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Applied AI for International Business and Marketing Applications

Handbook of Research on Applied AI for International Business and Marketing Applications

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Chapter 15
Finding the Solution of Balanced and Unbalanced Intuitionistic Fuzzy Transportation Problems by Using Different Methods With Some Software Packages

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ABSTRACT

In this chapter, two different methodologies are proposed to find out the optimal solution to the balanced and unbalanced intuitionistic fuzzy transportation problems (UBIFTPs). In addition, the parameter of both the balanced and UBIFTPs are considered to be triangular intuitionistic fuzzy numbers (TIFNs). Two new methodologies, respectively method-1 and method-2, are presented in this chapter. Proposed method-1 is based on linear programming technique, and proposed method-2 is based on modified distribution method. Both the methodologies are used to solve the balanced and UBIFTPs. The ideas of the proposed methodologies are illustrated with the help of real-life numerical examples. The solutions obtained by the proposed methodologies are checked with some software (e.g., MATLAB, LINGO) and the computer code related to the proposed problems is also given. The unique results, comparative study, discussions, and the merits of the proposed methodologies are all given. At the end of the chapter, future work is mentioned.

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INTRODUCTION OF CLASSICAL TRANSPORTATION PROBLEM

In several real-life situations, there is a need to transport the homogeneous items/materials from various sources (factories) to different destinations (storage centres/retail stores) and the aim of the decision-makers (DMs) is to find how much quantity of the materials from which source to which destination should be supplied so that all the supply points are fully used and demand of all the destinations is fulfilled as well as total transportation cost is minimum/total transportation profit is maximum.

The TP plays a vital role in logistics and supply chain management for reducing cost and improving services. In today's highly competitive market, the pressure on organizations to find better ways to create and deliver items and services to customers becomes more strong. How and when to send the items to the customers in the quantities which they want in a cost-effective manner becomes more challenging one. The transportation model provides a powerful framework to meet this challenge. They ensure the efficient movement and timely availability of raw materials and finished goods.

Resource allocation is used to assign the available/existing resources in an economic way. When the resources to be allocated are scarce, a well-planned action is necessary for a decision-maker (DM) to attain the optimal utility. If the supplying sources and the receiving agents are finite, the best pattern of the allocation to get the minimum cost or the best plan with the maximum profit, whichever may be applicable to the problem, is to be found out. Those classes of problems are referred to as 'allocation problems' and are divided into two categories, namely:

- transportation problems (TPs) and
- assignment problems.

This type of allocation problems is studied in optimization or applied operations research.

During world war-II, Britain was having very limited military resources; therefore, there was an urgent need to allocate resources to the various military operations and to the activities within each operation in an effective manner. Therefore, the British military executives called upon a team of scientist to apply scientific approach to study the strategic and tactical problems related to air and land defence of the country. As the team was dealing with research of military operations, the work of this team of scientists was called as 'Operations Research'.

The TP is one of the subclasses of linear programming problem (LPP). The objective of the TP is to transport various quantities of a single homogeneous products/items that are initially stored at various origins, to different destinations in such a way that the total transportation profit is maximum for a maximization problem and the total transportation cost is minimum for a minimization problem.

The conventional TP deals with the transportation a certain commodity from each of *m* origins ($i = 1, 2, 3, \ldots..m$) to any of *n* destinations ($j = 1, 2, 3, \ldots..n$). The origins are factories with respect capacities $a_1, a_2, a_3, \ldots, a_m$ and the destinations are warehouses with required levels of demands $b_1, b_2, b_3, \ldots, b_n$. For the transport of a unit of the given commodity from the ith source/origin to the jth destination a cost c_{ij} is assigned with $c_{ij} \geq 0,$ for all i, j. Hence, one must determine the amounts y_{ij} to be transported from all the sources ($a_1, a_2, a_3, \ldots, a_m$) to all the destinations $(b_1, b_2, b_3, \ldots, b_n)$ in such a way that the total cost is minimized.

The conventional TP can be mathematically modeled as given below:-

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raised by the reviewers. The authors have been implemented all of the reviewers recommendations in their final book chapter. Also, this book chapter is a double-blind peer reviewed. So, these things all are strengthening this book chapter.

The author's view is, 'every book chapter printed on a paper is not a good book chapter but any book chapter printed on a paper if it is used to solve the public problems then it is called a good book chapter'. Hence, the author has solved social problems in this book chapter. So, as said above, this book chapter considered as a good book chapter. The author very hopefully this book chapter will be helpful for the academicians, business executives, practitioners, and PhD students (research scholars) after its publication.

FUTURE WORK

The author has planned to solve the proposed problems in this chapter by using the python programming software. Since, Python programming language is an easily readable language. The author would like to solve the non-linear optimization problems by using IFNs. His main aim is to solve the general issues of the people by using intuitionistic fuzzy sets. Further, he would like to develop the new algorithm for solving non-linear optimization problems under uncertain environment. In the near future, the proposed methodologies may be modified to solve IFSTPs, MIFSTPs, IFSAPs, MIFSAPs and so forth.

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