Gabriele Nava

PostDoc Researcher, Robotics Engineer

Employment History

Postdoctoral Researcher

Istituto Italiano di Tecnologia, Genova (IT)
Artificial and Mechanical Intelligence Laboratory
Apr 2020 – Present

- Technical coordination and management (Scrum Master) of the iRonCub team. It is a multidisciplinary team of about 10 people working on mechanical design, estimation and control of a jet-powered humanoid robot for disaster response.
- Co-tutoring of several Ph.D. candidates and M.Sc. students, in research areas including: robot torque control and control in aerodynamic conditions, trajectory planning for flight-to-walk transition maneuvers, jet-engines and force/torque sensor modeling, design and control of morphing covers.
- Analysis and design of whole-body flight controllers for humanoid robots, implemented in Matlab-Simulink and C++ and tested on the iCub and iRonCub humanoid robots.

Ph.D. Researcher

Istituto Italiano di Tecnologia, Genova (IT)
Artificial and Mechanical Intelligence Laboratory
Nov 2016 – Apr 2020

- Stability analysis and design of balancing controllers for humanoid robots using Quadratic Programming. Control of robots with Series Elastic Actuators and robot balancing in highly dynamic environments.

Research Fellow

Istituto Italiano di Tecnologia, Genova (IT)
Dynamic Interaction Control Laboratory
Dec 2015 – Nov 2016

- Design of force and momentum based whole-body controllers for humanoid robots, in the context of the European Projects KOROIBOT and CoDyCo.

International Experience

Visiting Ph.D.

Laboratory for Analysis and Architecture of Systems, Toulouse (FR)
Robotics and Interactions Group
Jun 2019 – Sept 2019

- Development of force control algorithms for aerial manipulators equipped with on board Force/Torque sensors. The control is implemented in Matlab-Simulink and tested on the fully actuated aerial manipulator OTHex.

Research Projects

- Aerial Humanoid Robotics
- Ph.D. Thesis Videos
- CoDyCo Project

Coding Projects

- iRonCub-Mk1 Software
- Whole-Body-Controllers

Software Tools

Programming Languages

- Familiar with C++ and Python

Calculus and Design

- Proficient in MATLAB and Simulink
- Familiar with PTC Creo

Software for Robotics

- Proficient with YARP, iDynTree and Gazebo Simulator

Version Control

- Proficient with GitHub and GitLab

Operating Systems

- Proficient in Windows and Linux

Office and Similar

- Proficient with Word, PowerPoint, Excel, and Latex

Languages

English - Fluent
First Certificate in English – B2 (CEFR)

French - Elementary

Italian - Mother tongue

Education

Ph.D. Degree in Bioengineering and Robotics

Università degli Studi di Genova (IT)

Nov 2016 – Apr 2020

- Ph.D. thesis title: *Instantaneous Momentum-Based Control of Floating Base Systems.* Supervisors: Dott. Giorgio Metta and Dott. Daniele Pucci. Online version available

Master Degree in Mechanical Engineering

Politecnico di Milano, Milano (IT)

Sept 2013 – Dec 2015

- Thesis title: *Analysis and Synthesis of Balancing Controllers for Humanoid Robots*. Supervisors: Dott. Francesco Braghin and Dott. Daniele Pucci

Bachelor Degree in Mechanical Engineering

Politecnico di Milano, Milano (IT)

Sept 2010 – Sept 2013

Liceo Scientifico *G. Galilei*

Erba (Como, IT)

Sept 2005 – Sept 2010

Job-Related Experiences

- Engaged in international conferences, such as IEEE HUMANOIDS, ICRA, and IROS. I assumed the role of co-chair for oral presentation sessions.
- Reviewer for conference and journal submissions including IEEE T-RO and RAL. I was part of the IPC of SIMPAR 2018 and served as a review editor for Frontiers in Robotics and AI.
- Member of the yearly evaluation committee for several Ph.D. students of the University of Genova.
- Mentor for the Easy-Peasy Robotics 2018 Crash Course.

