International Journal of Innovative
Computing, Information and Control
Volume **5**, Number **8**, August **2009**

 ISSN 1349-4198
pp. 2427–2438

DISRUPTION MANAGEMENT FOR VEHICLE ROUTING PROBLEM WITH THE REQUEST CHANGES OF CUSTOMERS

Xuping Wang, Chuanlei Xu and Deli Yang

Institute of Systems Engineering
Dalian University of Technology
Dalian, 116023, P. R. China
wxp@dlut.edu.cn; xclec@163.com; somdyang@dlut.edu.cn

Received May 2008; revised October 2008

Abstract. *To tackle the disruption caused by the requests of the customers in the logistics, the disruption recovery solution is given based on the theory of disruption management. The transformation method for the disruption recovery of the vehicle routing problem is proposed on the basis of single depot, and the disruption recovery strategies and the methods of deviation measurement are given, which is the basis of the disruption management modeling for the vehicle routing problem. For the disruption management of vehicle routing problem with the request changes of customers, the disruption is illustrated, the disruption management model is constructed, and the normalization processing for the model is given, making the model compatible with VRPTW. On the basis of the characteristic of model, the chromosome code based on customer is ameliorated; according to the disruption management, the genetic algorithm is designed. A representative result and the analysis are given in this paper, and the experiment indicates the validity of the model and algorithm.*

Keywords: Disruption management, Disruption recovery, Vehicle routing problem, Request changes of customers, Genetic algorithm

1. **Introduction.** Sorts of disruptions usually occur in logistics scheduling, e.g., road interruptions because of weather, disabled vehicles and spilled cargoes caused by traffic accidents. Not only original distribution planning may be broken down, but also economic loss and social impact are inevitable. Therefore, it is a meaningful and valuable study of disruption management in logistics scheduling. On the background that frequent disruptions occur in the logistics, there is a kind of disruption, which is caused by the request changes of customers, such as, new requests by the new customers, requests cancelling, service in advance/lingeringly and demand changes. As they occur, not only the disrupted customers can not be serviced according to the plan, but also the customers in succession to them are affected. In practice, the logistics enterprisers must make the adjustment plan quickly, to correspond with request changes of customers, minimizing increased cost under the premise of the least disruption on the original.

As we all know, vehicle routing problem with time windows (VRPTW) is NP-Hard problem, and the above problem is VRPTW problem with changes of customers' time windows, location, and demand, which should be solved quickly. At present, the classic optimization methods dealing with disruptions are stochastic vehicle routing problem and robust optimization. Stochastic vehicle routing problem [1] randomizes the variable factors and seeks the optimal plan on average. Considering all cases that may occur in future, robust optimization [2] seeks the optimal plan for the most cases, and even the worst case. Because of the dependence on statistics of historical data and the forecast for the probability of future cases, the plan by these two methods is far away from the