A Hybrid Benders Based Rolling Horizon Algorithm for a Dynamic Facility Location Problem

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Abstract

We study a well-known capacitated dynamic facility location problem (DFLP) where facilities are assumed to provide finite amount of goods to meet time-dependent and deterministic customer demand subject to time-dependent cost parameters in a multi-period planning horizon. The objective is to satisfy customer demands at a minimum cost by determining the time period for opening, closing, or retaining facilities. To solve this challenging *NP*-hard problem, this paper develops a unique hybrid solution algorithm that combines a rolling horizon algorithm with an accelerated Benders decomposition algorithm. Extensive computational experiments are performed on benchmark test instances to evaluate the hybrid algorithm's efficiency and robustness in solving the DFLP problem. Computational results indicate that the hybrid Benders based rolling horizon algorithm consistently offers high quality feasible solutions in a much shorter computational time period than the standalone rolling horizon and accelerated Benders decomposition algorithms in the experimental range.

Keywords
Dynamic facility location problem, Benders decomposition algorithm, rolling horizon heuristics, hybrid Benders based rolling horizon algorithm.

Biography

Dr. Ridvan Gedik received his Ph.D. in Industrial Engineering from the University of Arkansas, Fayetteville. He holds a B.S. and M.S. degree in Industrial Engineering from Middle East Technical University, Ankara, Turkey and the University of Arkansas, respectively. He worked as a visiting and research assistant professor in the Department of Industrial & Systems Engineering and Institute for Systems Engineering Research at Mississippi State University in 2014/2015 academic year. Then, he joined the Mechanical and Industrial Engineering Department at the University of New Haven in September 2015. His primary research interests include production line simulation, manufacturability assessment and developing efficient solution techniques for large-scale optimization problems in the application areas of healthcare, transportation, homeland security, supply chain management. He is a member of the Institute for Operations Research and the Management Sciences (INFORMS) and the Institute of Industrial Engineers (IIE).

Dr. Mohammad Marufuzzaman received his Ph.D. in Industrial & Systems Engineering from Mississippi State University in 2014. He received his MASc degree in Industrial Systems Engineering from University of Regina, Canada in 2010 and B.Sc degree in Industrial & Production Engineering from Shah Jalal University of Science & Technology, Bangladesh in 2006. He joined Industrial & Systems Engineering department as an Assistant Professor in August 2015. His main areas of interest are in supply chain optimization with applications in renewable energy, stochastic programming, decomposition methods, solving large scale supply chain network problems and supply chain risk management. Dr. Maruf's publications have appeared in journals such as Transportation Science, Computers & Operations Research, Transportation Research Part E, International Journal of Production Economics, Canadian Journal of Chemical Engineering and several conference proceedings. He is a member of INFORMS and IIE.