Training and Certificates

EASA Drone Licence - cat. A1-A3

Feb. 2022

REG-ML Summer School - Regularization Methods for Machine Learning

GENOVA (IT) - Jul. 2018

GADES Summer School - Stability and Bifurcation of Dynamical Systems

SAVONA (IT) - *Jul. 2017*

LabVIEW - Control and Design introduction - National Instruments

Oct. 2014

Seminar: MSC Nastran/Patran Base - MSC Institute of Technology

Oct. 2012 - Nov. 2012

Energy and Time Saving by Railway Tilting - Politecnico di Milano

Mar. 2012 - Jul. 2012

Stage – Public library

PONTELAMBRO (IT) - *Aug. 2009*

Hobbies

Reading | Traveling | Gardening | Hiking | Running | DIY Jobs

Publications List

Journal Articles

[1] F. Bergonti, G. Nava, L. Fiorio, G. L'Erario, and D. Pucci, "Modeling and control of morphing covers for the adaptive morphology of humanoid robots," *IEEE Transactions on Robotics*, vol. 38, no. 5, pp. 3300–3313, 2022. DOI: 10.1109/TRO.2022.3170281.

[2] H. A. O. Mohamed, G. Nava, G. L'Erario, S. Traversaro, F. Bergonti, L. Fiorio, P. R. Vanteddu, F. Braghin, and D. Pucci, "Momentum-based extended kalman filter for thrust estimation on flying multibody robots," *IEEE Robotics and Automation Letters*, vol. 7, no. 1, pp. 526–533, 2022. DOI: 10.1109/LRA.2021.3129258.

[3] G. Nava, A. Gazar, F. J. A. Chavez, and D. Pucci, "Jerk control of floating base systems with contact-stable parameterized force feedback," *IEEE Transactions on Robotics*, vol. 37, no. 1, pp. 1–15, 2021. DOI: 10.1109/TRO.2020.3005547.

[4] G. L'Erario, L. Fiorio, G. Nava, F. Bergonti, H. A. O. Mohamed, E. Benenati, S. Traversaro, and D. Pucci, "Modeling, identification and control of model jet engines for jet powered robotics," *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 2070–2077, 2020. DOI: 10.1109/LRA.2020.2970572.

[5] G. Nava, Q. Sablé, M. Tognon, D. Pucci, and A. Franchi, "Direct force feedback control and online multi-task optimization for aerial manipulators," *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 331–338, 2020. DOI: 10.1109/LRA.2019.2958473.

[6] L. Rapetti, Y. Tirupachuri, K. Darvish, S. Dafarra, G. Nava, C. Latella, and D. Pucci, "Model-based real-time motion tracking using dynamical inverse kinematics," *Algorithms*, vol. 13, no. 10, 2020, ISSN: 1999-4893. DOI: 10.3390/a13100266. url: https://www.mdpi.com/1999-4893/13/10/266.

[7] F. Romano, G. Nava, M. Azad, J. Camernik, S. Dafarra, O. Dermy, C. Latella, M. Lazzaroni, R. Lober, M. Lorenzini, D. Pucci, O. Sigaud, S. Traversaro, J. Babič, S. Ivaldi, M. Mistry, V. Padois, and F. Nori, "The codyco project achievements and beyond: Toward human aware whole-body controllers for physical human robot interaction," *IEEE Robotics and Automation Letters*, vol. 3, no. 1, pp. 516–523, Jan. 2018.

Conference Proceedings

[8] M. Elobaid, G. Romualdi, G. Nava, L. Rapetti, H. A. Omer Mohamed, and D. Pucci, "Online non-linear centroidal mpc for humanoid robots payload carrying with contact-stable force parametrization," in *2023 IEEE International Conference on Robotics and Automation (ICRA)*, 2023, pp. 12 233–12 239. doi: 10.1109/ICRA48891.2023.10161086.

[9] G. Nava and D. Pucci, "Failure detection and fault tolerant control of a jet-powered flying humanoid robot," in *2023 IEEE International Conference on Robotics and Automation (ICRA)*, 2023, pp. 12 737–12 743. doi: 10.1109/ICRA48891.2023.10160615.

[10] T. Hui, A. Paolino, G. Nava, G. L'Erario, F. Di Natale, F. Bergonti, F. Braghin, and D. Pucci, "Centroidal aerodynamic modeling and control of flying multibody robots," in *2022 International Conference on Robotics and Automation (ICRA)*, 2022, pp. 2017–2023. doi: 10.1109/ICRA46639.2022.9812147.

