

Pricing Models for Maximizing Profit from Delivery Route Based Services

Joseph Geunes¹, Zuo-Jun Max Shen², Akin Emir³

Abstract

Classical vehicle routing problems typically do not consider the impact of delivery price on the demand for delivery services. Existing models seek the minimum sum of tour lengths in order to serve the demands of a given set of customers. This paper takes a different approach by allowing a delivery service provider's demand for delivery services to depend on delivery price. Our objective is to maximize profit from delivery service, where price determines demand for deliveries as well as the total revenue generated by satisfying demand. We consider a variant of the model in which each customer's delivery volume is price sensitive, as well as the case in which customer delivery volumes are fixed, but the total number of customers who select the delivery service provider is price sensitive. A third model variant allows the delivery service provider to select a subset of delivery requests at the offered price in order to maximize profit.

Keywords: Revenue Management, Pricing, Vehicle Routing Problem.

1. Introduction and Literature Review

Past research on the well-known vehicle routing problem (VRP) has typically focused on finding the minimum total distance required by a set of capacity-constrained vehicles for serving a fixed set of customers, each with some predetermined demand volume (see, e.g., Toth and Vigo 2002). Recent trends towards outsourcing the transportation logistics function have led to increased competition for delivery services, and have led third-party logistics (3PL) firms to compete increasingly on service level and price (see, e.g., Newman, Yano, and Kaminsky 2005). Little past research exists, however, that considers the effects of delivery prices on the demand for delivery services. Our goal in this paper is to consider delivery pricing strategies that

¹ Dept of Industrial and Systems Engineering, University of Florida.

² Corresponding author. Email: shen@ieor.berkeley.edu. Dept. of Industrial Engineering and Operations Research, University of California, Berkeley.

³ Merck and Co., Inc. West Point, PA.