

PhD in Mechanical Engineering

Research Title: Development and control of novel actuation systems for lower limb prosthetic systems

Funded by	Fondazione Istituto Italiano di Tecnologia (IIT - GENOVA)
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Context of the research activity	<p>State of the art lower limb prosthetic systems are either totally passive, semi-active, or active. Each of these technologies performs differently and allows for different use. Passive systems are the simplest and cost effective, however their usability is limited due to the nature of the core technology employed. Semi-active (so-called “electronic”) systems are the most energetically efficient. This latter feature is definitely paramount as users need long autonomy times to be able to keep using the prosthesis with reliability. Semi-active prostheses also represent a good compromise between flexibility – they can be regulated to adapt the pace speed, and patient’s weight –, cost, weight and complexity, however, they do not offer the functionality of active systems, which can provide mechanical power to execute a diverse range of tasks.</p>
Objectives	<p>The aim of this project is to develop novel mechatronic systems for lower limb prostheses which could offer the advantages of both the semi-active and active approach. One way of tackling this is to develop hybrid systems which can deliver power when needed, at the same time making use of more efficient semi-active systems to save energy whenever possible. Furthermore, the control system could involve EMG signals coming from patient’s residual muscles to properly control the prosthesis during its use.</p> <p>The project will be carried out at the Advanced Robotics dept of IIT, in collaboration with the Rehab Technologies dept. of IIT.</p> <p>The projects will be a technological challenge in which IIT and an internationally recognized clinical partner will share resources, competencies and motivation to achieve excellent results transferable to the medical field.</p>
Skills and competencies for the development of the activity	<p>We are looking for a highly motivated, outstanding student with a solid background in mechatronics.</p> <p>During / at the completion of this PhD, the student will be able to:</p> <ul style="list-style-type: none">• Autonomously design complex mechatronic systems• Autonomously design control systems applied to electromechanical devices• Develop a solid background in medical and prosthetic devices