
A non-linear algorithm for the pollution-routing problem

Hooman Malekly¹, Emrah Demir*², and Gilbert Laporte^{4,3}

¹Islamic Azad University – Iran

²Eindhoven University of Technology (TUE) – Netherlands

⁴HEC Montréal – Canada

³Centre Interuniversitaire de Recherche sur les Réseaux d'Entreprise, la Logistique et le Transport (CIRRELT) – Canada

Abstract

The Pollution-Routing Problem (PRP), which is an extension of the Vehicle Routing Problem with Time Windows, consists of routing a set of vehicles serving a set of customers within their time windows and jointly determining the speeds of the routes. This is a mixed integer non-linear program and very difficult to solve by a standard non-linear solver. We have decomposed the problem into two subproblems and developed a two-stage hybrid algorithm for the PRP. The first stage solves a classical routing problem by means of an accelerated Benders Decomposition method, and the second stage applies a speed optimization algorithm and a non-linear based interior point method. Computational experiments on well-known PRP benchmark instances confirm on the efficiency of the algorithm.

*Speaker