



The European Coordination Hub for Open Robotics Development

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**HyQ-REAL experiment  
(partners: IIT and Moog)**

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# Background

## Motivation for the Work Conducted

- Need of Moog to improve and validate micro-hydraulics and push them into market. Many interested end-users.
- Hydraulic quadrupeds not on the market yet, but have huge potential for various applications.

## Technical Problem Addressed / Challenge Overcome

- Technical challenges to build and integrate fully onboard hydraulic system with battery. Hurdles are size, weight and efficiency.
- Solution demands for multi-domain expertise ranging from valve design, add. manufacturing, robot design, joint control, locomotion, software, etc. Only Boston Dynamics did it, but no intentions to sell hydraulic robots.

## Expertise Relied on

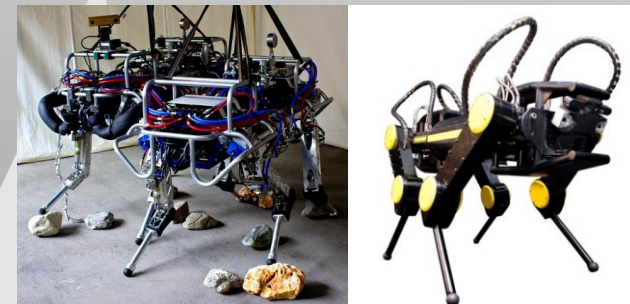
- IIT is expert in robot design and control, Moog in hydraulics and additive manufacturing (AM)

**Start-date / End-date:** 9/2016 – 6/2018

**Participation in Experiment Booster? - No**



**MOOG**



# Solution Developed

## Starting Point

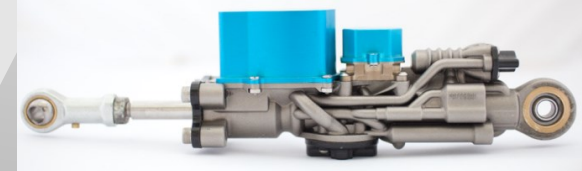
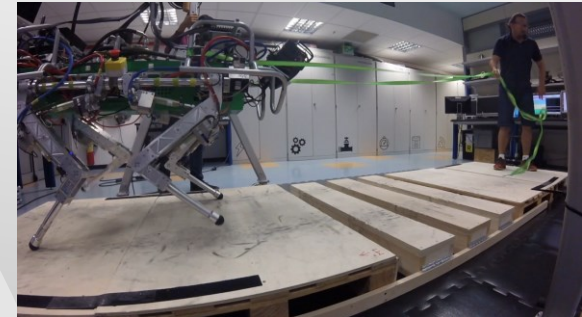
- **We had** a hydraulic quadruped robot prototype (HyQ) with a hydraulic tether, sophisticated control software for rough terrain locomotion, limited robustness. Formula1 servovalves, Integrated Servo Actuator (ISA) prototypes, expertise in miniature hydraulics and AM.
- Both IIT and Moog used internal money to get to the starting point.

## Approach Followed / Development Work Conducted

- Improvement of Moog's Integrated Servo Actuator
- More reliable robot design and software, safety layers
- Development of hydraulic components including onboard pumps to make robot power-autonomous

## Technical Result / End Point

- HyQreal prototype
- Moog ISA in the market (TRL 8)
- Range of new miniature hydraulic components



# Being an Experiment in ECHORD++

## Benefit from participation in ECHORD++

- Externally monitored timeline/milestones
- Feedback on progress
- Financial support
- Visibility, PR (fairs, conferences etc.)
- Strong additional financial support by both partners with their own money

## Impact on Development Process

Moog started many new projects with universities, but thanks to the E++ funding of HyQ-REAL, they favoured this project over others that did not receive any external funding.

## Actionable Insights

- Areas of **possible improvement** for future FSTP (cascade funding) in upcoming Ec projects:
  - Improved monitoring platform
  - Faster amendment process or different type of involvement of the partners



# Impact of Work Conducted

## What do you have to show for it?

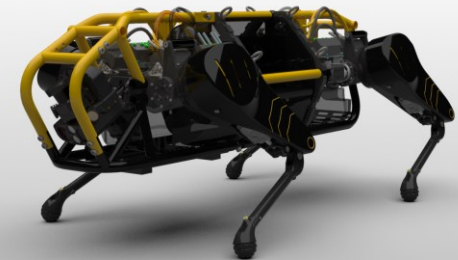
- HyQreal robot, ISA and other new hydraulic components

## What has the support allowed you to achieve

- Increase in technology maturity
- Created jobs (Moog 4, IIT 15 for 3 years), made sales (30 ISAs), improved a product (ISA), etc.

## How does the outcome fit with your development strategy

- The ISA is a TRL8 product and is starting to show first sales to selected end-users. The HyQreal robot will be used in follow up projects and sold in a future start up company (not created yet).



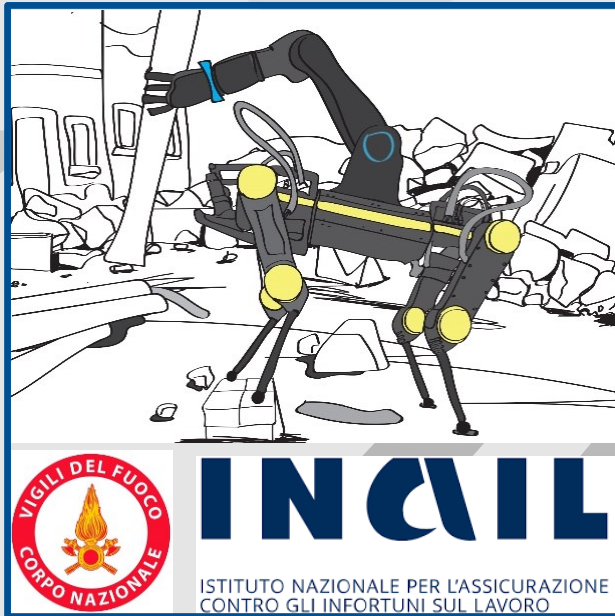
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# Future use of expertise

## Follow-up projects:

- INAIL Teleop (3 years, 3 MEuro)
- Vodafone 5G (2 use cases)
- Moog@iit joint lab extension (3+2 years)



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