FlexTech

Human Systems Integration

of Increasingly-Autonomous Complex Systems

CentraleSupélec

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Partners: French Air Force, CS Group

FROM RIGID AUTOMATION...
... TO FLEXIBLE AUTONOMY

We automated a lot during the 20th century increasing safety, efficiency and comfort in nominal situations, but leading to rigidity in off-nominal situations. It is time to develop research and innovation on flexibility that increases technological, organizational and human autonomy. At the same time, digitalization of our life and work spaces and supporting systems increases the need for research on both physical and cognitive tangibility. This is the reason why FlexTech develops interdisciplinary research and innovation at the cross-roads of systems engineering, artificial intelligence and human factors.

This is the shift from HighTech to FlexTech

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Research

The FlexTech Chair continue to evolve with three PhD students working on Human Systems Integration (HSI) on increasingly autonomous complex systems: (1) function allocation between servicing robots and human operators remotely interacting among each other; (2) experience feedback integration into a digital twin for process control remote management; (3) learning digital twin for remote maintenance of helicopter engines. This research work is carried out with oil and gas industry and a helicopter engine manufacturer.

The PRODEC method for HSI engineering design has been developed and tested on various projects. PRODEC proved to be effective in HSI to better integrate people's requirements into engineering design.

We worked on a man-machine teaming project, MOHICAN, funded by DGA and supervised by Thales. We developed metrics for the assessment of operational performance, trust and collaboration of fighter pilots with virtual assistants. This was carried out based on the use of PRODEC, human-in-the-loop simulations, formative evaluations and agile incremental human-centred design.

Publications

Boy, G.A. (2020). Human Systems Integration: From Virtual to Tangible. CRC Press – Taylor & Francis Group, USA (https://www.taylorfrancis.com/books/9780429351686).

Kolski, C., **Boy, G.A.**, Melançon, G., Ochs, M. & Vanderdonckt, J. (2020). Cross-Fertilisation Between Human-Computer Interaction and Artificial Intelligence. In A Guided Tour of Artificial Intelligence Research. Springer Nature Switzerland AG, by P. Marquis et al. (eds.) https://doi.org/10.1007/978-3-030-06170-8_11.