
Lifted compact formulations for the Capacitated Vehicle Routing problem

Valeria Leggieri*¹ and Mohamed Haouari²

¹Faculty of Science and Technology, Free University of Bozen-Bolzano – Italy

²Mechanical and Industrial Engineering Department, Qatar University – Qatar

Abstract

We present lifted polynomial length formulations that can be obtained using Reformulation and Linearization Techniques (RLT) from an initial ordered path-based formulation. The tightest formulation that can be derived using this process turns out to be equivalent to the strongest multi-commodity flow formulation presented in the literature by Letchford and Salazar-Gonzalez. In order to further strengthen the formulation, three sets of polynomial size valid inequalities are proposed. The first set is retrieved using precedence relationship between customers from the Traveling Salesman problem, the second set is obtained applying RLT on precedence constraints and the third set exploits the possible incompatibilities of the customers on the basis of their demands and of the capacity load of the vehicles. Finally, we present computational results with the aim of showing the tightness of the proposed formulation and the impact of the valid inequalities.

*Speaker