Green Location Routing Problem

Okan Dukkanci*†[1], Bahar Y Kara[1], and Tolga Bektaş[2]

[1]Bilkent University – Bilkent University 06800 Bilkent, Ankara TURKEY, Turkey
[2]University of Southampton (UNITED KINGDOM) – United Kingdom

Abstract

This talk will introduce the Green Location-Routing Problem (GLRP), an extension of the classical Location-Routing Problem that explicitly accounts for fuel consumption and CO2 emissions, the amount of which is measured by a widely used comprehensive modal emission model. The GLRP consists of (1) locating depots on a subset of a discrete set of points, from where vehicles of limited capacity will be dispatched to serve a number of customers with service requirements, and (2) routing the vehicles by determining the order of customers served by each vehicle and the speeds on each leg of the journey, such that customers are served within their respective time windows and vehicle capacities are respected. We will define a single and a bi-objective variant of the problem. The former objective is to minimize a total cost function comprising depot, fuel and emission costs. In the latter, one objective is the minimization of the fixed depot costs and the other is to minimize the total amount of emissions. We will present mixed integer programming formulations for both variants of the problem. For the single-objective GLRP, we will describe a group of valid inequalities to strengthen the formulation and a branch-and-cut algorithm building on these inequalities. As for the bi-objective GLRP, we will present an application of the ϵ-constraint method. Computational results on realistic data sets will be presented.

*Speaker
†Corresponding author: okan.dukkanci@bilkent.edu.tr