A Vehicle Routing and Scheduling Algorithm (VeRSA) using an Indexing Method for Last Mile Distribution of Medical Supplies

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Abstract: Healthcare vehicle routing and scheduling problems differ from a standard vehicle routing problem (VRP) due to different objectives, such as minimize the time from when a medical specimen is available for pickup until it is delivered to a central laboratory, and additional constraints such as need to maintain cold temperatures for vaccine distribution. To provide fast solutions, we developed a new algorithm called the Vehicle Routing and Scheduling Algorithm (VeRSA) that uses an indexing method inspired by scheduling techniques to efficiently construct a good feasible solution. Instead of using a linear programming relaxation, as is common for VRPs, we use the index and a quickly calculated lower bound to traverse a branch-and-bound tree associated with the mixed integer program, and provide an optimality gap at every iteration. The indexing method is easily modified to incorporate variations on the objective function and constraints. The combination of quickly constructing a feasible incumbent solution and coupling it with a lower bound for pruning makes VeRSA scalable to large problems. Numerical results will be presented on applications for pickup and distribution of medical supplies, and vehicle routing problems with time windows.

Bio: Dr. Zelda B. Zabinsky is a Professor in the Department of Industrial and Systems Engineering at the University of Washington, with adjunct appointments in the departments of Electrical Engineering, Mechanical Engineering, and Civil and Environmental Engineering. She is an INFORMS Fellow and an IIE Fellow. Professor Zabinsky has published numerous papers in theory and applications of global optimization and a book, *Stochastic Adaptive Search in Global Optimization*. Her research has been funded by the National Science Foundation (NSF), NASA-Langley, Federal Aviation Administration (FAA), and the Office of Naval Research (ONR), as well as local industries including Boeing Commercial Airplane Company, Microsoft, and the Port of Tacoma. She has applications in engineering design, supply chain, healthcare, power systems with renewable resources, air traffic flow management, and communication scheduling of nano-satellites. Professor Zabinsky is currently on the editorial board of the Journal of Global Optimization, and has been a board member for the Pacific Institute of Mathematical Sciences (PIMS) and the Women in Engineering (WIE) Initiative. She teaches courses in Operations Research and has received the annual teaching award in Industrial Engineering at the University of Washington several times.