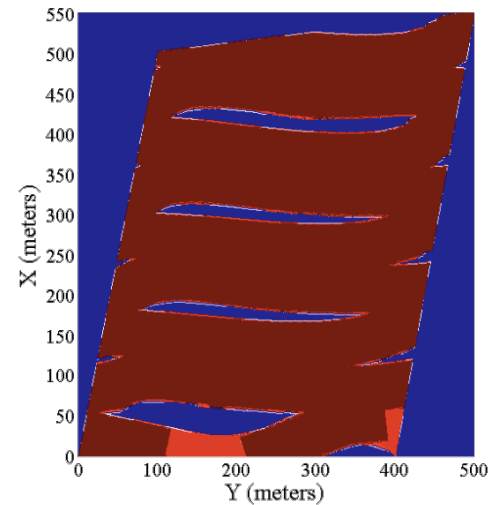
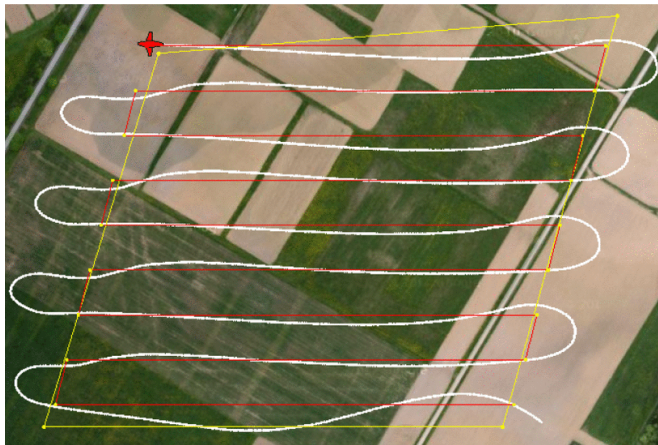


- Multi-robot exploration revisited



Outdoor large scale observation missions

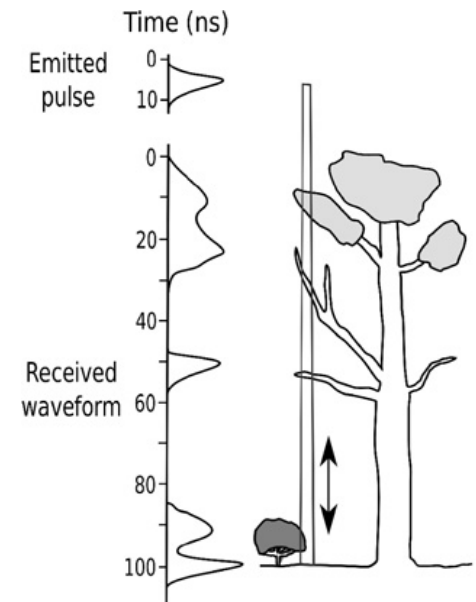
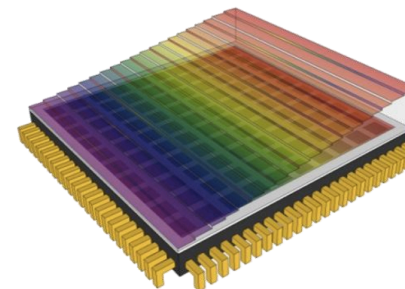
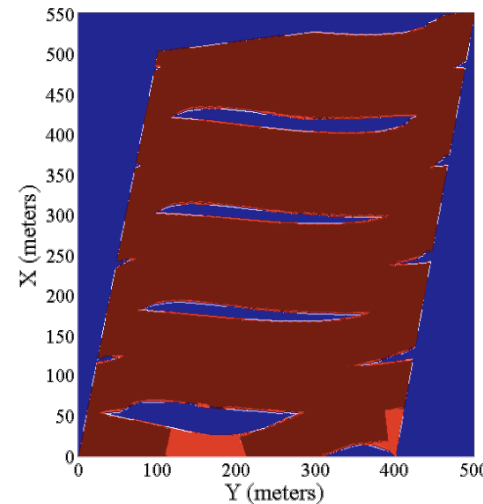
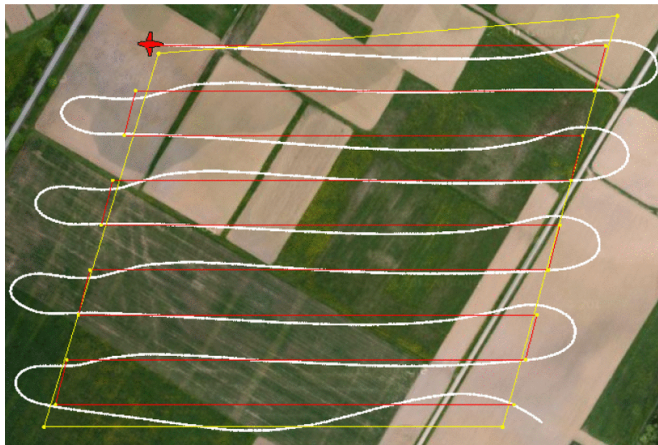
- “Fleets of drones to monitor agricultural parcels”
 - From automatic control to autonomous control



