





Università degli Studi di Napoli Federico II

DOTTORATO DI RICERCA / PHD PROGRAM IN INFORMATION TECHNOLOGY AND ELECTRICAL ENGINEERING

Seminar announcement

Wednesday 18 June 2025, Time: 15:00–16:00 Room T3, Ground Floor, Building 1 - Via Claudio 21



Prof. Ciro Natale

Università degli Studi della Campania Luigi Vanvitelli Vanvitelli Robotics Lab <u>https://scholar.google.it/citations?user=vy3qwUAAAAAJ&hl=it</u> Email: <u>ciro.natale@unicampania.it</u>

Robotic Manipulation @Vanvitelli Robotics Lab: A bird's eye view on the last 5 years

Abstract: Neurophysiological studies on human manipulation demonstrated that humans exhibit instinctive reactions to safely manipulate objects under load perturbations and unexpected surface conditions. They instinctively adjust the grip force on the basis of tactile perception, which provides information about the object properties such as friction, compliance and shape, as well as contact status. Roboticists have been trying to replicate on robots such capability since many years, by proposing various technologies for tactile sensing and methods for slipping detection and avoidance. The Vanvitelli Robotics Lab contributed to advancing manipulation capabilities of robots with new force/tactile sensors and new slipping control algorithms,

that allow both safe grasping and in-hand manipulation of objects of unknown weight and shape. In-hand manipulation is certainly one of the most challenging problems in robotic manipulation. Solutions to this problem depend on the specific device used to grab the object, but nowadays, the trend is to exploit not only the gripper but also external constraints, such as other objects in the environment or external forces, like gravity. This allows a robot to manipulate an object even with parallel grippers. Recent contributions concern also non-prehensile manipulation tackled resorting by to nonlinear model predictive control and visual servoing, where the relevance of digital implementation is often neglected in the literature.







Lecturer short bio: Ciro Natale received the Laurea degree (Magna cum Laude) in Electronic Engineering and the Research Doctorate degree in Electronic Engineering and Computer Science from the University of Naples Federico II in July 1995 and February 2000, respectively. His Laurea thesis was awarded the UCIMU 1996 prize as the best Italian thesis in the sector "Robot: design and applications". His Doctorate thesis was selected as a finalist at the First Euron PhD Award. From October 1998 to April 1999 he was Visiting Researcher at the Institute of Robotics and Mechatronics of the DLR, Germany. From July 2000 to January 2005 Ciro Natale has been a Researcher at the Faculty of Engineering of the Second University of Naples, where until November 2017 he held the position of Associate Professor in the scientific sector ING-INF/04 - Automatica and since December 2017 he is Full Professor. He is the leader for the Vanvitelli Robotics Lab. His main research interests are robotic manipulation based on tactile sensing, nonlinear control of mechanical systems, identification and robust active control of vibrating structures, modelling and control of systems with hysteresis. He has been the Principal Investigator for the University of Campania in many European research projects in the area of Aeronautics and of ICT - Cognitive Systems and Robotics: ECHORD, SAPHARI, LOCOMACHS, EUROC, LABOR, and of two national research projects ROCOCO' and STEPFAR. From 2009 to 2015 he served as Associate Editor of the IEEE Trans. on Control Systems Technology, from 2015 to 2017 he was Associate Editor of the IEEE Robotics and Automation Letters and from 2017 to 2024 he served as Associate Editor of Automatica. He is the Editor of the Section "Control" of the Springer Encyclopedia of Robotics. Ciro Natale published more than 130 papers in international journals and conference proceedings, he is the author of the book "Interaction Control of Robot Manipulators" (Springer) and co-author of the book "Active Control of Flexible Structures" (Springer).

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