

# Vehicle routing optimization with multiple fuzzy time windows based on improved wolf pack algorithm

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## ABSTRACT

The vehicle routing problem with multiple fuzzy time windows is investigated in this paper. The dynamic change of traffic flow and the fuzzy time window of customers are considered. A multi fuzzy time window vehicle routing model based on time-varying traffic flow is proposed, and the objective function is to minimize the total cost of distribution and maximize customer satisfaction. According to the basic principle of wolf pack algorithm, in order to promote the exchange of information between the artificial wolves, improve the wolves' grasp of the global information and enhance the exploring ability of wolves, a drift operator and wave operator were introduced into scouting behaviors and summing behaviors. An adaptive dynamic adjustment factor strategy was proposed for beleaguering behaviors, the exploitation ability of the algorithm strengthened constantly. Thus the convergence rate of algorithm was enhanced. We further do simulation on an example, and compare the results obtained by wolf pack algorithm and ant genetic algorithm. The results show that use improved wolf pack algorithm to solve vehicle routing problem with multiple fuzzy time windows has the advantages of small number of iterations and high efficiency, it can converge to the global optimal solution in a short time. The improved wolf pack algorithm is an efficient algorithm for solving vehicle routing problem with multiple fuzzy time windows.

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## ARTICLE INFO

### Keywords:

Vehicle routing  
Traffic flow  
Multi fuzzy time windows  
Wolf pack algorithm  
Customer satisfaction

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### Article history:

Received 3 July 2017  
Revised 12 October 2017  
Accepted 8 November 2017

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