Outdoor large scale observation missions

- “Fleets of drones to monitor agricultural parcels”

- From automatic control to autonomous control

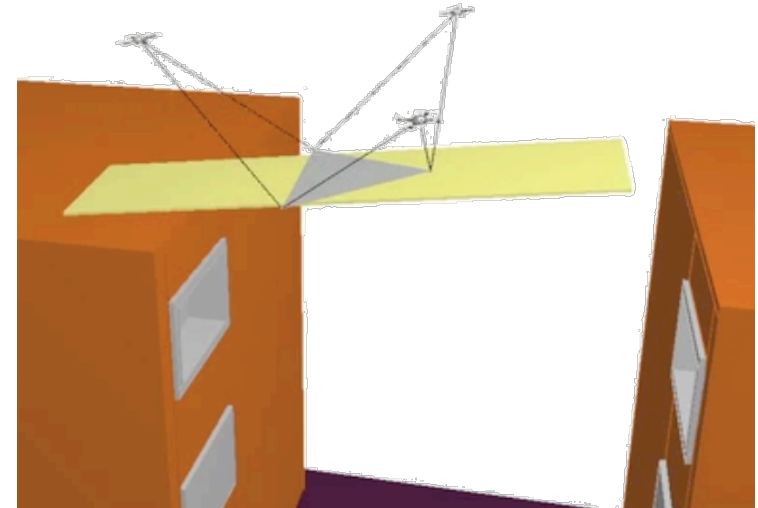


- Alternate sensors

- Hyperspectral imager
 - Multi-echo Lidar

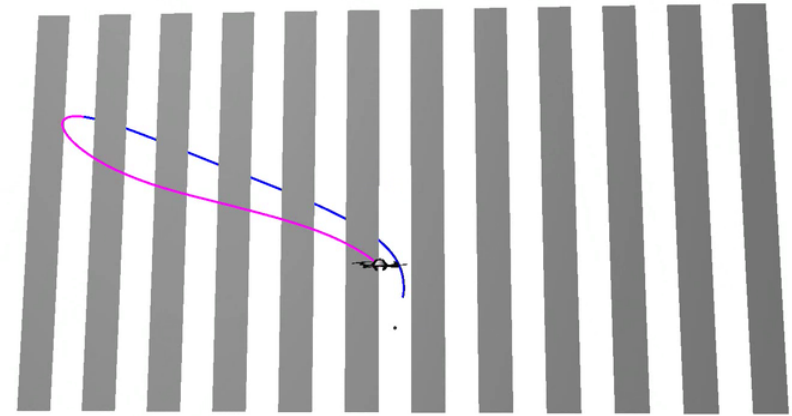
Physical interactions with the environment

- “Assembly and structure construction with cooperative free-flying robots” (ARCAS FP7 project, 2011-15)
- “Aerial robotic system with advanced manipulation capabilities for industrial inspection and maintenance” (AEROARMS H2020 project, 2015-19)

