PUBLIC SELECTION BASED ON QUALIFICATIONS AND INTERVIEW FOR THE AWARDING OF NO. 2 EARLY STAGE GRANTS LASTING 12 MONTHS FOR CONDUCTING RESEARCH PURSUANT TO ART. 22 OF LAW NO. 240/2010 AT THE GITT - CENTRE ON INNOVATION MANAGEMENT AND TECHNOLOGY TRANSFER (A.R.F. 09/A2 – APPLIED MECHANICS - A.D. ING-IND/13 – APPLIED MECHANICS (CUP: E36D1700009009) TYPE B FINANCED BY LOMBARDY REGION IN THE CONTEXT OF THE "BANDO LINEA" FOR RESEARCH AND INNOVATION COFINANCED BY POR FESR 2014-2020

announced with decree of the Chancellor Rep. no. 867/2018 of 10.12.2018 and posted on the official registry of the University on 10.12.2018

Research structure: GITT - Centre on innovation management and technology transfer Duration of the grant: 12 months Scientific Area: 09 – Industrial and information Engineering Academic recruitment field: 09/A2 – Applied mechanics Academic discipline: ING-IND/13 - Applied mechanics Scientific Director: Prof. Paolo Righettini

RESEARCH PROJECT CODE 1

"Control strategies for mechatronic systems by means of "Vision in The Loop" technology"

Objectives

The candidate will be involved in the research group of the University of Bergamo, coordinated by prof. Paolo Righettini, in the research activity entitled "Control strategies for mechatronic systems by means of "Vision in The Loop" technology", ING-IND/13 - Applied Mechanics Area 09 Industrial and Information Engineering, Competition Sector 09/A2

Research program

Computer vision is a very powerful tool for "sensorizing" a mechatronic system, because allows passive measurements of the environment without the need of physical contact. So it allows to measure several different kind of objects leading to great flexibility. The research project deals with the application and mainly the integration of a vision system into mechatronic systems at the aim to manage the information coming from the sensors (cameras) for the system's control. So the vision system becomes part of the control systems itself: this is "Vision in The Loop".

According to this technology, information coming from one or more cameras located on or around a robotic system are used as feedback of the control system, hence leading to another regulation loop in addition to the traditional position and velocity control loop.

Therefore the integration of the cameras into the mechatronic system both from the configuration point of view and from the control software point of view becomes very important.

Additional topic of the research activity will be also the investigation on optimal control methods to maximize the dynamic performances of a mechatronic system controlled by means of the Vision in The Loop technology.

Results of the research

Deepening of the optimal integration and control methodologies for maximizing the performance of a mechatronic system controlled by vision in the loop technology.

RESEARCH PROJECT CODE 2

"Synthesis and design criteria for parallel kinematics robotic systems"

Objectives

The candidate will be involved in the research group of the University of Bergamo, coordinated by prof. Paolo Righettini, in the research activity entitled "Synthesis and design criteria for parallel kinematics robotic systems", ING-IND/13 - Applied Mechanics Area 09 Industrial and Information Engineering, Competition Sector 09/A2

Research program

The design of a robotic system is a quite complex process and it is characterized by different steps. On of them is the synthesis phase consisting of the configuration and dimension of the robot's links, as well as the optimal positioning of the working volume. The research activity focuses on the definition of synthesis criteria, in particular for parallel kinematics systems, in order to optimize the design of a robotic system. The criteria taken into consideration are kinematic, kineto-static and dynamic, with particular attention

to structure's internal stresses.

One of the critical point of the design process is the typical flexibility of the links and in the way the constraints are realized. Hence, the research project will focus also on the influence of such characteristics on the system's performances.

In particular, attention will be given to the identification of the solutions which guarantee high stiffness and high positioning precision. The research will be carried on also by means of both numeric simulations/co-simulations.

Results of the research

Definition of synthesis criteria, in particular of parallel kinematics systems, which allow the optimization of the design of a robotic system.