Borsa di Ateneo

Tematica: *"Performance-aware and resilient supervisory control of cyber-physical and industrial automation systems"*

Research theme title:

Performance-aware and resilient supervisory control of cyber-physical and industrial automation systems

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Curriculum of DAUSY:

C1 AS for Automation

Hosting University/Research Centre

Università degli Studi di Salerno

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Prospective Supervisors:

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Description:

Today's technological society is permeated by complex systems composed by multiple smart elements and devices interacting together by way of communication networks, often called distributed cyber-physical systems (CPSs). Examples of CPSs are connected autonomous vehicle systems, automated warehouse systems, smart grids and buildings. Many computing subsystems in CPSs and industrial automation control systems are based on commercial-off-the-shelf smart components, endowed with communication capabilities. These components provide a significant level of control, lower deployment and operational costs in comparison to the traditional vendor-specific proprietary and closed-source systems. However, the coordination of these components to guarantee certain performance levels represents a challenging problem. In addition, they expose the control systems to vulnerabilities and threats.

There is a great potential in this area for developing novel approaches using methodologies that pertain to discrete event systems (DESs). Indeed, both the coordination and the cyber-attacks affect essentially the higher levels of the control architecture, where the discrete event view of the system is the most effective description of the system dynamics.

The goal of the research is to improve the state of the art by using timed models for the synthesis of supervisory control systems guaranteeing a certain performance level and also resilience against cyber-attacks.

Specific Information:

Applicants must hold a master's degree, preferably in Engineering, with a good background in relevant areas of interest (i.e., optimization, control). Solid mathematical and coding skills are encouraged. Proficiency in both spoken and written English is required. The candidate should be highly motivated and interested in undertaking innovative and challenging research activities involving both theoretical analysis and experimental validation. Technical and soft skills are strongly required to meet, during the research, a continuous trade-off between industrial needs and research challenges.

References:

[1].   João Carlos Basilio, Christoforos N. Hadjicostis and Rong Su, Analysis and Control for resilience of Discrete Event Systems: Fault Diagnosis, Opacity and Cyber Security, Foundations and Trends® in Systems and Control: Vol. 8: No. 4, 2021.
[2].   Christos G. Cassandras, Stéphane Lafortune, Introduction to Discrete Event Systems, Springer Cham, 2021.
[3].   Christoforos N. Hadjicostis, Estimation and Inference in Discrete Event Systems A Model-Based Approach with Finite Automata, Springer Cham, 2020.
[4].   Carla Seatzu, Manuel Silva, Jan H. van Schuppen, Control of Discrete-Event Systems: Automata and Petri Net Perspectives, Springer London, 2013.

Type of scholarship:

Project funded by the Hosting Institution

Study and research period outside the Hosting Institution:

Minimum 6, maximum 12 months of the study shall be performed as a research period abroad, in an institution to be defined later.