



## Towards Aerial Humanoid Robotics

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### Abstract:

Robotics is a very active research field of Engineering. Leaving aside the cognitive capabilities of intelligent robots, Manipulation and Locomotion remain two fundamental robot abilities that receive much of the scientific attention. The resulting endeavor gave impetus to new branches of Robotics aimed at combining Manipulation and Locomotion into single robotic platforms. Aerial Manipulation, for instance, conceives robots capable of flying while manipulating an object, thus unifying Manipulation and Aerial Locomotion. Humanoid Robotics, instead, merges Manipulation and Terrestrial Locomotion since humanoid robots can usually manipulate objects and move around by exploiting contacts with the environment (e.g. walking). This talk presents the first step towards unifying Manipulation, Aerial, and Terrestrial Locomotion by laying the foundation of Aerial Humanoid Robotics. Robots implementing Aerial Humanoid Robotics can then fly, walk, manipulate, and transport objects. Aerial Humanoid Robotics is paramount in disaster scenarios where legged robots struggle with stable and robust terrestrial locomotion on challenging terrains. Furthermore, Aerial Humanoid Robotics can be used as testbed for flying exoskeletons, which one day will allow humans for personal flight.

### Biography:

Daniele Pucci received the bachelor and master degrees in Control Engineering with highest honors from “Sapienza”, University of Rome in 2007 and 2009, respectively. In 2009, he also received the “Academic Excellence Award” from Sapienza. In 2013, he earned the PhD title with a thesis prepared at INRIA Sophia Antipolis, France, under the supervision of Tarek Hamel and Claude Samson. From 2013 to 2017, he has been a postdoc at the



Istituto Italiano di Tecnologia (IIT) working within the EU project CoDyCo. Since August 2017, he is the head of the Dynamic Interaction Control lab and the PI of the H2020 European Project AnDy. The main lab research focus is on the humanoid robot locomotion problem, with specific attention on the control and planning of the associated nonlinear systems.

### Publication of speakers:

1. Daniele Pucci, A programmable central pattern generator with bounded output, *Robotics and Autonomous Systems*, Volume 125, March 2020, 103423
2. Daniele Pucci, Polyphenolic profiles and antioxidant and antiradical activity of Italian berries from *Vaccinium myrtillus* L. and *Vaccinium uliginosum* L. subsp. *gaultherioides* (Bigelow) S.B. Young, *Food Chemistry*, Volume 204, 1 August 2016, Pages 176-184
3. Daniele Pucci, Nonlinear feedback control of axisymmetric aerial vehicles, *Automatica*, Volume 53, March 2015, Pages 72-78
4. Daniele Pucci, An overview of the software architecture of the plasma position, current and density realtime controller of the FTU, *Fusion Engineering and Design*, Volume 89, Issue 3, March 2014, Pages 204-213

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