A hub location model in air transportation considering queuing networks

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ABSTRACT

Hub location problem is the class of network design problems. This problem are discussed when the flow rate is required to be transported between points of origin and destination, but direct communication between all points is very costly or impossible. The hub location problem is, locating the hubs and allocation of origin and destination points to hubs. In this study, a hub and spoke network is designed for air transportation, where the sum of the travel times and waiting times at hubs is considered simultaneously. To calculate the waiting time at hubs, each hub is considered as open Jackson network, including four components of M/M/c queuing systems, consisting; landing, unloading areas, loading areas and take off. Flow passing through each hub are separated to input and output flows from them. Optimum arrival rate to each hub and then the average waiting time at each hub is done with the location of hubs and allocation non-hub simultaneously. The proposed model is a mixed integer nonlinear programming. Due to the complexity of the model, the exact solution will be found a long time, so metaheuristic methods including genetic and particle swarm optimization algorithms are used to solve proposed model.

KEYWORDS

Hub location, Mixed integer nonlinear programming, Queuing Jackson network, Genetic and Particle swarm optimization algorithms