Optimizing Protection Decision in Railway Systems

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Abstract

Events during last two decades have shown that railways have become the primary interest of terrorist activities. But, planning for protection against these threats on railways is challenging because of their geographical extensiveness, open and easily accessible infrastructures. Hence, identification and protection of only the critical components of railway infrastructures are very essential. In this paper, we present an optimization model to allocate the protective resources among the components of the railway systems optimally to minimize the impact of worst-case disruptions. The main focus is to enhance the applicability of the model by capturing additional realism and complexities of railway systems. We formulate the problem as a tri-level mixed-integer program. Then, we simplify it a bi-level problem and solve it by super valid inequalities based decomposition algorithm. Computational results of a case study on South East Coast Indian railways are analyzed for efficient protection decisions.

Keywords

Fortification, Interdiction, Tri-level programming, Decomposition

Biographies

Girish Ch. Dey is a doctoral student in the Department of Industrial & Systems Engineering, Indian Institute of Technology Kharagpur, India. He earned his M. Tech from the same department of IIT Kharagpur, India. His current research area is critical infrastructures protection decisions under disruptions. The main focus of the research is to develop optimization models to protect critical facilities and transportation infrastructures against strategic and random disruptions. He is a member of IISE, INFORMS, POMS and APICS.

Mamata Jenamani is an Associate Professor in the Department of Industrial & Systems Engineering, Indian Institute of Technology Kharagpur, India. She holds a PhD degree from the same department of IIT Kharagpur, India. She is a recipient of the Emerald/EFMD Outstanding Doctoral Research Award in Enterprise Application of Internet Technology. Her broad areas of interest are Information Systems and E-Business. The specific focus areas include web data analytics and supply chain optimization in the context ICT applications. She has published more than 50 research papers in reputed international journals and has presented in many international conferences. Currently, M. Jenamani is running a number of projects in the areas such as e-business in general, auction, ICT in supply chain and urban sustainability with a focus on e-governance.