Developing a new Iterative Optimization-based Simulation (IOS) model with Predictable and Unpredictable Trigger Events in Simulated Time

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Abstract

Due to their capabilities to accurately construct dynamic, non-linear or even qualitative relationships in complex systems with little mathematical sophistication, SO models have been widely utilized as a pivotal decision-making tool to determine the attractive configurations of systems [1]. In this study, a new SO model, called Iterative Optimization-based Simulation (IOS) is designed and implemented. In this model, an optimization module is embedded inside a simulation manager to improve system's performance [2]. This model is designed to be adapted to confront of several system performance deviations which are monitored either by limit-charts, thresholds or events. These events could be predictable or unpredictable. Whenever any of these trigger events occur, the optimization manager is called to solve the problem to optimality. Therefore, this platform provides a unique capability for practitioners to evaluate short-term or long-term performance of their desired system while it has been optimized on several occasions during the simulation run. This framework is implemented using SIMIO as a simulation manager, MATLAB/CPLEX as an optimization manager and MySQL as a database manager. A case study in a manufacturing system is provided to evaluate the performance of the resultant approach against the existing models. The results show, the IOS approach generally has better performance compared to the Non-IOS approaches, while it takes longer to execute. The benefits of this hybridization for other industries, including healthcare and supply chain management systems are discussed.

Keywords
Simulation Optimization, Iterative Optimization-based Simulation (IOS), Dynamic Scheduling

References
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Biography

Mohammad Dehghani is a recent gradated PhD student in Engineering Management at Western New England University, Springfield, MA. This study reflects his dissertation work which is focused on developing a new Simulation-Optimization approach. Currently, he is a Teaching Assistant Professor in Mechanical and Industrial Engineering Department at Northeastern University, and his research interests include simulation, simulation-optimization, MCDM, healthcare systems' operation, and supply chain management. He is member of IIE, SCS and SEMS.