A Binary Integer Programming Model for the Job Shop Scheduling Problem

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Abstract

The current changes in the strategy of many companies have led to increase their product mix. In order to satisfy their customer needs, the companies have acquired newer and more advanced manufacturing resources and also they have migrated from the traditional production systems to more advanced ones like cellular manufacturing system. As a result of those changes, production scheduling has been defined as a crucial function. This function involves the accurate use of the existing resources to manufacture the jobs required, satisfying the due dates established by the customers. A reliable tool to assist the enterprises must be developed. In this work, a binary integer programming model is proposed as an alternative to deal the job shop scheduling problem. The mathematical model assigns the different sub-operations of the jobs to alternative machines to specify the production sequence and technological requirements are considered. The model minimizes the weighted tardiness where precedence relationships are satisfied. For larger instances, a metaheuristic based on the bacterium E-coli swimming strategy is proposed. A decision support systems is been developed on the top of MS Excel using Visual Basic for application which includes the tools previously mentioned.

Keywords
Scheduling, Job Shop, Binary Integer Programing, Metaheuristic, Decision Support System

Biography

Alejandro Vital Soto is a Ph.D. student in Industrial and Manufacturing Systems Engineering at the University of Windsor, Canada. He earned a B.S. in Industrial Engineering from the University of Puebla (BUAP), Mexico, Master

of Science in Industrial Engineering from University of the Americas Puebla (UDLAP), Mexico. Currently, he is developing a project with an industry located at the Windsor industrial corridor. His research interests include Job scheduling and process planning.

Ahmed Azab is an associate professor of Industrial & Manufacturing Systems Engineering, and Director of the Product Lifecycle Management Research Lab. He has a successful record of industrial experience and publications. He has been involved in projects with local industry and has been effective in acquiring funding as sole Principal Investigator and else. He has earned to date funding from both federal and provincial granting agencies and industrial partners in the amount of about $0.4 M. He was one of three researchers to receive a $1M CFI-LOF/MEDI-ORF grant supporting research infrastructure. He has been recipient and nominee for a number of international and national research excellence awards. He serves as a reviewer for a number of international journals; he also sits on the editorial board for Industrial Engineering & Management. Dr. Azab was awarded in 2009 the Outstanding Graduate Research Award at University of Windsor, and in 2015 the Faculty of Engineering Medal of Excellence for his role leading the undergraduate Industrial Engineering program's national accreditation efforts from CEAB (Canada Engineering Accreditation Board).

Mohammed Fazle Baki is a professor in the Odette School of Business in the University of Windsor, Canada. He has graduated in Civil Engineering from Rajshahi University of Engineering and Technology (RUET) in 1987. He has received MBA degrees from the University of Dhaka, Bangladesh in 1991 and the University of New Brunswick, Canada in 1995. He has received a Ph.D. degree in Operations Management from the University of Waterloo, Canada in 1999. His research interest lies in the development and application of quantitative methods in business and industrial engineering. He is particularly interested in the combinatorial problems that arise in manufacturing, supply chain management, and healthcare management.