Emergency Goods Distribution Model over Finite Time Interval using Genetic Algorithm

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Whenever disasters take place, it is literally difficult to design a strategy for goods distribution. It is believed that the effective strategy should yields equality, where disaster victims receive the same proportion of cumulative goods according to their cumulative demand. To explore such a strategy, an optimization model for equality emergency goods distribution is established. The objective of this model is to investigate an equality distribution strategy over finite-time interval. The constraints of the model, such as (a) demand of victims, which is linearly increasing, (b) quality and quantity of emergency goods, and (c) structure of disaster area, are considered. In this model, transportation routes are defined as a shortest path tree of graph representing disaster area. The model is flexible enough to handle insertion/deletion of edge/node as well as dynamic demand. Genetic Algorithm (GA) is applied to optimize the parameters of this model. In this GA, chromosomes represent distribution strategies. Hence, unlike traditional GA, the length of chromosomes in this work can vary in the considered time interval. To handle this problem, the chromosome encoding system with dynamic chromosome length is introduced, and the detailed description of basic implementation steps for the algorithm is given. The finding shows that GA and dynamic length chromosome encoding system are suitable for solving the emergency goods distribution over finite-time interval problems.