

Smart Manufacturing

Andrew Kusiak
Intelligent Systems Laboratory
3131 Seamans Center
The University of Iowa
Iowa City, Iowa 52242, USA
andrew-kusiak@uiowa.edu

<http://user.engineering.uiowa.edu/~ankusiak/>

Abstract

Smart manufacturing is an emerging form of production integrating manufacturing assets of today and tomorrow with sensors, computing platforms, communication technology, and data intensive modeling, control, simulation and predictive engineering. Smart manufacturing utilizes the concepts of cyber-physical systems, internet of things, cloud computing, service-oriented computing, artificial intelligence, and data science. Once implemented, these technologies will make smart manufacturing the hallmark of the modern industry. Increasing volumes of data and information are being collected on materials, products, and equipment. Data analytics and predictive computer models are being developed to anticipate failures ranging from individual components to disruption of supply chains. The key differentiators of smart manufacturing are the greater use of data, predictive capabilities, resource sharing, networking, and sustainability. Driven by big data, predictive engineering offers a new paradigm in constructing high-fidelity models (digital representations) of phenomena of interest. Such models allow exploring future spaces, some within the realm of existing technology and others that have not been studied. Resource sharing aims at better utilization of the investments made with benefits expressed in monetary and sustainability metrics. Sustainability is of paramount importance in the applications supported by smart manufacturing. The shape of all industries will change in decades to come. Some forms of manufacturing will be distributed, others tightly integrated. The tutorial will provide insights into incoming changes of manufacturing. Leading theories applicable to modeling smart manufacturing are presented. The concepts discussed in the tutorial are illustrated with applications.

Biography

Dr. Andrew Kusiak is a Professor in the Department of Mechanical and Industrial Engineering at The University of Iowa, Iowa City and Director of the Intelligent Systems Laboratory. He has served as chairman of two departments, Industrial Engineering (1988-95) and Mechanical and Industrial Engineering (2010-15). His current research interests include applications of computational intelligence and big data in renewable energy, automation, manufacturing, product development, sustainability, and healthcare. He is the author or coauthor of numerous books and hundreds of technical papers published in journals sponsored by professional societies, such as the Association for the Advancement of Artificial Intelligence, the American Society of Mechanical Engineers, Institute of Industrial Engineers, Institute of Electrical and Electronics Engineers, Nature, and other societies. He speaks frequently at international meetings, conducts professional seminars, and consults for industrial corporations. Dr. Kusiak has served in elected

professional society positions as well as various editorial boards of over fifty journals, including five different IEEE Transactions.

Professor Kusiak is a Fellow of the Institute of Industrial Engineers and the Editor-in-Chief of the Journal of Intelligent Manufacturing. His publications can be viewed at <https://research.engineering.uiowa.edu/kusiak/>.