Contribution and challenges of multiagent simulation for factory digital twin

Flavien Balbo, Sophie Peillon, Benjamin Serra

▶ **To cite this version:**

Flavien Balbo, Sophie Peillon, Benjamin Serra. Contribution and challenges of multiagent simulation for factory digital twin. Un état des lieux sur les activités de recherche sur l'intelligence artificielle dans les écoles de l'IMT, Apr 2019, Paris, France. emse-02102177

HAL Id: emse-02102177

https://hal-emse.ccsd.cnrs.fr/emse-02102177v1

Submitted on 17 Apr 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Institut Mines-Télécom

Contribution and challenges of multiagent simulation for factory digital twin

Parties prenantes

MINES Saint-Étienne
Une école de l'IMT

Auteurs

Flavien Balbo
Sophie Peillon
Benjamin Serra

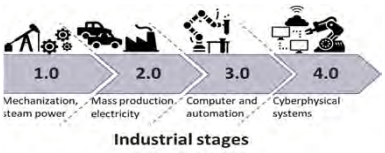
Partenaires

SOLYSTIC
A NORTHROP GRUMMAN company

LABORATOIRE HUBERT CURIEN

CONNECTED INTELLIGENCE

Coactis



Digital twin

A key technology for the Industry of the Future

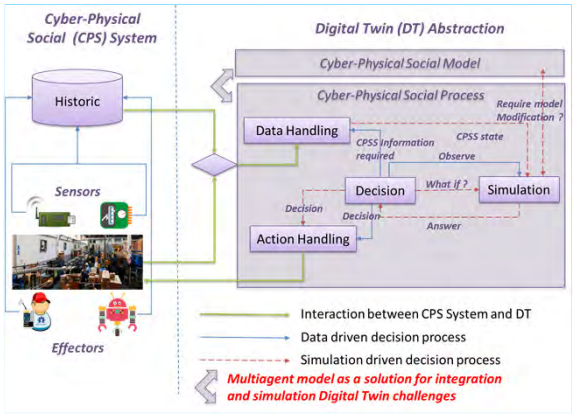
- One of top 10 **strategic technology** trends for 2019 (cf. Gartner)
- A factory digital twin serves as a **virtual replica** of what is actually happening on the factory floor in near-real time

SOSi™

SOLYSTIC

SOSi™

- **SOLYSTIC** is a provider of solutions for mail and parcel industry
- **SOSi™** is an inhouse developped factory/supply chain digital twin; simulates **1 production year in 10 minutes**
- Enables **digital VSM** and **optimization of processes**



Multiagent approach

A bottom-up modeling approach for modeling a CPS System

- **Agents** for modeling goal-driven decision processes
- **Environment** for modeling information perception and actions
- **Interaction** for modeling influences between components
- **Organization** for modeling formalized and\or implicit rules

Multiagent model of a CPS System

A solution for making easier the transition

- **FROM Simulation as a tool for Observation**: to understand the behavior of the reference system thanks to a model that is considered as a miniature reproduction of the reference system
- **TO Simulation as a tool for Validation**: to test an hypothesis of the reference system, to validate or to certify the underlying theory.

Why?

A CPS System is often

- **Complex:** the global behavior of the system is hard to model and any modifications is difficult
  - **Multiagent solution**: The global system is not explicitly designed
  - **Multiagent solution:** The multiagent concepts can be understood by non-experts
- **Open**: new component may be added to the system leading to a modification of the initial model
  - **Multiagent solution:** only the new components and its interaction with other components must be designed
- **Heterogeneous:** different decision models, data models, …
  - **Multiagent solution:** the resulting model is independent of the domain and can integrate several point of views.
- Decentralized: many local decisions without a centralized control
  - **Multiagent solution**: decentralization management is the core of a multiagent system.

Contact : flavien.balbo@mines-stetienne.fr

Colloque de l'Institut Mines Télécom Paris
April 2019