

Vehicle routing problem with scheduled lines, parcel lockers, and crowd shippers

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Abstract. Since city logistics systems and public transportation systems co-exist in urban areas in many parts of the world, including Taiwan, this research incorporates mass rapid transit (MRT) into the city logistics system of this study. MRT moves some parcels from terminal stations to other MRT stations near the destinations of the parcels and then places them in parcel lockers at those stations. Due to the rise of the sharing economy in recent years, we also consider integrating crowdsourcing into the city logistics system. The resulting optimization problem is called the vehicle routing problem with scheduled lines, parcel lockers, and crowd shippers (VRP-SL-PL-CS). In this problem we utilize a network consisting of a single depot, a set of customers, a set of MRT stations that can be further categorized as regular stations where parcel lockers are installed, terminal stations that serve as transfer points of parcels, a set of crowd shippers, and a set of regular vehicles of the logistics service provider. Customers can choose to pick up their goods at a parcel locker by themselves or receive the parcels by home delivery. We develop a mathematical programming model for VRP-SL-PL-CS and then solve the model by CPLEX. Computational analysis shows that our model is able to obtain optimal solutions to small VRP-SL-PL-CS instances.

Keywords: Vehicle Routing Problem, City Logistics, Crowd Shipper, Public Transit, Parcel Locker