[11] G. L'Erario, G. Nava, G. Romualdi, F. Bergonti, V. Razza, S. Dafarra, and D. Pucci, "Whole-body trajectory optimization for robot multimodal locomotion," in *2022 IEEE-RAS 21st International Conference on Humanoid Robots (Humanoids)*, 2022, pp. 651–658. doi: 10.1109/Humanoids53995.2022.10000241.

[12] A. J. A. Momin, G. Nava, G. L'Erario, H. A. O. Mohamed, F. Bergonti, P. R. Vanteddu, F. Braghin, and D. Pucci, "Nonlinear model identification and observer design for thrust estimation of small-scale turbojet engines," in *2022 International Conference on Robotics and Automation (ICRA)*, 2022, pp. 5879–5885. doi: 10.1109/ICRA46639.2022.9812283.

[13] G. Nava, Q. Sablé, M. Tognon, D. Pucci, and A. Franchi, "Direct force feedback control and online multi-task optimization for aerial manipulators," in *IEEE/RSJ International Conference on Robotics and Automaton (ICRA)*, May 2020.

[14] F. Andrade Chavez, G. Nava, S. Traversaro, F. Nori, and D. Pucci, "Model based in situ calibration with temperature compensation of 6 axis force torque sensors," in *2019 IEEE/RSJ International Conference on Robotics and Automaton (ICRA)*, May 2019.

[15] Y. Tirupachuri, G. Nava, L. Rapetti, C. Latella, and D. Pucci, “Trajectory advancement during human-robot collaboration,” in *2019 28th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*, 2019, pp. 1–8. doi: 10.1109/RO-MAN46459.2019.8956339.

[16] S. Dafarra, G. Nava, M. Charbonneau, N. Guedelha, F. Andradel, S. Traversaro, L. Fiorio, F. Romano, F. Nori, G. Metta, and D. Pucci, “A control architecture with online predictive planning for position and torque controlled walking of humanoid robots,” in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2018, pp. 1–9.

[17] G. Nava, D. Ferigo, and D. Pucci, “Exploiting friction in torque controlled humanoid robots,” in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2018, pp. 1226–1232.

[18] G. Nava, L. Fiorio, S. Traversaro, and D. Pucci, “Position and attitude control of an underactuated flying humanoid robot,” in *2018 IEEE-RAS 18th International Conference on Humanoid Robots (Humanoids)*, Nov. 2018, pp. 1–9.

[19] L. Penco, B. Clement, V. Modugno, E. Mingo Hoffman, G. Nava, D. Pucci, N. G. Tsagarakis, J. .-. Mourert, and S. Ivaldi, “Robust real-time whole-body motion retargeting from human to humanoid,” in *2018 IEEE-RAS 18th International Conference on Humanoid Robots (Humanoids)*, Nov. 2018, pp. 425–432.

[20] V. Modugno, G. Nava, D. Pucci, F. Nori, G. Oriolo, and S. Ivaldi, “Safe trajectory optimization for whole-body motion of humanoids,” in *2017 IEEE-RAS 17th International Conference on Humanoid Robotics (Humanoids)*, Nov. 2017, pp. 763–770.

[21] G. Nava, D. Pucci, N. Guedelha, S. Traversaro, F. Romano, S. Dafarra, and F. Nori, “Modeling and control of humanoid robots in dynamic environments: Icub balancing on a seesaw,” in *2017 IEEE-RAS 17th International Conference on Humanoid Robotics (Humanoids)*, Nov. 2017, pp. 263–270.

[22] G. Nava, D. Pucci, and F. Nori, “Momentum control of humanoid robots with series elastic actuators,” in *2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Sep. 2017, pp. 2185–2191.

[23] G. Nava, F. Romano, F. Nori, and D. Pucci, “Stability analysis and design of momentum-based controllers for humanoid robots,” in *2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2016, pp. 680–687.

[24] D. Pucci, G. Nava, and F. Nori, “Automatic gain tuning of a momentum based balancing controller for humanoid robots,” in *2016 IEEE-RAS 16th International Conference on Humanoid Robots (Humanoids)*, Nov. 2016, pp. 158–164.