SAMUELE SANDRINI

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Current Position: Ph.D. Student at the STIIMA-CNR.

EDUCATION

2019, University of Study of Brescia

B.Sc Cum Laude in Industrial Automation Engineering

Thesis: Integrated deterministic and data-driven techniques for the estimation of the vehicle side-slip angle

2021, University of Study of Brescia

M.Sc Cum Laude in Industrial Automation Engineering

Thesis: Real-time human pose estimation and reconstruction for motion re-planning in collaborative robotics

2021-Now, Ph.D. Student at STIIMA-CNR, Milan, Italy

National PhD program in Artificial Intelligence (Area: Industry 4.0), coordinated by Politecnico di Torino with CNR and others Italian Universities

Research Topic: Risk-Aware Task and Motion Planning for Human-Robot.

Supervisor: Nicola Pedrocchi

RESEARCH ACTIVITIES

My research interests are mainly Task and Motion Planning for human-robot collaboration and multi-robot systems. My PhD project deals with studying and implementing a human-aware task-planning approach for industrial applications with human-robot coexistence. The motivation of this study is that until now, researchers have focused more on developing a safety approach on the motion planning level rather than on the task planning level, which, if it is human-agnostic, may lead to inefficient and risky plan solutions. I proposed a "synergy" term between each couple of human-robot tasks estimated in an offline phase. Integrating those synergy terms into an optimal task allocation and scheduling problem, e.g., with a mixed integer linear programming formalization, provides a proactive human-aware plan solution.

Research Projects: I was involved in Sharework (H2020-ICT-2018 -1 - RIA) as Team member of Work Package 3 (Task and motion planning for HR cooperation) for the definition and development of the behaviour tree of the demo at Cembre Spa for human and robot coordination.

Awards: I participated with the CARI team in the robot manipulation competition: "Robothon - The Grand Challenge" both in 2022, taking first prize and in 2023, finishing in second place. The competition is run by MIRMI TUM, Automatica, Messe MÜNCHEN, sponsored by Huawei, Siemens, and supported by Bayerisches Staatsministerium für Digitales. ⚲ https://automatica-munich.com/en/munich-i/robothon/teams/

Teaching Activities:

Teaching assistant for the course of Mechatronic Systems interacting with humans of the degree course in Industrial Automation Engineering at the University of Brescia in 2022/2023 and 2023/2024.

Teacher of Automatic Systems in a fifth class at IIS G. Beretta (Gardone Val Trompia, Brescia) for 2022/2023.

Main Skills

</> **Programming Languages**: C++, Python, Matlab.

Framework: ROS, ROS 2, Git.

Miscellaneous: IEC61131, μ-controllers, Solidworks, Web-Based languages (HTML, CSS, PHP, MongoDB), Vision systems for robotics.

Language: Italian, English.

Pubblications

- S. Sandrini, M. Faroni and N. Pedrocchi, "Learning Action Duration and Synergy in Task Planning for Human-Robot Collaboration" 2022 IEEE 27th International Conference on Emerging Technologies and Factory Automation (ETFA), Stuttgart, Germany, 2022, pp. 1-6, doi: 10.1109/ETFA52439.2022.9921721.

- S. Sandrini, N. Pedrocchi M. Faroni and A. Orlandini, "Enhancing Task Planning in Proactive Human-Robot Collaboration", 2023 I-RIM Conference (Institute of Robotics and Intelligent machines), Rome (Italy), 2023.

- S. Sandrini, M. Faroni, N. Pedrocchi. Learning and planning for optimal synergistic human-robot coordination in manufacturing contexts. TechRxiv. December 18, 2023.