



PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 40th cycle

Research Area n. 3 - Systems and Control

**PNRR 630 Research Field: BILATERAL TELE-OPERATION CONTROL OF REDUNDANT
MANIPULATORS WITH DYNAMIC CONSTRAINTS IN DELAYED COMMUNICATIONS**

Monthly net income of PhDscholarship (max 36 months)

€ 1500.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

**Motivation and objectives of the research
in this field**

Teleoperation, or remote control, of robots is a longstanding problem, that encompasses issues and challenges related to communication delay, uncertain environment, transparent haptic feedback on the user, shared autonomy between the user and the robot. Applications are foreseen in space robotics, robotic surgery, inspection robots, demining operations, and many more.

The research is specifically aimed at providing effective and stable remote control of kinematically redundant robots with delayed communications.

**Methods and techniques that will be
developed and used to carry out the
research**

The candidate will implement methods and techniques for robust robotic control in presence of communication delay, for shared control between human operator and robot, as well as for machine learning in computer vision problems.

The research is in the framework of a joint agreement with Leonardo Robotics Lab (Italy) and will be conducted at Politecnico di Milano (Merlin and Nearlab, DEIB) and at the Leonardo premises in Genova (Italy).

Educational objectives

- Acquire capabilities for effectively controlling and interfacing human and robots;



	<ul style="list-style-type: none"> - Understanding the task needs and evaluate the effectiveness of the approach; - Disseminate scientific results in journals/ conferences; - Communicate scientific results in outreach events.
Job opportunities	The job market for experts in the field of robotics is already large today and is expected to become even more interesting in the coming years. Opportunities to work in the research institutes will also be available.
Composition of the research group	1 Full Professors 2 Associated Professors 2 Assistant Professors 10 PhD Students
Name of the research directors	Proff. Paolo Rocco, Elena De Momi

Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	0

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Leonardo SpA, Italia
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	German Aerospace Center (DLR), Germany
By number of months abroad	6



Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student.

TEACHING ASSISTANTSHIP: availability of funding in recognition of supporting teaching activities by the PhD student.

There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

COMPUTER AVAILABILITY:

1st year: Yes

2nd year: Yes

3rd year: Yes