Incorporating Descriptive Simulation of Integrated Manufacturing Systems to an Engineering Technology Capstone Course

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Abstract

Manufacturing systems are becoming more autonomous, requiring less operator intervention in daily operations. This is a consequence of today's market conditions, characterized by global competition, a strong pressure for better quality at lower prices, and products defined in part by the end-user. Manufacturing engineers need to integrate isolated manufacturing operations with the objective of extracting from them the most flexibility and productivity they can offer by using various technologies. There is a need to introduce the principles and practice of integrated manufacturing systems into an Engineering Technology Program which has most of the students pursuing their future careers in manufacturing industry.

The Engineering and Technology department at Ohio University hosts a senior capstone course, which operates within a team centric manufacturing environment. This course couples an operations management course with an opportunity for the students to apply the skills they have acquired through partial completion of the program to pursue the design, development, and manufacturing launch of a new product. Course requirements dictate that the students create a functional physical prototype. As part of the class, students are required to design, build and validate all of the required manufacturing documentation and fixturing for use during the production of their product. The student design teams execute a pilot production run to validate documentation and fixtures and then they refine the manufacturing and production process to efficiently produce the products. The capstone course ends with a six-hour production run, where the students lead a group of their peers to build between 15 and 21 products. To incorporate the practice of integrated manufacturing systems into this course, students are also required to design, simulate and analyze a fully automated production line for their products which includes production stations, material handling systems, storage systems, motion controllers, sensors, and robots. The system will be simulated and analyzed using ARENA software or Simulmatik software.

This paper will demonstrate the design of the new capstone course activities, scheduling, and assessment. And a comparison between the ARENA and Simulmatik will be conducted based on process simulation, evaluation method, and interfacing with physical hardware components. This project will provide a strategy and case study in incorporating manufacturing automation and integration to Engineering Technology programs for students to gain hands-on and software simulation and modeling experiences.

Biographies

Dr. YUQIU YOU is an Associate Professor of Engineering Technology and Management at Ohio University. She earned her B.E. degree from HuaZhong University of Science and Technology in China, MS from Morehead State University of Morehead, KY, and Ph.D. (Technology Management with the concentration in manufacturing systems, 2006) from Indiana State University. Dr. You is currently teaching at Ohio University. Her interests are in computer-integrated manufacturing, automation control, and remote control systems. Dr. You may be reached at youy@ohio.edu.

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