DIPARTIMENTO DI INGEGNERIA
CORSO DI DOTTORATO IN INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE -
PHD COURSE IN INDUSTRIAL AND INFORMATION ENGINEERING - 35TH CYCLE

Title of the research activity:	**Design and analysis of modular grippers for robotics applications**
State of the Art:	Applicative scenarios envisaged in this present and in the immediate futures see a closer cooperation between humans and robots. The automated solution will be spread not only in large productive realities but also in SME (small medium enterprises) [1]. This new perspective effects also design requirements for robotic systems: from the maximization of the merely dynamical performance needed in a completely automated reality to more complex constraints necessary to assure a suitable level of adaptability to uncertainties, robustness, safety in the physical interaction with an unstructured environment and with humans [2]. Most of the work on collaborative robots and more in general on physical human robot interaction have focused on robotic arm design and control. Commercial examples of these new robots are the LBRiiwa (KUKA,Germany),the Sawyer (Rethink Robotics, USA) and the FRANKA (FRANKA EMIKA, Germany), just to name a few. A concept common to these robots is the possibility to compliantly react to a collision, in opposition to the stiff behaviour of classical industrial robots.[3] Although robot end-effectors are most of the time the part of the robot more proximal to the human partner in collaborative scenarios, only a few works have been dedicated to the design and the control of collaborative grippers[4-7] and some of them are modular grippers[8-9].
Short description and objectives of the research activity:	The research activity will be focused on innovative and advanced soft-gripper with modular characteristics and intrinsic softness with embodied ability to comply and adapt to features of the objects and of the environment. A particular attention has to paid to engineering degree of the innovative soft-gripper for robotics applications in industrial environment. The soft-gripper has to be studied, analysed, design and controlled with respect to four main principles that a gripper should have with respect to foster human robot cooperation: i) intrinsic safety and adaptability, ii) easy reconfigurability, iii) portability and iv) easy interface with the human operator.
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Scientific coordinator (s)	Prof.ssa Maria Cristina Valigi
Contact (s)	mariacristina.valigi@unipg.it