

Research Topic for the Arts et Métiers ParisTech - CSC PhD Program

Subfield: Industrial engineering

ParisTech School: ENSAM Lille

Title: Reconfigurable production system: adaptability to variability of products and quantities

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Short description of possible research topics for a PhD:

Industry 4.0 is the main international program which aims at improving the operational system in industries. More and more companies are concerned by this approach. Internet of objects can be one proposition: “objects” are connected to ease the communication, but other improvements can be envisaged. At a bigger level, an integration of the whole production system is needed. Managers need to fully control the production, the actual one and the future one. But how can the future demand be integrated without major changes in the actual layout? The production system needs to be flexible to the variety of products and to the quantities of products. A lot of problematics are concerned by this 4th industrial revolution: sizing of the shop floor, sizing of resources, planning of activities, assignment of resources, scheduling of activities. Some aid decision tools can be proposed to help the manager. To do so, we also need to consider some new trends such as continuous improvement, big data or collaborative robotics. For instance, it would be necessary to use the data in the shop floor to treat them in live to adapt the schedule and planning to the hazards, a link with the used ERP by the company needs to be done. Thanks to collaborative robotics, flexible production means can be used in our future flexible and agile production system, which will be reconfigurable. Many companies are actually thinking about converting their actual system into a reconfigurable production system.

Required background of the student: Industrial engineering, supply chain management, operational research, information system

A list of 5 (max.) representative publications of the group:

- Cristovao Silva, Nathalie Klement, and Olivier Gibaru. (2016). A generic decision support tool for lot-sizing and scheduling problems with setup and due dates. In International Joint Conference - CIO-ICIEOM-IIIE-AIM (IJC 2016), San Sebastian, Spain. ICIEOM.
- Joris Guérin, Olivier Gibaru, Eric Nyiri and Stéphane Thiery. (2016). Learning local trajectories for high precision robotic tasks: application to KUKA LBR iiwa Cartesian positioning. To appear in IECON Industrial Electronics Conference, 2016
- Michel Gourgand, Nathalie Grangeon, and Nathalie Klement. (2014). An analogy between bin packing problem and permutation problem: A new encoding scheme. In Advances in Production Management Systems. Innovative and Knowledge-Based Production Management in a Global-Local World, Vol. 438, Springer Berlin Heidelberg, 2014, pp. 572–579.
- Michel Gourgand, Nathalie Grangeon, and Nathalie Klement. (2014). Activities planning and resource assignment on multiplace hospital system: Exact and approach methods adapted from the bin packing problem. In 7th International Conference on Health Informatics, Angers, France, pages 117–124.

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