Maximum Element Corresponding Minimum Appears In Row Or Column Allotment Method To Appraise Enhanced Groom Pattern

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Abstract: In this article, proposed methodology namely Maximum Element Corresponding Minimum Appears in Row or Column Allotment Method is justified to finalize the feasible solution with respect to minimize the cost from the basic feasible solution set for the transportation problems. The proposed methodology is a distinctive way to gain the feasible (or) may be optimal solution without interrupt the degeneracy condition.

Keywords: Assignment problem, Column, Degeneracy, Maximum, Minimum, Optimizing cost, Pay Off Matrix (POM), Pivot element, Row, Transportation problem

1. Introduction

In logistics and supply chain management sectors using transportation techniques to minimize the cost[1] [2]. Each source has a limited supply (i.e. maximum number of products that can be sent from it) while each destination has a demand to be satisfied (i.e. minimum number of products that need to be shipped to it) [3]. The cost of shipping from a source to a destination is directly proportional to the number of units shipped [8], [9].

In Electronics and Communication branches along with Operations Research methods so many different techniques used to minimize the cost[5], [6], [7].

Some preceding processes have been devised solution system for the transportation problem with precise supply and demand constraintsOptimized methods have been developed for solving the transportation problems and assignment problems when the cost coefficients for the supply and demand quantities are known exactly [4]. In real world applications, the supply and demand quantities in the transportation problem are sometimes hardly specified precisely because of changing the current scenario of their economic status [10].

2. Algorithm:

Maximum Element Corresponding Minimum Appears In Row Or Column Allotment Method (MxECMiROCA)

Step 1 : Construct the Transportation Table (TT) for the given pay off matrix (POM).

Step 2 : Choose the maximum element from given POM.

Step 3 : Supply the demand for the minimum element which lies in the corresponding row or column of the selected maximum element in the Constructed TT (CTT).

Step 4 : Select the next maximum element in Newly CTT (NCTT) and repeat the step 2 & 3 until degeneracy condition fulfilled.

Pivot element cell is highlighted.

Example 1: Consider the following balanced POM, cost for the transportation to be minimized.

	D_1	D_2	D_3	D_4	Supply
S_1	1	2	3	4	6
S_2	4	3	2	0	8
S_3	0	2	2	1	10
Demand	4	6	8	6	24

Table: 1

By using the proposed methodology, we get

Step 1: Here the maximum cost is 4in TT (2, 1) (is a Pivot element for the POM highlighted in the following Table: 2)in POM, by applying the above said methodology, the minimum cost is 0in TT (2, 4) and TT (3, 1) which appears in the corresponding rowand corresponding column of the selected maximum cost, we got the tie up with minimum cost, so we have considered the minimum 0 along with the maximum demand 6 and allot the maximum possible demand 6 units for TT(2, 4) and delete the same column D_4. Remaining columns will be considered as NCTT.

	D_1	D_2	D_3	D_4	Supply
S_1	1	2	3	4	6
S_2	4	3	2	0 [6]	2
S_3	0	2	2	1	10
Demand	4	6	8	0	18

Table: 2

Step 2: Here the maximum cost is 4in TT (2, 1) (is a Pivot element for the POM highlighted in the following Table: 3)in POM, by applying the above discussed methodology, the minimum cost 0 which appears in the corresponding column of the selected maximum cost and allot the maximum possible demand 4 units for TT(3, 1) and delete the same column D_1. Remaining columns will be considered as NCTT.

	D_1	D_2	D_3	Supply
S_1	1	2	3	6
S_2	4	3	2	2
S_3	0 [4]	2	2	6
Demand	0	6	8	14

Table: 3

Step 3: Here the maximum cost is 3in TT (1, 2) and TT (2, 1), we got the tie up with maximum cost, so we have considered the maximum cost 3in TT (1, 2) along with the maximum demand 8 (is a Pivot element for the POM highlighted in the following Table: 4)in POM, by applying the above proposed methodology, the minimum cost is 2in TT(1, 1), TT (2, 2) and TT (3, 2) which appears in the corresponding row and corresponding column of the selected maximum cost, we got the tie up with minimum cost, so we have considered the minimum cost 2 along with the maximum demand 8and maximum supply 6, and allot the maximum possible demand 6 units for TT(3, 2) and delete the same row S_3. Remaining rows will be considered as NCTT.

