Code	**AMI- NPST008**
Project Name:	Development & Evaluation of a System of Integrated Agents and Numerical Optimization for Flexible Manufacturing Systems (Design – FMS)
Objectives:	1. Determine optimal buffer sizes in FMS 2. Select manufacturing system components 3. Develop a database for FMS components and their characteristics 4. Design, develop and evaluate a manufacturing simulation system 5. Develop an integration framework for buffer sizes optimization and components selection 6. Design, develop and evaluate a manufacturing design decision-support system
Project Period	24 Months
Start Date	
Budget	1523000 Saudi Riyals
Status	Accepted
Project Outcome	1. A set of algorithms for FMS buffer sizes optimization and components selection 2. A framework to integrate buffer sizes optimization and components selection in manufacturing system design 3. An open source simulation for FMS 4. An open source functional software for manufacturing system design
Abstract	Nowadays, flexible manufacturing systems (FMS) are widely used in high volume industries. FMS gained importance because of growing manufacturing systems' complexity and production costs. Deciding buffer sizes and picking the FMS components are difficult challenges in FMS design and implementation; and when done properly may lead to an optimal FMS. Consideration of all the factors that potentially impact manufacturing systems performance can lead to complex analytical models; and sometimes it is difficult to develop such models. The proposed research integrates numerical simulation with artificial intelligence methods to evaluate and optimize FMS design. In the past decades, a number of studies related to FMS design were published. However, little attention was given to solutions that take into consideration several decision variables concurrently. Moreover, to the best of authors' knowledge, there is no published work that integrates FMS components' selection and buffer sizes' optimization in single framework. The successful completion of the proposed research will lead to the development of a System of Integrated Agents Numerical-optimization (SIGN) to optimize FMS design. SIGN integrates simulation and artificial intelligence to select machine tools, robots and buffer sizes. An interface will be developed, where a user can input their parameters and to choose optimization and decision-making techniques. Using this interface, FMS parameters and setting can be inputted and output results can be displayed. Numerical experiments will be conducted to verify the contributions of the proposed research. The results of this project can be applied to different manufacturing system structures. This project will have broader impacts on academic and industry and will be implemented in open source software. The outcome of this project will have a wide influence on the open source manufacturing system design, industries development and economic development.
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