

54th CIRP Conference on Manufacturing Systems

Complexity theory and self-organization in Cyber-Physical Production Systems

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Abstract

The heterogeneity of the components of a Cyber-Physical Production System in addition to the high decentralization and autonomy required in Industry 4.0, introduces new levels of engineering complexity and dynamism that classical reductionists approaches are not able to solve. Within this context, novel solutions that rely on complexity sciences seem to be a good alternative to cope with these underline challenges. In this context, this paper presents a conceptual framework of complexity theory, self-organization and emergence and its subsequent relation to cyber manufacturing systems. Such analysis shows very promising ideas in the further development of complex, robust, adaptive and at least partial autonomous manufacturing systems.

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Peer-review under responsibility of the scientific committee of the 54th CIRP Conference on Manufacturing System

Keywords: Cyber-Physical Production Systems; Self-organization; Complex adaptive systems
