A STUDY ON ALLOCATION METHODS TO SOLVE TRANSPORTATION PROBLEMS

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ABSTRACT :

In transportation problem the main requirement is to find the initial basic feasible solution for the transportation problem. The objective of the transportation problem is to minimize the cost. In this paper, a new algorithm (i.e.) "ALLOCATION TABLE METHOD"(ATM) which is proposed to find an initial basic feasible solution for the transportation problem. This method is illustrated with numerical examples.

KEYWORD:

Transportation problem, Minimum odd cost, transportation table, allocation table.

INTRODUCTION TRANSPORTATION PROBLEM:

Special type of linear programming problem is known as Transportation problem (TP). These kind of problems makes us to decide the minimum charge of transporting goods from one place to another. It plays a vital role in logistics. There are several methods for finding an initial basic feasible solution like North West Corner Rule (NWCR), Least Cost Method (LCM), Vogel's Approximation Method(VAM) and to find the optimality we are using the method MODI. In this paper we are introducing a new method for finding an Initial Basic Feasible Solution. Two numerical examples are provided to prove the claim with stepwise procedure of this new method.

Themethodnamecalled"ALLOCATIONTABLEMETHOD"(ATM)introducedbyMollah

Mesbahuddin Ahmed, Aminur Rahman Khan, Md.Sharif Uddin, Faruque

Ahmed[4]in2016,whichgivesthebetterinitialbasic feasible solution is presented.

1. ALLOCATION TABLE METHOD

INTRODUCTION:

Finding an initial basic feasible is the prime requirement to obtain an optimal solution for the transportation problems. In this chapter a new method called "**ALLOCATION TABLE METHOD**" (ATM) is introduced by Mollah Mesbahuddin Ahmed, Aminur Rahman Khan, Md.Sharif Uddin, Faruque Ahmed [1] in 2016. In this method an Allocation Table is formed to find the solution for the transportation problem.

Algorithm for "ALLOCATION TABLE METHOD" is given below:

- **Step 1:** Construct a Transportation Table (TT) from the given transportation problem.
- **Step2:** Check whether the given transportation problem is balanced or not, if not make it balanced.
- **Step3:** Select Minimum Odd Cost (MOC)from the transportation table.

If there is no odd cost in TT, keep on dividing all the cost cells by two till obtaining at least one odd value in the cost cells.

- **Step4:**Usingstep-3, form a new table which is called "ALLOCATION TABLE" (AT). Subtract selected minimum odd cost only from each of the odd cost value from the TT. Now all the cell values are called "ALLOCATION CELL VALUE" (ACV).
- **Step 5:** Start the allocation from minimum of supply/demand. Allocate this minimum of supply/demand in the place of minimum odd value in the Allocation Table formed instep-4. If demand is satisfied, delete the column. If it is supply, delete the row.
- **Step 6:** Now identify the minimum ACV and allocate minimum of supply/demand at the place of selected ACV in the AT. In caseof same ACVs, select the ACV where minimum allocation

can be made. Again in caseof same allocations in the ACVs, choose the minimum cost cell which is corresponding to the cost cells of TT formed in step-1. If the cost sells and the allocations are equal, in such case choose the nearer cell to the minimum of supply/demand which is to be allocated. Now if demand is satisfied delete the column and if it is supply delete the row.

- **Step7:** Repeatstep-6 until the demand and supply are exhausted.
- **Step8:** Now transfer this allocation to the original transportation table.
- **Step 9:** Finally calculate the total transportation cost of the TT. This calculation is the sum of the product of cost and corresponding allocated value of the transportation table.

APPLICATION OF ATM:

1. A company manufacturers motor cars and it has three factories F_1, F_2, F_3 whose weekly production capacities are 300, 400 and 500 pieces of cars respectively. The company supplies motor cars to its four showrooms located at D_1, D_2, D_3 and D_4 whose weekly demands are 250, 350, 400 and 200 pieces of cars respectively. The transportation costs per piece of motor cars are given in the transportation table. Find out the schedule of shifting of motor cars from factories to showrooms with minimum cost.

Factories	Showrooms				Production capacity
	D_1	D_2	D_3	D_4	
F_1	3	1	7	4	300
F_2	2	6	5	9	400
F_3	8	3	3	2	500
Demand	250	350	400	200	

SOLUTION:

The given transportation problem is balanced. Because the sum of supplies = the sum of demands = 1200.

	D1	D2	D3	D4	
F_1	3	1	7	4	300
F_2	2	6	5	9	400
F_3	8	3	3	2	500
	250	350	400	200	

In the transportation table"1"is the minimum odd cost value placed in the cell (1,2).

Step1: Subtract"1" from all other odd valued cost cells of the transportation table.

	D_1	D_2	D_3	D_4	
F_1	2	1	6	4	300
F_2	2	6	4	8	400
F_3	8	2	2	2	500
	250	350	400	200	

Step 2: "1" is the minimum odd cost value and from the corresponding supply/demand 300 is minimum. Hence allocate 300 to the cell(1, 2).

	D_1	D_2	D_3	D_4	
F_1	2	300 1	6	4	300
F_2	2	6	4	8	400
F_3	8	2	2	2	500
	250	350 (50)	400	200	

Here the supply F_1 is satisfied, hence the row F_1 is to be exhausted.

Step3: The next minimum cost is "2"whichisplacedinthe cells (2,1), (3,2), (3,3) and (3,4). Among these corresponding supply/demand 50is minimum,

which is allocate to the cell (3,2).

	D_1	D_2	D_3	D_4	
F_2	2	6	4	8	400
F_3	8	50 2	2	2	500 (450)
	250	50	400	200	

Here the demand D_2 is satisfied, hence delete the column D_2.

Step4: Again"2"istheminimum cost placed in the cells(2, 1),(3,3)and(3,4). Among these the corresponding supply/demand"200"is minimum and it is allocate to the cell (3, 4).

	D_1	D_3	D_4	
F_2	2	4	8	400
F_3	8	2	200 2	450 (250)
	250	400	200	

The demand D_4 is satisfied and it is to be exhausted.

Step 5: Again "2" is the minimum in the cells (2, 1) and (3,3). In both of these cells the corresponding minimum supply/demand is 250. But in between these two cells it is found that the minimum cost appears in the cell (2,1) in the given transportation table, so allocate 250 to the cell (2,1).

	D_1	D_3	
F_2	250 2	4	400 (150)
F_3	8	2	250
	250	400	

Here the demand D_1 is satisfied and it is to be exhausted.

Step 6: Here "2" is the minimum cost placed in the cell (3,3) and the corresponding supply/demand250isminimum.Henceit is allocate to the cell (3,3)

	D_3	
F_2	4	150
F_3	250 2	250
	400 (150)	

Here the supply F_3 is satisfies and it is to be exhausted.

Step 7: The last allocation is 150 and it is allocate to the cell (2,3).

	D_3	
F_2	150 4	150
	150	

	D_1	D_2	D_3	D_4	
F_1	3	300 1	7	4	300
F_2	250 2	6	150 5	9	400
F_3	8	50 3	250 3	200 2	500
	250	350	400	200	

Step8: The allocations are transferred to the given transportation table which is shown below.

The transportation cost is

300x1 + 250x2 + 150x5 + 50x3 + 250x3 +200x2 = Rs. 2850.

REFERENCES :

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