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A New Method for the Optimum Solution of a Transportation Problem

Research Article

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Abstract: In Linear programming, the transportation problem is a special class of model. It deals with the situation in which commodity from several sources is shipped to different destination with the main objective to minimize the total shipping cost. In this paper, we are trying to find the optimum solution of a transportation problem using the method. we are presenting the algorithm for the above method by using statistical tool called Arithmetic Mean.

MSC: 90C08.

Keywords: Transportation, Basic feasible solution, Arithmetic Mean, optimal solution.

1. Introduction

A transportation problem is one of the earliest and most important applications of linear programming problem. It was first studied by F.L. Hitchcock in 1941 [5], then separately by T.C. Koopmans in 1947, and finally placed in framework of linear programming and solved by simplex method by G.B. Dantzing in 1951 [4]. The Simplex method is not suitable for the Transportation problem especially for large scale transportation problem due to its special structure of model in 1954 charnes and cooper [3] was developed Stepping Stone method.

In last few year Abdual Quddoos et.al [2] and sudhaker et.al [10] proposed two different methods in 2012 respectively, for finding an optimal solution. Reena G. Patel et. al [7, 8] and A. Amaravathy et.al [1] developed the method is very helpful as having less computations and also required the short time of period for getting the optimal solution.

Besides the covenantal methods many researchers has provide many method a better of a transportation problem. Some of the important related works the current research has deal with are: 'Transportation Problem using Stepping Stone Method and its Application' [9] by Urvashikumari D. Patel et.al. An alternative method to north west corner method for solving transportation problem which is totally new concept [6] by Neetu M. Sharma et.al .

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. In statistical, measures of central tendency play a vital role in explaining the nature of the distribution. Arithmetic mean of a series is the number obtained by dividing the total values of various items by their number.

A.M. = sum of all the observations / number of observations

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2. Algorithm for 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 Arithmetic Mean for each Row as well as column and find the one with maximum value.

Step 3 : Compare the minimum of supply or demand whichever is minimum then allocate the min (supply or demand) at the place of minimum value of related row or column.

Step 4 : Repeat Step 2 and Step 3 unless and until all the demands are satisfied and all the supplies are exhausted.

Step 5 : 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*

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	18	14	

Solution. Since $\sum a_i = \sum b_j = 34$. The given transportation problem is balanced; therefore exist a basic feasible solution to Proposed Method problem.

	D_1	D_2	D_3	D_4	Supply				
S_1	19 / 5	30	50	10 / 2	7, 2	(27.25)	(19.67)	(19.67)	(20)
S_2	70	30 / 2	40 / 7	60	9, 2	(50)	(53.3)	-	-
S_3	40	8 / 6	70	20 / 12	18	(34.5)	(22.67)	(22.67)	(14)
Demand	5	8 6	7	14 12					
	(43)	(22.67)	(53.3)	(30)					
	(43)	(22.67)	-	(30)					
	(29.5)	(19)	-	(15)					
	-	(19)	-	(15)					

The transportation cost is:

$$Z = 19 * 5 + 10 * 2 + 30 * 2 + 8 * 6 + 40 * 7 + 20 * 12 = 743/-$$

□

Example 3.2. *Illustrate*

	D_1	D_2	D_3	Supply
S_1	3	3	5	9
S_2	6	5	4	8
S_3	6	10	7	10
Demand	7	12	8	

	D_1	D_2	D_3	Supply			
S_1	3	3 / 9	5	9	(3.6)	(4)	(4)
S_2	6	5 / 3	4 / 5	8,3	(5)	(4.5)	(4.5)
S_3	6 / 7	10	7 / 3	10,3	(7.6)	(8.5)	-
Demand	7	12 3	8 5				
	(5)	(6)	(5.3)				
	-	(6)	(5.3)				
	-	(4)	(4.5)				

Solution. Since $\sum a_i = \sum b_j = 27$. The given transportation problem is balanced; therefore exist a basic feasible solution to Proposed Method problem.

The transportation cost is:

$$Z = 9 * 3 + 3 * 5 + 5 * 4 + 7 * 6 + 3 * 7 = 125/-$$

□

3.1. Comparison of the Numerical Results

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

Method	**Example 3.1**	**Example 3.2**
Proposed Method	743	125
North West Corner Rule	1015	143
Matrix Minima Method	814	159
VAM	779	143
MODI-Method	743	125

4. Conclusion

In this paper, we developed the algorithm is very helpful as having less computation and getting the optimal solution. Also in this paper we have described the comparison between the transportation methods and the Proposed Method also the solution is same as that MODI'S method. The Proposed Method is important tool for the decision makers when they are handling various types of logistic problems.

References

[1] A. Amaravathy, K.Thiagarajan and S.Vimala, *MDMA Method-An Optimal Solution for Transportation Problem*, Middle-East Journal of Scientific Research, 24(12)(2016), 3706-3710.

[2] Abdual Quddoos, Shakeel Javaid and M.M.Khalid, *A New Method for Finding an Optimal Solution for Transportation Problems*, International Journal on Computer Science and Engineering, 4(7)(2012), 1271-1274.

[3] Charnes and Cooper, *The Stepping-Stone method for explaining linear programming, Calculation in transportation problems*, Management Science, 1(1)(1954), 49-69.

[4] G.B.Dantzig, *Application of the simplex method to a transportation problem*, Activity Analysis of production and allocation, (T.C. Koopmans ed.), Wiley, New York, (1951), 359-373.

[5] F.L.Hitchcock, *The distribution of a product from several sources to Numerous localities*, Journal Of Mathematical Physics, 20(1941), 224-230.

[6] Neetu M.Sharma and Ashok P.Bhadane, *An alternative method to north west corner method for solving transportation problem*, International Journal for Research in Engineering Application & Management, 1(12)(2016), 1-3.

[7] Reena G.Patel and P.H.Bhathawala, *The Advance Method for the Optimum Solution of a Transportation Problem*, International Journal of Science and Research, 6(14)(2015), 703-705.

[8] Reena G.Patel and P.H.Bhathawala, *An Innovative Approach to Optimum Solution of a Transportation Problem*, International Journal of Innovative Research in Science, Engineering Technology, 5(4)(2016), 5695-5700.

[9] Urvashikumari D.Patel, Dhavalkumar H.Patel and Ravi C.Bhavsar, *Transportation Problem Using Stepping Stone Method and its Application*, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 6(1)(2017), 46-50.

[10] V.J.Sudhakar, N.Arunnsankar and T.Karpagam, *A new approach for find an Optimal Solution for Transportation Problems*, European Journal of Scientific Research, 68(2)(2012), 254-257.