

Abstract

This work investigates the effectiveness of using clustering methods in solving various capacitated location-routing problems (CLRP) for medium- and large-scale datasets, with up to 20 000 datapoints. Different clustering methods as well as hybrid clustering methods are tested and compared.

A new problem called the planar CLRP (plCLRP) is introduced. Based on the results from the clustering methods, cluster-based approaches are suggested to solve variants of the CLRP. These include the Hamiltonian p -median problem (HpMP), the planar CLRP (plCLRP), the concentrator discrete CLRP (cdCLRP) and the standard discrete CLRP (sdCLRP). A new method called the two-phased proportional regret ordering based unconstrained to constrained (PROBUC) method is also proposed to create capacitated clusters.

The focus falls on finding effective non-exponential time algorithms that can be used to solve large-scale problems with good results. A full set of results for each problem are presented and comparisons are made with known results from the literature where possible.

The PLRP (periodic location-routing problem) introduced by Prodhon and Prins (2008), is also investigated. A change in the current problem formulation, as provided by Prodhon (2011), is proposed to enforce single-source constraints across time horizon and limit the maximum number of vehicles.

An approach to solve the PLRP, based on the cluster-based approaches to solve the discrete CLRPs, is suggested. The results of the cluster-based approach are compared to best-known solutions for existing PLRP instances given by Prodhon (2009a). A set of large scale PLRP instances are introduced, based on instances generated by Harks et al. (2013) for the sdCLRP.