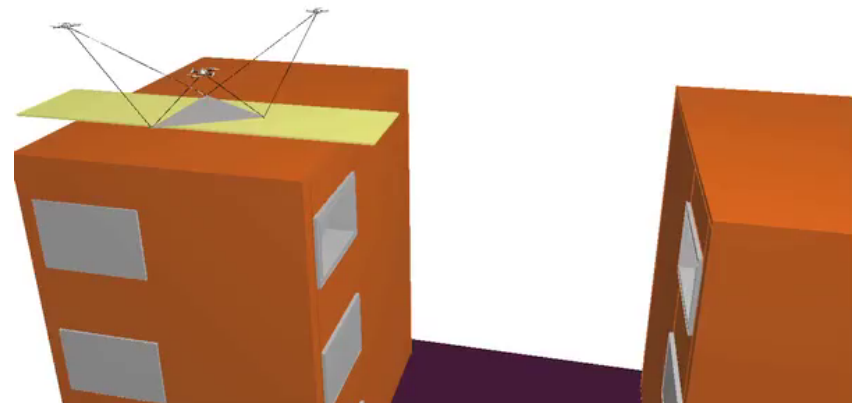


Kino-dynamic motion planning

- Planning dynamic motions



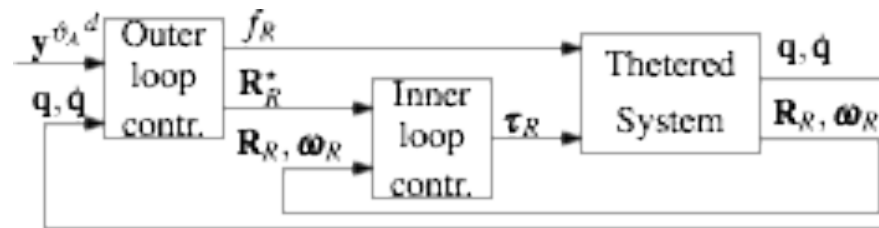
- Planning load transport motions



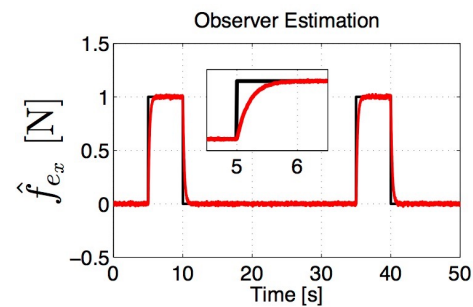
Physical interactions: methods

- Main **classes of problems** investigated

- Motion **control**



- **Identification** and **observation**



