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OFSTF Method- An Optimal Solution for Transportation Problem

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Abstract

In this paper a different approach OFSTF (Origin, First, Second, Third, and Fourth quadrants) Method is applied for finding a feasible solution for transportation problems directly. The proposed method is a unique, it gives always feasible (may be optimal for some extant) solution without disturbance of degeneracy condition. This method takes least iterations to reach optimality. A numerical example is solved to check the validity of the proposed method and degeneracy problem is also discussed.

Keywords: Assignment Problem, Degeneracy, Pay Off Matrix (POM), Quadrants, Transportation Problem

1. Introduction

An important part of logistics management is established by the transportation problem.Furthermore, logistics problems minus commodities shipmentmight be framed as problems of transportation. For example, the decision problem on lessening dead kilometers[11] may be formulated as a transportation problem[18,20]. Since dead kilometres is equal to extra losses, the problem is significant in urban transport tasks. In addition, it is likely to approximate specific additional linear programming problems through applying a transportation formulation[4].

In order to solve the transportation problem for obtaining an optimal solution, diffrerent methods are accessible. Among different methods, the representative/ eminent transportation methods there are the following: "the stepping stone method"[2], "the modified distribution method"[3], "the modified stepping-stone method"[16], "the simplex-type algorithm"[1] and "the dual-matrix approach"[9]. A comprehensive computational comparison of basic solution algorithms to solve the transportation problems has been proposed by Glover et al.[6]. Additionally, a systematic approach to handle the degeneracy situation taken place in the stepping stone method was suggested by Shafaat and Goyal[14].

There has not existed a thorough review of literature about the main solution methods. For obtaining the ideal solution, an original basic viable solution is necessary for all the ideal solution algorithms to solve transportation problems. There exist different experiential methods accessible for obtaining an original basic viable solution, for instance: "North West Corner" rule, "Best Cell Method," "VAM — Vogel's Approximation Method"[13], "Shimshak*eta*/.'sa version of VAM"[17], "Coyal's version of VAM"[7], "Ramakrishnan's version of VAM"[12] etc. Additionally, to obtain an original basic viable solution for the problem of transportation, Kirca and Satir[10] improved a heuristic solution, termed TOM (Total Opportunity-cost Method), Gass[5] described the applied issues to solve transportation problems and proposed comments about different features of methodologies of transportation problem together with discussions on the computational results, by the particular researchers.

Lately, in order to obtain the first good solutions for dual based approaches which are applied to solve transportation problems, Shajma and Sharma[15] suggested

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a new heuristic approach. Even in the above method needs more iteration to arrive optimal solution. Hence the proposed method helps to get directly optimal solution with less iteration. The proposed method is given below.

2. Transport Problem through OFSTF (Origin, First, Second, Third, and Fourth quadrants) Method

We now introduce a new method called the Transport Problem through OFSTF method for finding a feasible solution to a transportation problem. The OFSTF method proceeds as follows.

Step1

Construct the Transportation Table (TT) for the given Pay Off Matrix (POM).

Step 2

Choose the maximum and minimum element in the constructed Transportation Table (TT).

Step 3

Find the difference between the maximum and minimum element from Step 2.

If the Resultant Element (RE) matched with anyone of the element in the POM, then find the difference between each element in the Transportation Table (TT) with the Resultant Element (RE). That is,

Maximum Element – Minimum Element = R.E

If R.E = an element in TT

Every element in TT – R.E.

If, R.E ≠ an element in TT

select next minimum element in TT and repeat the Step 2.3.1.

Repeat the process until the condition satisfied.

Step 4

In the Reduced POM, there will be at least one zero in the TT, select a particular zero based on the maximum deviation element from the given zeros.

Step 5

Case 1

Fix zero as origin, and find the maximum deviated element from the selected zero.

Case 2

Fix zero as origin, and find the maximum deviated element in the first quadrant (+, +) from the selected zero.

Case 3

Fix zero as origin, and find the maximum deviated element in the second quadrant (-, +) from the selected zero

Case 4

Fix zero as origin, and find the maximum deviated element in the Third quadrant (-, -) from the selected zero.

Case 5

Fix zero as origin, and find the maximum deviated element in the fourth quadrant (+, -) from the selected zero.

Step 6

Compare and fulfil the demand of the maximum deviated element with the supply in the TT.

Step 7

Calculate the total cost for each cases, the feasible solution is obtained in the origin area for all kind of transportation Problem.

Hence we say that in transportation problem, calculating the cost from origin will lead to a feasible solution by our OFSTF.

3. Numerical Example

Consider the following cost minimizing transportation problems.

	D_1	D_2	D_3	D_4	Supply
S_1	3	1	7	4	300
S_2	2	6	5	9	400
S_3	8	3	3	2	500
Demand	250	350	400	200	1200

Now Using the OFSTF method, total cost in origin = 2850, total cost in first quadrant = 3800, total cost in second quadrant = 2900, total cost in third quadrant = 4850, total cost in fourth quadrant = 4150.

The optimal solution is in origin's total cost = 2850 which satisfied our proposed method.

4. Conclusion and Future Work

Thus the OFSTF method provides a feasible value of the objective function for the transportation problem. The proposed algorithm carries systematic procedure, and very easy to understand. It can be extended to assignment problem and travelling salesman problems to get optimal solution. The proposed method is important tool for the decision makers when they are handling various types of logistic problems, to make the decision optimally.

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