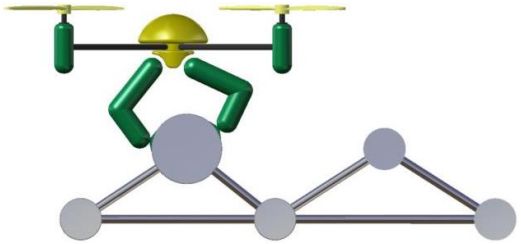

AErial RObotic system integrating multiple ARMS and advanced manipulation capabilities for inspection and maintenance (AEROARMS)

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Ambition:

First aerial robots with multiple articulated arms

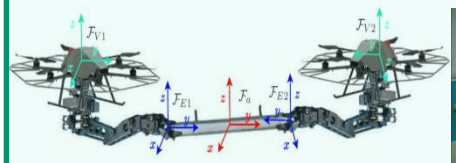
Application to inspection and maintenance in oil and gas plants

AEROARMS Approach

ARCAS FP7 results
First helicopters and multi-rotors with 6/7 DOF arms





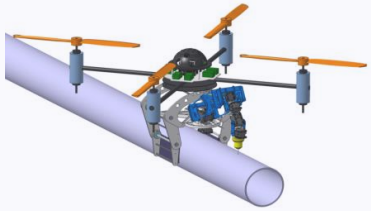



Control, perception and planning for multiple aerial robots

Objectives: Aerial manipulation methods and technologies for industrial inspection and maintenance

O1.1. Evolution of existing aerial manipulation

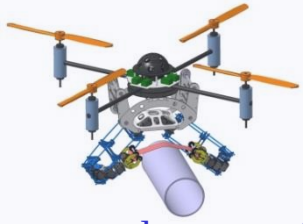
- New aerial robots able to grab and dock with one or more arms, in order to be able to perform dexterous accurate manipulation with another arm
- Helicopters with dexterous arm + simple sensor arm.
- Telemanipulation with haptic devices




O1.2 New methods and technologies

- Multi-rotor platform that can fly and manipulate with the coordinated motion of two arms

Applications better performed with two hands
Fixed contact point with one arm while operating with the second arm




New control, perception and planning for aerial robots with multiple arms

AEROARMS Impact

Inspection and Maintenance of oil and gas industries

2008 Worldwide hydrocarbon processing industry maintenance cost: $ 56.000.000.000
(Maintenance of pipes: $ 1.120.000.000)
One large refinery can have 40.000 Kms of pipes

Pipe inspection and maintenance: hundreds of thousands measurements in a large refinery





Difficult access: ropes and scafolding

AEROARMS validation applications (Objective O2):

- **Installation and maintenance of permanent sensors:** preparation of structures to install the sensors (drilling a hole into insulation, removing paint etc.), the installation of the sensors and the finishing of the structure.
- **Deploying and maintaining a mobile robotic system** permanently installed on a remote structure: easy exchange and maintenance of components (e.g., batteries etc.)

Regulations: Remotely Piloted Aircraft Systems (RPAS) and ATEX (ATmosphère Explosible) directive