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Introduction to the thematic issue on Intelligent systems, applications and environments for the industry of the future

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1. Introduction

Recent advances in the area of ubiquitous computing, ambient intelligence and intelligent environments are making inroads in business-oriented application domains. This issue of JAISE addresses core topics on the design, use and evaluation of smart applications and systems for the factory of the future, an emerging trend perhaps better known as *Industry 4.0*.

The digital transformation in the enterprise envisioned by Industry 4.0 will entwine the cyber-physical world and real world of manufacturing to deliver networked production with enhanced process transparency. Production systems, data analytics and cloud-enabled business processes will interact directly with customers to realize the ambitious goal of single lot individualized manufacturing.

This thematic issue features a survey and 5 research articles which address the modeling, designing, implementation, assessment and management of intelligent systems, applications and environments that will shape and advance the smart industry of the future.

2. In this thematic issue

The Thematic Issue starts with a survey article **"The intelligent industry of the future: a survey on emerging trends, research challenges and opportunities in Industry 4.0"**, in which Preuveneers and Ilie-Zudor, the guest editors of this thematic issue, present insights about the latest developments in this domain and highlight directions to further the research into the successful design, development and evaluation of smart factory solutions.

The article **"Decentralized decision support for intelligent manufacturing in Industry 4.0"** argues why decentralized decision making is fundamental in smart factories. Marques et al. analyze the complexity and the main barriers of the decision process with respect to the number of variables and constraints that need to be considered. They propose a strategy for decision making in collaborative networks, contributing to the horizontal integration and the ability to adapt strategies in response to continuously changing conditions within Industry 4.0 scenarios.

The article **"A novel context-aware augmented reality framework for maintenance systems"** highlights the application of semantic web technologies (OWL and SWRL), behavior networks and augmented reality to help technicians carry out maintenance tasks by offering them in real-time additional useful information about the task at hand. Their system is able to adapt the type and amount of information as well as the way it is represented based on the context, skills and preferences of the technician, as well as the availability of computational resources on the device on which the application runs.

The article **"Multi-motor drive optimal control using a fuzzy model approach"** elaborates on how to design an optimal controller for a continuous production line and this using a model based on fuzzy logic. Perdukova et al. describe a black-box fuzzy model that is based on the system's input and output data, which is then used for the design of optimal continuous line

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control in terms of a given optimization criterion. The authors compare their solution with conventional controllers and classic fuzzy controllers based on linguistic rules from experts.

The article **"Non monotonic reasoning rules for energy efficiency"** presents a rule-based approach based on Defeasible Logic to avoid energy waste and reduce the energy consumption of systems and devices. The benefit of the approach proposed by Tomazzoli et al. is that it is much more capable of handling conflicting rules and at the same time deal with human-computer interactions with complex systems.

The final article **"Development of an ontology-driven, component based framework for the implementation of adaptiveness in a Jellyfish-type simulation model"** focuses on simulation modeling for complex manufacturing processes and material flow systems. Bohács et al. present a novel simulation modeling structure based on the Jellyfish simulation model that unifies layout and process-type simulation models. Their solution uses ontologies to abstract and concentrate information, and is particularly suitable for adaptive modeling of processes and material flow structures that are subject to frequent changes.

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