	D_2	D_3	Supply
S_1	2	3	6
S_2	3	2	2
S_3	2	2 [6]	0
Demand	6	2	8

Table: 4

Step 4: Here the maximum cost is 3in TT (1, 2) and TT (2, 1), we got the tie up with maximum cost, so we have considered the maximum cost 3in TT (2, 1) along with the maximum demand 6 (is a Pivot element for the POM highlighted in the following Table: 5)in POM, by applying the above said methodology, the minimum cost is 2in TT (1, 1) and (2, 2), we got the tie up with minimum cost, so we have considered the minimum cost 2 along with the maximum demand 6 which appears in the corresponding column of the selected maximum cost and allot the maximum possible demand 6 units for TT(1, 1) and delete the same row $S_2$and column D_2. Remaining rows and columns will be considered as NCTT.

	D_2	D_3	Supply
S_1	2 [6]	3	0
S_2	3	2	2
Demand	0	2	2

Table: 5

Step 5: Supply the maximum possible demand 2 units in TT (1, 1) which leads to the solution satisfying all the conditions.

	D_3	Supply
S_2	2 [2]	0
Demand	0	0

Table: 6

Step 6: The resulting basic feasible solution is

	D_1	D_2	D_3	D_4	Supply
S_1	1	2 [6]	3	4	6
S_2	4	3	2 [2]	0 [6]	8
S_3	0 [4]	2	2 [6]	1	10
Demand	4	6	8	6	24

Table: 7

Optimum Cost:

Supply	1	2	2	3	3
Demand	2	3	4	1	3
Cost	12	4	0	0	12
Optimum Cost					28

Table: 8

Example 2: Consider the following balanced POM, cost for the transportation to be minimized.

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	100	150	200	140	35	400
S_2	50	70	60	65	80	200
S_3	40	90	100	150	130	150
Demand	100	200	150	160	140	750

Table: 9

By using the proposed methodology, the resulting basic feasible solution is

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	100	150 [150]	200	140 [110]	35 [140]	400
S_2	50	70	60 [150]	65 [50]	80	200
S_3	40 [100]	90 [50]	100	150	130	150
Demand	100	200	150	160	140	750

Table: 10

Optimum Cost:

Supply	1	1	1	2	2	3	3
Demand	2	4	5	3	4	1	2
Cost	22500	15400	4900	9000	3250	4000	4500
Optimum Cost							63550

Table: 11

Example 3: Consider the following balanced POM, cost for the transportation to be minimized.

	D_1	D_2	D_3	D_4	Supply
S_1	6	1	9	3	70
S_2	11	5	2	8	55
S_3	10	12	4	7	90
Demand	85	35	50	45	215

Table: 12

By using the proposed methodology, the resulting basic feasible solution is

	D_1	D_2	D_3	D_4	Supply
S_1	6 [35]	1 [35]	9	3	70
S_2	11	5	2 [50]	8 [5]	55
S_3	10 [50]	12	4	7 [40]	90
Demand	85	35	50	45	215

Table: 13

Optimum Cost:

Supply	1	1	2	2	3	3
Demand	1	2	3	4	1	4
Cost	210	35	100	40	500	280
Optimum Cost						1165

Table: 14

3. Comparison with existed methods:

Comparison with North West Corner method (NWC) :

Example	NWC	MxECMiROCA	Accuracy in %
1	42	28	150
2	92450	63550	145.48
3	1265	1165	108.58
Average Accuracy with NWC			134.69

Table: 15

Comparison with Vogal's Approximation method (VAM):

Example	VAM	MxECMiROCA	Accuracy in %
1	34	28	121.43
2	66300	63550	104.33
3	1220	1165	104.72
Average Accuracy with VAM			110.16

Table: 16

Comparison with Least Cost method (LCM) :

Example	LCM	MxECMiROCA	Accuracy in %
1	28	28	100.00
2	63550	63550	100.00
3	1165	1165	100.00
Average Accuracy with LCM			100.00

Table: 17

4. Results and Discussion:

Average Accuracy	
With NWC	134.69
With VAM	110.16
With LCM	100.00
Overall Accuracy	114.95

Table: 18

The proposed methodology gives **14.95 %**more accuracy in the optimal feasible solution than the existed optimization methods.

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