Workshop on Research Trends in Robotics and Haptics

Giovedì 18 Aprile 2019

Aula 101 ore 14:30

14:30 - 14:50 Prof. Cristian Secchi, Dipartimento di Scienze e Metodi dell'Ingegneria, Università degli Studi di Modena e Reggio Emilia

Title: Flexible and Safe interaction control: an energy-based approach

Abstract: The possibility of adapting online the way a robot interacts with the environment or the human is a crucial step for obtaining a reliable and effective robotic companion. In this talk, I will show how, using energy based arguments, it is possible to build a flexible yet provably reliable control strategy for human robot interaction.

14:50 - 15:10 Prof. ssa Maria Cristina Valigi, Dipartimento di Ingegneria, Università degli Studi di Perugia

Title: Dynamics, tribology and modelling of mechanical systems in industrial and biomedical fields.

Abstract: Dynamics, modelling of mechanical systems and tribology (lubrication, friction and wear) are important aspects to be investigated for the optimization of components in many applications of industrial engineering , in transportation and in biomechanical field. For this reason setting tribo-dynamic modelling of mechanical components is very useful because it allows to simulate conditions of friction instabilities that can lead to undesired phenomena such as stick-slip and noise, damage and wear. In this way a design tool can be created and adequate design parameters can be chosen. Also the analysis of wear and friction is useful to improve the performances despite to wearing action. Moreover wear models can be adequately predictive if the experimental assessment of the wear progress is well performed. The optomechatronics in tribology with the wear assessment by means of 3D optical scanners represents a new challenge and a new field of research.

15:10 - 15:30 Dr. Guillem Alenyà, Institut de Robotica i Informatica Industrial (CSIC-UPC), Barcelona, Spagna

Title: Assistive robots: the need for better manipulations and planning

Abstract: Assistive robots are called to be the ultimate introduction of robots in daily living. However, there are still several technical and scientific issues to be solved in the perception of dynamic and complex environments, on the actions, particularly those involving contacts, and in the decision making. We will talk about the required manipulation capabilities, in particular with deformable objects, and the advances in the introduction of planning paradigms to shape the robot decisions to user needs and preferences.

15:30-15:45 Prof. Domenico Prattichizzo, Dipartimento di Ingegneria dell'Informazione e Scienze Matematiche, Università degli Studi di Siena

Title: Short overview of the research on robotics and haptics at #SIRSLab

15:45-16:00 Prof.ssa Monica Malvezzi, Dipartimento di Ingegneria dell'Informazione e Scienze Matematiche, Università degli Studi di Siena

Title:The Role of Closed-Loop Hand Control in Handshaking Interactions

Abstract: The handshake is an important social interaction, common as a greeting in many parts of the world and in both business and social contexts. Human/Robot handshake is an interesting Human Robot Interaction (HRI) problem. In this presentation we analyse role of haptic feedback in human/robot handshaking by comparing different force controllers. The basic hypothesis is that in human handshaking force control there is a balance between an intrinsic (open–loop) and extrinsic (closed–loop) contribution. To investigate this assumption, we use an underactuated anthropomorphic robotic hand, instrumented with a set of pressure sensors estimating the grip force applied by humans. In a first set of experiments we ask subjects to mimic a given force profile applied by the robot hand, to understand how human perceive and are able to reproduce a handshaking force. We then implement different handshaking controllers in which we varied the intrinsic and extrinsic contributions and in a second set of experiments we ask participants to evaluate them in a user study. We show that a sensorimotor delay mimicking the reaction time of the Central Nervous System (CNS) is beneficial for making interactions more human-like. Moreover, we demonstrate that humans exploit closed-loop control for handshaking. By varying the controller we show that we can change the perceived handshake quality, and also influence personality traits attributed to the robot.

16:00 - 16:15 Prof. Gianni Bianchini, Dipartimento di Ingegneria dell'Informazione e Scienze Matematiche, Università degli Studi di Siena

Title: Optimization-based passivity layer design for haptic-enabled teleoperation.

Abstract: This talk presents some preliminary advances on the integration of optimization in teleoperation systems with haptic feedback involving several degrees of freedom. We focus on the implementation of a passivity layer for a well-established time domain scheme via the solution of an optimization problem aimed at preserving transparency of interaction along subsets of the environment space which are preponderant for the given task, while guaranteeing the energy bounds required for passivity.