



Industrial and Systems Engineering Seminar Series
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A Mixed Integer Programming Model for Locating and Dispatching Ambulances via District Design

Laura A. McLay, Associate Professor
Department of Statistical Sciences and Operations Research
Virginia Commonwealth University

Monday, November 26, 2012, 1:50 – 2:40
3024 Emerging Technologies Building

Abstract: The decision of which servers to dispatch to which customers is an important aspect of service systems (such as in emergency medical services, medical triage, and electric utilities). In this presentation, we propose a mixed integer programming (MIP) model for identifying how to locate and dispatch ambulances through district design. The model maximizes the coverage level, i.e., the fraction of high-priority calls that can be responded to within nine minutes by locating ambulances at stations, assigning each call location to open ambulance stations according to a priority list, and balancing the workload across the ambulances. This district design approach identifies response districts for each ambulance that correspond to its primary and backup coverage regions, and contiguity is enforced for each ambulance's primary coverage region. A computational example illustrates the modeling paradigm and solution algorithm using a real-world example. The results suggest that the reduction in coverage to maintain contiguity and a balanced workload among the ambulances is small.

Bio: Laura A. McLay is an Associate Professor of Statistical Sciences and Operations Research at Virginia Commonwealth University. She received her Ph.D. in Industrial Engineering from the University of Illinois at Urbana-Champaign in 2006. Dr. McLay's research interests are in the field of operations research, with a particular focus on discrete optimization and Markov decision processes to manage both routine and severe risks. Her research has applications in homeland security, emergency management problems, and emergency response during severe weather events. Her research has been widely published. She has authored or co-authored twenty-nine publications in archival journals and refereed proceedings. Dr. McLay's research has been supported by National Science Foundation (NSF), the Department of Homeland Security, and the Department of Defense. She was recently awarded a prestigious NSF CAREER award. She is the recipient of an Outstanding Institute of Industrial Engineers (IIE) Publication Award and a best paper award for co-authored proceedings for the IIE Annual Conference. She has been named a fellow in the NSF-sponsored program Enabling the Next Generation of Hazards and Disaster Researchers. She is a member of INFORMS, IIE, Tau Beta Pi, Alpha Pi Mu, the American Meteorological Association, and the Virginia Academy of Science.