RESIST - RESilience management to Industrial Systems Threats (2022YSAE2X)
"finanziato dall'Unione europea – Next Generation EU

Abstract
Modern industries make large usage of digital and inter-connected devices to improve daily operations and functionalities. At the company level, the proper design and management of digital technologies ensure greater efficiency, higher coordination, and improved quality levels. Conversely, these technological devices bring inherent additional vulnerabilities at the informative level, with cascading effects on physical processes. Nonetheless, when referring to industrial systems engineering, the impact of a cyber vulnerability must be studied in larger operating contexts, including the potential consequences on industrial physical processes causing relevant damages. The benefits of industrial plants' digitalization must be traded-off with the higher chances of successful cyber-attacks. To this extent, reactive strategies for managing industrial plant physical failures must be complemented with proactive ones to model plant's resilience capacities. The incumbent presence of cyber vulnerabilities forces extending the repertoire of available preventive strategies for technical failure towards integrated cyber-physical models. When coupled with the actions performed by human operators, engineered aspects must be enlarged to cover an integrated socio-technical perspective, and finally embrace Cyber-Socio-Technical-Systems (CSTS) modelling.
This project (RESIST, RESilience management to Industrial Systems Threats) proposes the design and development of an integrated Digital Twin (DT) to assess industrial plants resilience in spite of cyber threats, yet acknowledging human actions. The approach will be tested into an experimental plant simulating a typical oil and gas transportation system, where the cyber-physical DT will be coupled with a human DT. The integrated DT will involve human and hardware in the loop to better reproduce the CSTS. The result of the analysis will include the design of resilience metrics to be used for establishing priorities of interventions aimed at increasing system capacity to withstand and recover from threats. The project encompasses an industrial systems engineering research dimension to capture system performance via advanced approaches, such as Systems-Theoretic Accident Model and Processes (STAMP), Motion Capture, and Mixed Reality.
Globally, the project will deliver a novel methodology for cyber-socio-technical industrial resilience analyses. The outcomes of the project will be documented in academic publications and conferences usually attended by both practitioners and academics to foster larger dissemination. Furthermore, a set of guidelines about cyber-socio-technical modelling for industrial plants and resilience metrics definition will be developed. RESIST guidelines are meant to support future research in anticipating and testing the effects of cyber vulnerabilities on different industrial plants.

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Durata del progetto
24 mesi + proroga 5 mesi

Importo finanziato (DIMA)
Contributo MUR per ricerca: €70.507
Cofinanziamento Ateneo/Ente: €17.046
 Costo totale: € 87.553