Journal of Manufacturing Systems 43 (2017) 213

Contents lists available at ScienceDirect

Journal of Manufacturing Systems

journal homepage: www.elsevier.com/locate/jmansys

Editorial

Introduction to the special issue on high performance computing and data analytics for cyber manufacturing

Cyber-manufacturing refers to a smart manufacturing paradigm that integrates cyber-physical systems, big data analytics, high performance computing (HPC), sensing technologies, and communication standards into manufacturing processes, systems and operations. The objective of this special issue is provide the readership with some of the most innovative, state-of-the-art concepts focused on advancing the architectures, platforms, and computational frameworks for cyber-manufacturing. 13 research papers were selected for this special issue.

The first paper by Thekinen and Panchal addresses an essential need in cyber-manufacturing: matching 3D printing service providers with service seeking designers in a cloud-based design and manufacturing environment. The paper presents a novel service matching method which determines an optimal allocation of manufacturing resources considering the objectives of all the participants

The second paper by Wu et al. evaluates the average elapsed time for executing a large-scale finite element model with more than eight million degrees of freedom on a workstation, a single server in the cloud, multiple servers in the cloud, and a supercomputer. Experimental results have shown that cloud computing can significantly accelerate engineering simulation as well as offers scalable computing capacity on a pay-per-use basis.

The third paper by Lynn et al. explores the application of general-purpose computing on graphics processing units (GPGPU) for tool path generation using HPC in computer-aided manufacturing. The performance of conducting surface offset operations is evaluated and benchmarked on various virtualized platforms.

The fourth paper by Corne et al. presents a neural network-based method for real-time tool wear monitoring using spindle power and cutting force data. This method is demonstrated using a drilling experiment with varying speeds and feed rates. Experimental results have shown that spindle power data can be used to predict tool wear accurately.

The fifth paper by Kozjek et al. applies several heuristic algorithms such as decision trees to identify faulty operating conditions in cyclic manufacturing processes. These algorithms are used to extract key information from large amounts of data collected from a plastic injection molding process.

The sixth paper by Lee presents a framework of fault detection using Industrial of Internet (IoT) devices and cloud computing environments. Three machine learning algorithms, including support vector machine, radial basis function, and deep belief learning, are used to detect manufacturing faults.

The seventh paper by Ren et al. focuses on the prediction of remaining useful life for rolling bearings using deep learning. The performance of the deep learning algorithm is evaluated using vibration data collected from a set of run-to-failure tests. Statistical features are extracted from both time and frequency domains.

The eighth paper by Adamson et al. presents a feature-based control and information framework for adaptive and distributed manufacturing environments. A feature-level resource capability model and a feature-enriched product model are introduced.

The ninth paper by Liu et al. introduces a scalable service-oriented architecture for cyber-manufacturing cloud systems. This prototype allows manufacturers to publish and subscribe web services for manufacturing operations and software applications to monitor manufacturing systems over the Internet.

The tenth paper by Zhao and Rosen presents a real-time process monitoring and measurement system for polymer additive manufacturing processes with exposure controlled projection lithography. Image processing and rule-based classification techniques are used to estimate the height profile of cured parts.

The eleventh paper by Kuttolamadom et al. optimizes manufacturing process parameters using high performance computing. This paper presents the integration of several commercial software on a high performance computing cluster.

The twelfth paper by Guo and Banerjee explores the application of topological data analysis in the manufacturing system domain. The Mapper algorithm is used to predict chemical process yield and detect faults in a semiconductor manufacturing process.

Finally, the thirteenth paper by DeSmit et al. introduces an approach to cyber-physical vulnerability assessment for intelligent manufacturing systems. The proposed approach will enable manufacturers to secure manufacturing processes from cyber-attacks.

Dazhong Wu
Janis Terpenny
Pennsylvania State University, University Park, PA, USA

Thomas Kurfess
Georgia Institute of Technology, Atlanta, GA, USA

Dean L. Bartles
North American Manufacturing Research Institution Dearborn, MI, USA
E-mail addresses: dxw279@psu.edu (D. Wu), jpt5311@psu.edu (J. Terpenny), kurfess@gatech.edu (T. Kurfess), dean.bartles@namrisme.org (D.L. Bartles).

http://dx.doi.org/10.1016/j.jmsy.2017.04.020