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EDITORIAL

Editorial for the special issue on big data and cloud technology for manufacturing

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With pervasive applications of new information technology such as the Internet of Things (IoT) and cloud computing, a massive amount of data is generated in the entire process of design, production, and service of a product. For example, the Internet of Things (e.g., RFID, wireless sensor network) can be used to collect useful data ubiquitously. Cloud service (e.g., cloud manufacturing service data) can be considered as a service/data warehouse which provides useful sources of social service/data for manufacturing [1]. Because these data are linked to the real and dynamic design, production, and service processes of a product, they can be employed optimally to improve the efficiency of the operations. However, the type of manufacturing big data to be generated in the entire lifecycle of a product is still unclear till now. Extraction and utilization of useful information from such huge and dynamic databases for "big data" are a daunting task. The efficient management and utilization of big data under the support of cloud technology or cloud service platform remain a challenge. This has recently motivated researchers and scientists to explore new methods and technologies for industrial applications of big data and cloud technology.

In this context, the objective of this special issue on "Big Data and Cloud Technology for Manufacturing" is to present the latest advances and developments of methods, techniques, systems, and tools dedicated to the industrial applications of big data and cloud technology.

At the closing of this special issue, 59 submissions were received, of which 38 papers are accepted for publication in this special issue based on peer review results. The accepted papers can be clustered into the following three groups: (1) researches on theoretical issues, (2) industrial applications, and (3) the complementary discussions.

The first group comprises 20 papers, and the topics are focused on the derived theoretical issues after introducing big data and/or cloud technology into manufacturing systems or specific production processes.

Specifically, big data and cloud technology are firstly introduced in *customized product design and manufacturing*. For example, Mai et al. proposed a customized production framework for distributed 3D printers, and the 3D printing technologies are expected to cater for distributed users in the form of cloud services. Another mass customization-integrated solution for customer-oriented product design was presented by Xu et al.

From the grid to cloud environment, the *manufacturing service management covering the entire service lifecycle* is divided into service generation stage, service pre-application stage, service application stage, and service post-application stage [2–4]. Many contributions considering big data and cloud technology are mainly carried out to explore some of operations in the former two stages as follows:

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- For the perceived *data collecting and processing* of manufacturing resources in the service generation stage, a representational state transfer (REST) framework based on software-defined network was proposed by Wen et al. for raw sensor data collection, a joint transceiver design of energy-harvesting for data conversion was presented by Wen et al. Zou et al. introduced a new FPGA-based data processing approach for big data in supply chain network, and a modular structure data modeling method was studied by Li et al.
- For *service aggregation* after the servitization of various manufacturing resources in the service generation stage, Xu et al. presented a correlation-aware QoS optimization model of service aggregation to ensure value and efficiency-added manufacturing activities.
- For *service searching and matching* driven by the specific manufacturing tasks and demands in the service pre-application stage, Zhang et al. investigated a task-driven cloud service proactive discovery method, and Zhang et al. designed an intelligent semantic matching engine to address and improve the effectiveness of service searching and matching.
- For *service evaluation* which is supporting the subsequent optimal selection and scheduling in the service pre-application stage, Cao et al. put forward a multivariate process capability indicator to evaluate the manufacturing process with the reliability of data on cloud decaying with time passing, and Yan et al. investigated the trust evaluation model of cloud manufacturing service to increase the credibility between different transaction entities.
- For *service optimal-selection and composition* in the service pre-application stage, Xiang et al. studied a two-phase method based on the big manufacturing data in a case library, while Zheng et al. proposed a QoS-aware based service selection approach.
- When it comes to *service scheduling* in the service pre-application stage, some works on the continuous process rather than the discrete manufacturing services are addressed. For example, an architecture of scheduling and management system for the services workflow was studied by Li et al., an integrated process planning and scheduling method was investigated by Liu et al., and the optimization of cutting process based on machining feature was discussed by Wu et al. Moreover, Wang et al. considered the physical Internet-based manufacturing system (π-MS) and explored therein initiative production scheduling issues.

In addition, there are some other discussions with the perspective from cloud services to *service supplier collaboration*. Wu et al. studied the tolerance design with multiple suppliers based on a two-level game approach under cloud manufacturing environments. Different from the works by Wu et al. on value network optimization, a multi-level ontology integration method for business collaboration was proposed by Ni et al.

Among the accepted papers, ten papers in the second group are concerned with applications of big data and cloud technology in different industries or different manufacturing scenarios. As the foundation of different industrial applications, Guo introduced a system design method for cloud manufacturing application systems. On the other hand, there are the following *specific applications in different industries*. For instance, Qu et al. investigated the dynamic production logistics synchronization system, and Zhong et al. studied the visualization of shop floor logistics data. An adaptive dispatching method was introduced by Li and Min for the semiconductor wafer fabrication facility. Huang et al. studied the group enterprises in cement equipment manufacturing as the case to put forward service requirement conflict resolution. Wang et al. introduced cloud computing applications in human resource management of small and medium-sized enterprises. A specific cloud manufacturing model in view of the characteristics of polymer materials enterprises was established by Qiu et al. Liu et al. analyzed a cloud-based design and manufacturing model of customized hydrostatic bearing system, and Cai et al. made the cloud-based simulation of heavy-duty machine tools. Wang et al. built an automated submerged arc welding platform for large-size and thick-wall workpieces with cloud technology application.

Finally, the remaining eight papers in the special issue address various topics which are complementary to the above two groups. Li et al. considered the unrelated parallel machine scheduling problem with energy and tardiness cost. Cheng et al. introduced a novel search algorithm based on waterweeds reproduction principle for job shop scheduling. Li et al. proposed an improved K-Nearest Neighbor algorithm to cope with the human performance prediction problem in a manufacturing system. Zhang et al. built the partial interdiction median models for multi-sourcing supply systems. Guo et al. made the efficient statistical analysis of geometric tolerances, and Shi and Liu discussed the performance of Krylov subspace methods for solving large-scale contact problem. Kai et al. investigated the multi-objective reentry trajectory optimization of reusable launch vehicle. Jiang et al. established a quantitative modeling on visual comfort to improve the human-machine interaction interface design in cloud manufacturing.

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