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An Effective Methodology for Solving Transportation Problem

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Abstract: *The general transportation problem (TP) is concerned with determining an optimal strategy for distributing a group of supply centers, such as factories to various receiving centers, in such a way as to minimize the cost and time. In this paper, we are trying to find the optimum solution of a transportation problem and is to minimize the cost. The most attractive feature of this method is that it requires very simple arithmetical and logical calculation, which compared to the existing method and illustrated with numerical example. It can be seen that the proposed algorithm gives an optimal solution nearly comparable to MODI method in less time period.*

Keywords: *Transportation problem, Minimization costs, Sources, Demand, Proposed Method.*

1. INTRODUCTION

A transportation problem is one of the earliest and most important applications of linear programming problem. Which can be applied for different sources f supply to different destination of demand in such a way that the total transportation cost should be minimized. Usually, the initial basic feasible solution of any transportation problem is obtained by using well known methods such as North West Corner Method or Least-Cost Method or Vogel's Approximation Method, and then finally the optimality of the given transportation problem is checked by MODI.

Afterwards many researchers provide many methods to solve transportation problem. Some of the important related works the current research has deal with are: 'Modified Vogel's Approximation Method for Unbalance Transportation Problem', [2] by N. Balakrishnan. 'An Improved Vogel's Approximation method [5] by Serder Korukogu and Serkan Balli., 'A new approach for find an Optimal Solution for Transportation Problems', [8] by Sudhakar VJ et.al, A New Approach to Solve A Transportation Problem[9] by. S. Saranya et.al.

In last few year S. Rekha, et.al.[7], M.Wali Ullah et.al [1] and S.M. Abul Kalam [6], N. M. Deshmukh [3], . Prof. Reena. G. Patel et. al.[4]developed the method is very helpful as having less computations and also required the short time of period for getting the optimal solution.

In this paper we introduce Method for solving transportation problem which is very simple, easy to understand and helpful for decision making and it gives minimum solution of transportation problem. The method developed here ensures a solution which is very closer to the optimal solution.

2. ALGORITHM OF PROPOSED METHOD

Step 1:- Examine whether the transportation problem is balanced or not. If it is balanced then go to next step.

Step 2:- Find the smallest cost from each row and subtract the smallest cost from each element of the row

Step 3 Find the smallest cost from each column and subtract the smallest cost from each element of the column

Step 4:- Find the difference between minimum and next minimum in each row or column which is called as row penalty and column penalty and write it in the side and bottom

Step 5 From that select the maximum value. From the selected row/column we need to allocate the minimum of supply/demand in the minimum element of the row or column. Eliminate by deleting the columns or rows corresponding to where the supply or demand is satisfied.

Step 6:- Repeating the step 4 to step 5 until satisfaction of all the supply and demand is met.

Step 7:-Now total minimum cost is calculated as sum of the product of cost and corresponding allocate value of supply/demand.

3. NUMERICAL EXAMPLE

Example 3.1. Illustrate

Table 1

	D_1	D_2	D_3	Supply
S_1	0	2	1	6
S_2	2	1	5	7
S_3	2	4	3	7
Demand	5	5	10	

Solution :Step 1 Since $\Sigma a_i = \Sigma b_j = 20$

Step 2:-Find the smallest cost from each row and subtract the smallest cost from each element of the row

Table 2

	D_1	D_2	D_3	Supply
S_1	0	2	1	6
S_2	1	0	4	7
S_3	0	2	1	7
Demand	5	5	10	

Step 3 Find the smallest cost from each column and subtract the smallest cost from each element of the column

Table 3

	D_1	D_2	D_3	Supply
S_1	0	2	0	6
S_2	1	0	3	7
S_3	0	2	0	7
Demand	5	5	10	

Step 4 Find the difference between minimum and next minimum in each row or column

Table 4

	D_1	D_2	D_3	Supply	Row Penalty
S_1	[3] 0	2	[3] 0	6	(0) (0) (0)
S_2	[2] 1	[5] 0	3	7	(1) (2)
S_3	0	2	[7] 0	7	(0) (0) (0)
Demand	5	5	10		
Column Penalty	(0) (0) (0)	(2)	(0) (0) (0)		

Therefore, the allocation in the original TT is

Table 5

	D_1	D_2	D_3	Supply
S_1	[3] 0	2	[3] 1	6
S_2	2	[5]		7

	2	1	5	
S_3	2	4	7 3	7
Demand	5	5	10	

The transportation cost is: Z = 3*0 + 1*3 + 2*2 + 1*5 +3*7 = 33/-

Example 3.2. Illustrate

Table 6

	D_1	D_2	D_3	D_4	Supply
S_1	13	25	12	21	18
S_2	18	23	14	9	27
S_3	23	15	12	16	21
Demand	14	12	23	17	

Solution :Step 1 Since $\Sigma a_i = \Sigma b_j = 66$

Step 2:-Find the smallest cost from each row and subtract the smallest cost from each element of the row

Table 7

	D_1	D_2	D_3	D_4	Supply
S_1	1	13	0	9	18
S_2	9	14	5	0	27
S_3	11	3	0	4	21
Demand	14	12	23	17	

Step 3 Find the smallest cost from each column and subtract the smallest cost from each element of the column

Table 8

	D_1	D_2	D_3	D_4	Supply
S_1	0	10	0	9	18
S_2	8	11	5	0	27
S_3	10	0	0	4	21
Demand	14	12	23	17	

Step 4

Table 9

	D_1	D_2	D_3	D_4	Supply	Row Penalty
S_1	14 0	10	4 0	9	18	(0) (0) (9)
S_2	8	11	10 5	17 0	27	(5) (5) (5) (5)
S_3	10	12 0	9 0	4	21	(0) (4) (4) (4)
Demand	14	12	23	17		
Column Penalty	(8) (8)	(10) - - -	(0) (0) (0) (5)	(4) (4) (4) (4)		

Therefore, the allocation in the original TT is

Table 10

	D_1	D_2	D_3	D_4	Supply
S_1	14 13	25	4 12	21	18
S_2	18	23	10 14	17 9	27
S_3		12	9		21

	23	15	12	16	
Demand	14	12	23	17	

The transportation cost is: Z = 14*13 + 4*12 + 10*14 + 17*9 + 12* 15 + 9*12 = 811/-

Comparison of the numerical results:-

Comparison of the numerical results which are obtain from the example is shown in the following table

Table 11

Method	Example 3.1	Example 3.2
Proposed Method	33	811
NWCM	42	1052
LCM	37	881
VAM	37	811
MODI	33	811

4. CONCLUSION

The proposed method is an attractive method which is very simple, easy to understand and gives result exactly or even lesser to VAM method. All necessary qualities of being time efficient, easy applicability etc., forms the core of being implemented successfully.

Also in this paper we have described the comparison between the transportation methods (Table: 11) and the proposed Method also the solution is same as that MODI'S method.

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