AN OPTIMIZATION PATH PROBLEM ON A NETWORK : A REVIEW

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Abstract

Many practical problems arising in real life situations can be formulated as network models. The shortest path in a network plays an important role for analyzing the network model. It has wide applications in communication, transportation and electronics systems. Network optimization is a very popular and an applied field in applied operation research. This paper reviews and highlights by presenting different gateways and different aspects of finding the shortest path in the network that are found in the literature.

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1 Introduction

A network is a connected graph. Many practical problems arising in real life situations can be formulated as network models partic-
ularly in communication system, transportation system, gas production and distribution system and supply chain network. In a network model, two things are to be considered as more important that is, representation or construction and analysis of the network. In general, a network model can be analyzed by using the concepts of graph theory and optimization theory. Many real-life situations dealing with network models require the computation of the best or the shortest path from one node to another node and they are called the shortest path (SP) problem of the network. Computing the shortest path plays an important role in all the network systems. The objectives used in determining the shortest path in such networks may be one or more. When an SP problem in a network has only one objective, it is called a single objective SP problem. If it has more than one objective, it is known as a multiple objective SP problem.

The SP problem concentrates on finding the path with minimum distance. The algorithms (Bellman [1], Dijkstra [5] and Dreyfus[6]) are referred to as the standard shortest path algorithms. To find the shortest path from a source node to the other nodes is a fundamental matter in real-life situations. In real-life situations, there is possible to get uncertainty instead of crisp about the parameters in the network. In such cases, the parameters are represented by fuzzy sets/numbers which was introduced by Zadeh [51].

2 Review of literature on shortest path problems

In this section, several algorithms developed by various researchers in the area of solving SP problem in the network have been summarized.

Orden[41] solved the SP problem using transshipment problem. Bellman [1] and Dijkstra [5] studied SP problems in the weighted network. The authors (Minty [30], Moore [34], Floyd [9], Nicholson [38], Dreyfus [6], Johnson [15] and Pape [44]) developed various algorithms for solving SP problems. The fuzzy SP problem was first studied by Dubois and Prade [7] using crisp algorithms. For solving multi-objective SP problems, the authors (Climaco and Martins [3], Loui [23], Henig [13], Martins [27] and Mohideen and Rajesh

3 Conclusion

The SP problem is a classical and important network optimization problem in real life situations. The shortest path, the minimum path and its length of an sp problem are the main and important information for the decision makers to take appropriate decision suitably.
and properly. This review paper will act as a tool to motivate all researchers who are working or will be working in the field of network optimization.

References