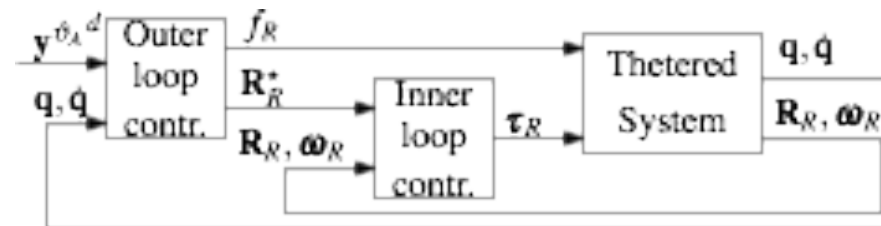
- **Mechatronics design**



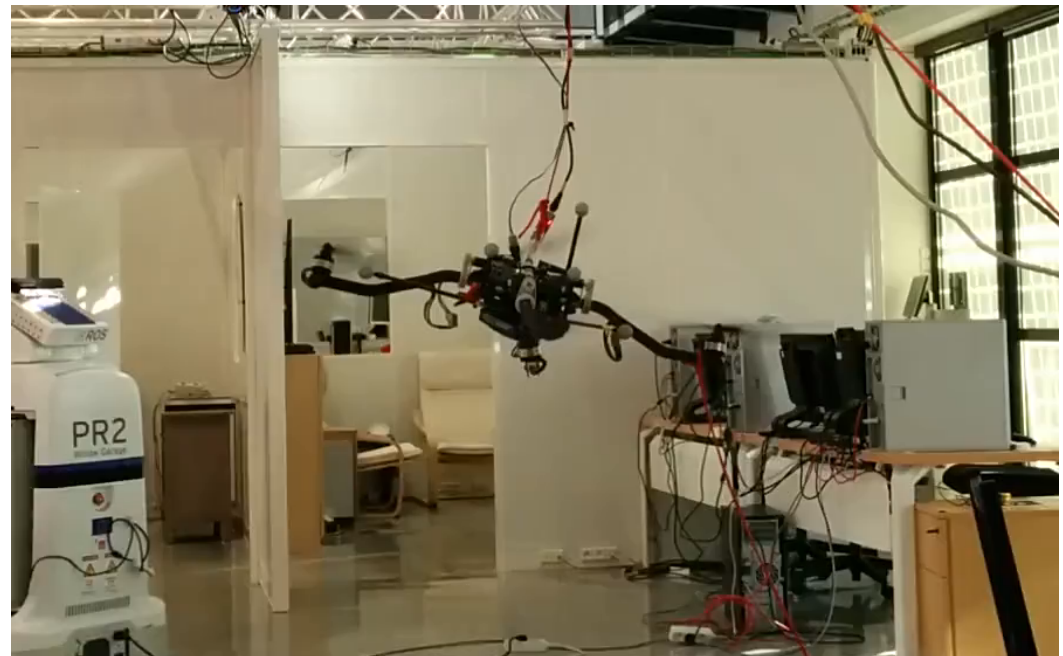
Physical interactions: methods

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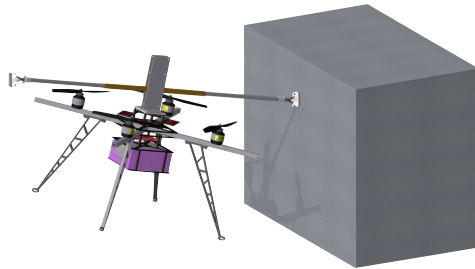
- Mechatronics **design**



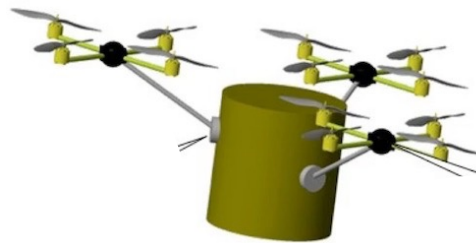
Physical interactions: considered tasks

- Main tasks addressed:

