

# **Standard Transformation Formulation Framework for Robust Optimization Technique with Application on Healthcare Delivery Systems**

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## **Abstract**

Assuming all the parameters as known data with certainty is a highly optimistic assumption in developing optimization model to solve the operations management problems. Facing with noisy, inaccurate, or unspecific data is an inevitable part of dealing with real-world optimization problems for the decision makers in their attempts to reduce variability and showing the overemphasis of the feasibility of optimization models. Robust Optimization technique is a promising optimization approach tackling the impact of uncertainty of input parameters for solving real-world optimization problems. However, its application is limited owing to the complexity of developing the robust models. To address this limitation, we propose a novel transformation formulation approach to be utilized as a standard framework in constructing linear robust programming formulation from their deterministic counterpart. The proposed framework encodes the construction of the mean, expected variability, and expected infeasibility of the objective function in the robust optimization formulation while it is compared with a stochastic programming formulation. The applicability of the presented framework is illustrated through an optimization problem from a healthcare operating room allocation decision model. The results demonstrate the effectiveness of utilizing the developed framework as an easy to understand and simple to implement approach by the decision makers while the optimal solutions are obtained.

## **Keywords**

Linear programming; Robust optimization; Two-stage stochastic recourse programming; surgery demand uncertainty; Operating room block scheduling

## **Biography**

**Morteza Lalmazlounian** received a B.S. degree in Industrial Engineering from the Malek-Ashtar University of Technology, Isfahan, Iran, in 2004 and an M.S degree in Industrial Engineering from the University Technology of Malaysia, Malaysia, in 2012. He is currently working towards a Ph.D. degree in Industrial and Manufacturing Systems Engineering at the University of Windsor, Canada, and is expected to graduate in 2016. His research is mainly devoted to real life application, such as healthcare management and supply chain optimization problems. His current research

interests focus on stochastic modeling and optimization under uncertainty as it relates to health care delivery systems, production & inventory systems and supply chains management, more specifically, on the planning and scheduling of these systems.

**M. Fazle Baki** is a Professor in the Odette School of Business in the University of Windsor, Canada. He graduated in Civil Engineering from Rajshahi University of Engineering and Technology (RUET) in 1987. He received MBA degrees from the University of Dhaka, Bangladesh in 1991 and the University of New Brunswick, Canada in 1995. He 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.

**Majid Ahmadi** received B.Sc. degree in Electrical Engineering from Sharif University (formerly known as Arya Mehr University), Tehran, Iran, and Ph.D. degree in Electrical Engineering from Imperial College of London University, London, UK, in 1971 and 1977, respectively. He has been with the Department of Electrical and Computer Engineering, University of Windsor, Windsor, Ontario, Canada, since 1980, and currently as Distinguished University Professor and Director of the Research Center for Integrated Microsystems. His research interests include digital signal processing, machine vision, pattern recognition, neural network architectures and VLSI implementation, as well as computer arithmetic. He has co-authored the book, *Digital Filtering in 1-D and 2-D dimensions; Design and Applications* (New York: Plenum, 1989) and has published more than 550 articles in the above areas. Dr. Ahmadi was the regional editor for the journal of *Circuits, Systems and Computers* and is the Associate Editor for the *Pattern Recognition* journal. He was recipient of an Honorable Mention award from the editorial Board of the *Pattern Recognition* journal in 1992 and received the Distinctive Contributed Paper award from Multiple-Valued Logic Conference Technical Committee and the IEEE Computer Society in 1999. He is a Fellow of the IEEE (USA) and a Fellow of IET (UK).