



Department of Civil Engineering and Engineering Mechanics
Columbia University

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627 Mudd

Multi-Objective Optimization of Construction and Sustainability Decisions



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The lecture highlights ongoing research efforts that focus on optimizing construction and sustainability decisions. The main objectives of the first research thrust on optimizing construction decisions focus on: (1) developing robust optimization models for minimizing construction cost, duration, service disruption, while maximizing quality, durability and safety; and (2) formulating scalable parallel computing methodologies for solving large-scale construction optimization problems. To accomplish these objectives, interdisciplinary research methodologies are adopted to integrate evolutionary computations, integer programming, and parallel computing. The main objectives of the second research thrust on optimizing sustainability decisions focus on (1) developing multi-objective methodologies for selecting green building measures that are capable of quantifying the impact of green building measures on the environment, society and economy in a transparent, scientific and reliable manner; and (2) optimizing the selection of green building measures to accomplish multiple objectives including maximizing the environmental, social and economic performances of the building as well as maximizing its LEED certification level.

Biosketch

Khaled El-Rayes is an Associate Professor and an O'Neil Faculty Scholar in the department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign. El-Rayes has more than 20 years of professional experience in both academia and the construction industry. He taught numerous graduate and undergraduate courses in the area of construction engineering and management and he was repeatedly named to the "List of Teachers Ranked as Excellent by their Students" at the University of Illinois in recognition of his teaching effectiveness. He also served as PI and Co-PI on numerous research projects that were funded by the National Science Foundation, Illinois Center for Transportation, National Center for Supercomputing Applications, and Qatar Foundation. The outcome of his research projects were published in more than 100 articles including more than 50 journal papers. The contributions of his research have also been recognized nationally and internationally, receiving many research awards including the "Best Journal Paper Award" in 2010 from the ASCE Journal of Construction Engineering and Management, the "ASCE Thomas Fitch Rowland Prize" in 2007; the "NSF CAREER Award" from the National Science Foundation in 2003; and the "Doctoral Prize of the Faculty of Engineering and Computer Science" from Concordia University in Canada in 1999. El-Rayes has trained 15 Ph.D. students, including nine former Ph.D. students who are currently holding faculty Positions in Purdue University, University of Washington, University of Central Florida, Florida International University, and University of Santa Clara. El-Rayes is currently serving as a Specialty Editor for the ASCE Journal of Construction Engineering and Management in the area of cost and scheduling. He also served as the Secretary, Vice-Chair and Chair of the ASCE Construction Research Council.