Supervisor Project Idea

Supervisor

Insert a brief CV and/or external link, the total number of publications, the ORCID link, 5 of the most significant/recent publications, and a list of funded projects and awards. max 300 words

Full CV at: https://mdm.univpm.it/wp-content/uploads/sites/2/2023/09/CVcallegari-EuroPass-EN-PUB-23.pdf
Bibliometry (from Scopus): 98 documents (46 journal papers); 1158 citations; H-index:18
OrcID ID: https://orcid.org/0000-0002-4065-3212

Selected publications:

- L. Carbonari, M.-C. Palpacelli, M. Callegari: "Inverse Kinematics of a Class of 6R Collaborative Robots with Non-Spherical Wrist", *Robotics*, 2023
- D. Costa, G. Palmieri, D. Scaradozzi, M. Callegari: "Experimental Validation of a Bio-Inspired Thruster", *J. Dynamic Systems, Measurement and Control*, 143(8), 2021
- M. Marconi, G. Palmieri, M. Callegari, M. Germani: "Feasibility Study and Design of an Automatic System for Electronic Components Disassembly", ASME J. Manufacturing Science and Engineering, 141(2), 2019
- D. Corinaldi, M. Callegari, J. Angeles: "Singularity-free Path-planning of Dexterous Pointing Tasks for a Class of Spherical Parallel Mechanisms", Mechanism and Machine Theory, 128, October 2018, pp.47-57.
- D. Massa, M. Callegari, C. Cristalli: "Manual Guidance for Industrial Robots Programming", Industrial robot, Vol. 42 Issue 5, 2015, pp. 457-465.

Projects:

- 2023-2025: Coordinator of the local research unit of the PRIN22 project "DYNamic Assessment and Mitigation of the Impact of Collaborative Applications (DYNAMICA)" by the Ministry of Research and University
- 2018-2022: Scientific coordinator of the HD3FLAB project on the introduction of Industry 4.0 technologies (9 million € budget)
- 2019-pres.: Coordinator of the Marche node of the Competence Center Artes 4.0 network
- 2006-2008: Coordinator of the Italian research project "Mini-robotic systems for advanced technology applications" by the the Ministry of Research and University
- 2005-2009: Principal investigator of the Polytechnic University of Marche in LEAPFROG, integrated project of the 6th FP on the automation of apparel production
- 1998-2005: Principal investigator of the European Networks of Excellence EURON and CLAWAR on robotics

Research Group Description

Provide the name the reference department and a brief description of the research group, including external links, and available instrumentations and infrastructures. max 300 words

Reference department: Dept. Industrial Engineering & Mathematical Sciences

The Machine Mechanics Research Group is a multidisciplinary team specialized in robotics, mechatronics, mechanical design and biomechanics. It combines expertise in engineering and applied sciences to develop cutting edge research, solve industrial problems and train the next generation of engineers.

The MdM Group manages the laboratory MIR (Mechatronics & Industrial Robotics) and is involved in the management of the I-Labs Industry and Artes 4.0 laboratories, where advanced technologies are used to develop new mechatronic and robotic applications for research purposes and for the benefit of companies:

- Industrial and Collaborative Robots

- Advanced Cameras and Vision Systems
- 3D Printing and Mechatronic Systems
- Exoskeletons and Tools for the Study of Ergonomics.

An industrial secondment at i-Labs Industry will allow the researcher to exploit all the mentioned equipment.

Title and goals

Provide the title of the topic and a short summary of the project idea. max 200 words

Title: Human centred automation of shoe processing

Project idea
The focus in the shoe market is mainly on product quality and customization possibilities, two areas in which Italian creativity and know-how are unmatched in the world. Therefore the digital transition of small companies in this sector must combine the potential of emerging technologies with the exploitation of the human capital and know-how available in the workshops, according to the guidelines of the Industry 5.0 paradigm.

The project aims at the development of collaborative robotic processes for shoe making and finishing by:

- advanced human-cobot interfaces
- ergonomic evaluation of operator-robot cooperation
- motion tracking, reactive control and dynamic task planning
- smart end-effectors, exploiting IIoT capabilities and developed for specific applications
- modelling of behaviour of human operator
- programming in virtual environments (human-in-the-loop)

The project will contribute to placing the human at the centre of the automation of craft processes, thus increasing the social and environmental sustainability of production.

Contact details (*including email address of the supervisor*)

Prof. Massimo Callegari

Dept. Industrial Engineering & Mathematical Sciences
Polytechnic University of Marche - www.diism.univpm.it
Via Brecce Bianche 12 - 60131 Ancona (Italy)
ph: +39 071 220 4444 - E-mail: m.callegari@univpm.it

i-Labs Industry
Via Guerri 7
60035 Jesi (AN)
Email: info@ilabsindustry.it