Performance of a deterministic 2e-VRP with synchronization in a real world situation

Alexandra Anderluh*†[1], Rune Larsen[2], Vera Hemmelmayr[1], and Pamela Nolz[3]

[1]WU Vienna University of Economics and Business (WU Vienna) – Welthandelsplatz 1 1020 Vienna, Austria

[2]Danmarks Tekniske Universitet - DTU (DENMARK) – Denmark

[3]AIT Austrian Institute of Technology – Austria

Abstract

Two-echelon Vehicle Routing Problems (2e-VRP) are hard to solve, especially when temporal and spatial synchronization constraints are taken into account. We have used a deterministic solver to handle such a problem in a city logistics setting within a reasonable amount of computational time. However, in the real world, such problems are affected by uncertainties. Especially travel time uncertainties may have a great influence on the solution, because a vehicles' delay can propagate to a number of other vehicles due to synchronization requirements. In this work, we investigate which insights we can gain from deterministic solutions that are applied in a stochastic environment. Therefore, we use scenarios based on lognormally distributed travel times to evaluate a deterministic solution under effects of stochasticity. Based on this information we reoptimize the solution in three different ways to decrease the cost under stochasticity. Furthermore, we examine the influence of time dependent travel times in the solution process for a realistic test instance of the city of Vienna. First results show that restructuring the solution can decrease stochastic cost without deteriorating the deterministic solution.

*Speaker

†Corresponding author: alexandra.anderluh@wu.ac.at