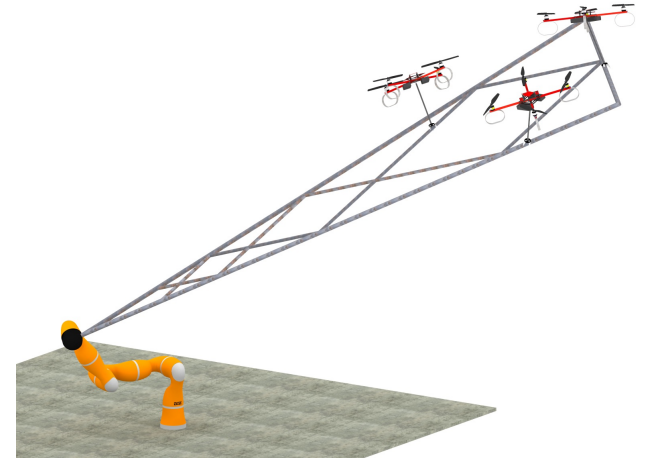
- Inspecting/Pushing



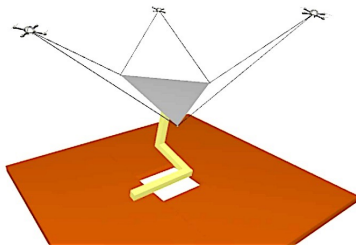
- Grasping with multiple ARs



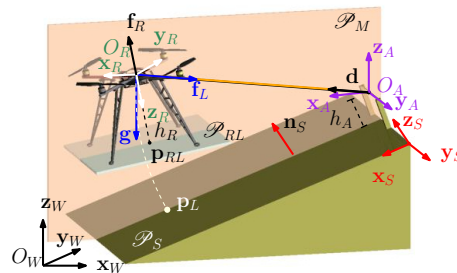
- Aerial-ground co-manipulation



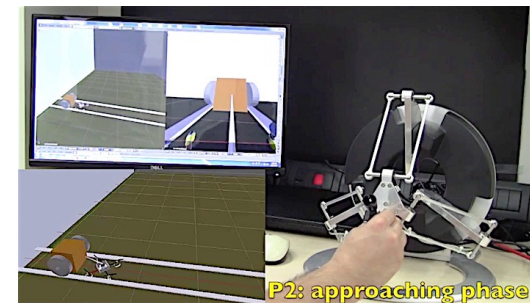
- Manipulation & Transportation by cables



- Takeoff/landing from/on slopes

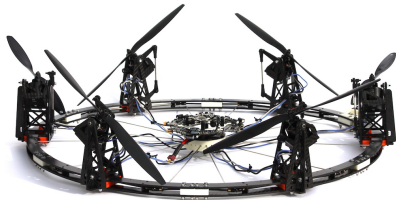


- Shared control

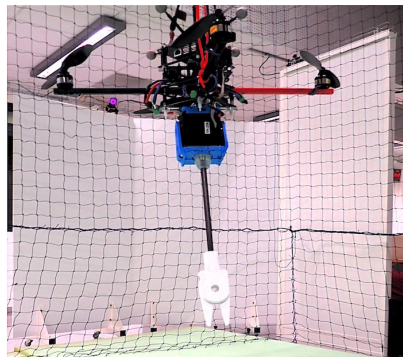


Physical interactions: platforms

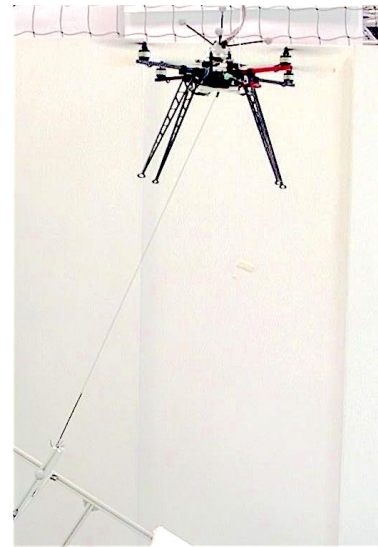
- Main hardware platforms



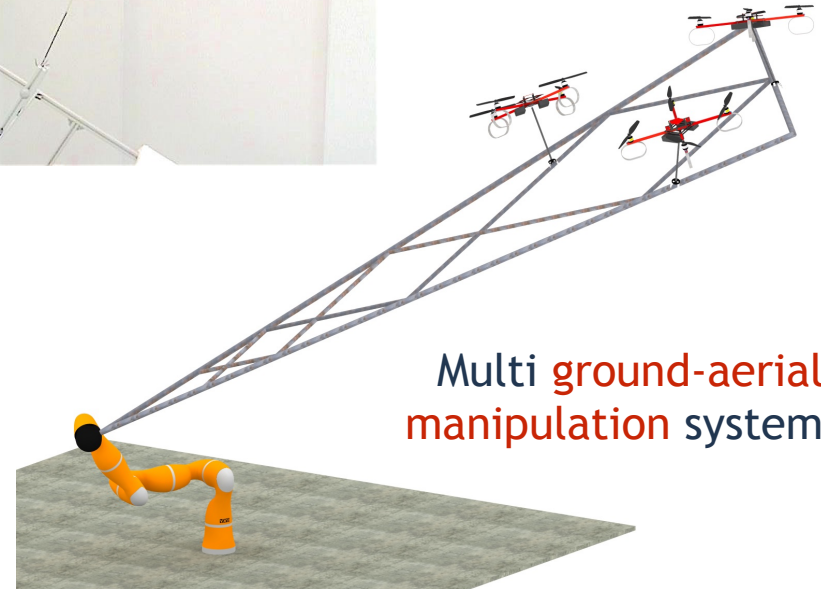
Fully-actuated by **tilting propellers**
hexarotor and quadrotor



Quadrotor with
elastic-joint arm



Cable tethered
quadrotor



Multi **ground-aerial**
manipulation system

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