Next Direct Left Maximum Minimum Economical Process -Protected and Unbalanced Lattice in Cloud Figuring

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Abstract: Objective:
Main Objective of this study is to find the minimum cost of the corresponding Payoff.
Method:
We Proposed "NILMMA" is to find and fix the cost in minimum level for the transportation problem, it reduced the runtime for finding the optimum cost than the existed methods in Operation research field. Also the proposed algorithm is very efficient and easy to understand.

Keywords: Assignment problem, Degeneracy, Immediate Left, Maximum, Minimum, Optimum Cost, Pay off Matrix, Pivot element, Transportation problem

1. Introduction

A Transportation problem is one of the most basic and most important applications of linear programming problem. Description of a classical transportation problem can be given as follows. A certain amount of homogeneous commodity is available at number of sources and a fixed amount is required to meet the demand at each number of destinations. A balanced condition (i.e. Total demand is equal to total supply) is assumed [1], [2].

In 1941 Hitchcock developed the basic transportation problem along with the constructive method of solution and later in 1949 Koopmans discussed the problem in detail [5], [6]. Again in 1951 Dantzig formulated the transportation problem as linear programming problem and also provided the solution method [8], [9].

The transportation problem is a special class of linear programming problem which has applications in industry, communication network, planning, scheduling and transportation etc. The transportation problem deals with shipping commodities from different sources to various destinations [3], [4]. The objective of the transportation problem is to determine the shipping schedule that minimizes the total shipping cost while satisfying supply and demand limits [7], [10]. The algorithm of the method is detailed with suitable numerical examples. Further comparative studies of the new technique with other existing algorithms are established by means of sample problems.

2. Algorithm:

Next immediate left maximum minimum allotment (nilmxmia):

Step 1: Make the TT for the given pay off matrix (POM).

Step 2: Choose the maximum element from given POM.

Step 3: Supply the maximum demand for the minimum element of the next immediate left side column (or) row of the chosen maximum element column in Constructed TT (CTT).

Step 4: Select the next maximum element in newly CTT (NCTT) and repeat the step 2 and 3 until degeneracy condition is satisfied.

Step 5: Incase, the maximum element column is in the extreme left, then shift the entire column where the minimum element appears to the left of the maximum element column.

Note: If the problem is not balanced, make the problem as balanced by adding dummy zero row or dummy zero column, then consider the allotment for the dummy zero row or dummy zero column in end iteration

Example 1: Consider the following balanced pay off matrix to minimize the cost.

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	2	11	10	3	7	4
S_2	1	4	7	2	1	8
S_3	3	9	4	8	12	9
Demand	3	3	4	5	6	21

Table 1

By applying the proposed algorithm, we get

Step 1: The maximum cost in the following table no 1.1 is 12 (is a pivot element and highlighted in green colour in the following table). Along with minimum cost 2 in the next immediate left column of the Pivot element, by the procedure allot the maximum possible demand 5 units in TT (2,4) and delete the same column.

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	2	11	10	3	7	4
S_2	1	4	7	2 $\boxed{5}$	1	3
S_3	3	9	4	8	12	9
Demand	3	3	4	0	6	16

Table 1.1

Step 2: The next maximum cost in the following table no 1.2 is 12 (is a pivot element and highlighted in green colour in the following table). Along with minimum cost 4 in the next immediate left column of the Pivot element, by the procedure allot the maximum possible demand 4 units in TT (3,3) and delete the same column.

	D_1	D_2	D_3	D_5	Supply
S_1	2	11	10	7	4
S_2	1	4	7	1	3
S_3	3	9	4 $\boxed{4}$	12	5
Demand	3	3	0	6	12

Table 1.2

Step 3: The next maximum cost in the following table no 1.3 is 12 (is a pivot element and highlighted in green colour in the following table). Along with minimum cost 4 in the next immediate left column of the Pivot element, by the procedure allot the maximum possible demand 3 units in TT (2,2) and delete the same row and column.

	D_1	D_2	D_5	Supply
S_1	2	11	7	4
S_2	1	4 $\boxed{3}$	1	0
S_3	3	9	12	5
Demand	3	0	6	9

Table1.3

Step 4: The next maximum cost in the following table no 1.4 is 12 (is a pivot element and highlighted in green colour in the following table). Along with minimum cost 2 in the next immediate left column of the Pivot element, by the procedure allot the maximum possible demand 3 units in TT (1,1) and delete the same column.

	D_1	D_5	Supply
S_1	2 $\boxed{3}$	7	1
S_3	3	12	5
Demand	0	6	6

Table 1.4

Step 5:

	D_5	Supply
S_1	7 $\boxed{1}$	0
S_3	12 $\boxed{5}$	0
Demand	0	0

Table 1.5

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

Step 6: The resulting initial feasible solution is given below.

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	2 $\boxed{3}$	11	10	3	7 $\boxed{1}$	4
S_2	1	4 $\boxed{3}$	7	2 $\boxed{5}$	1	8
S_3	3	9	4 $\boxed{4}$	8	12 $\boxed{5}$	9
Demand	3	3	4	5	6	

Table 1.6

Optimum Cost:

S	1	1	2	2	3	3
D	1	5	2	4	3	5
COST	6	7	12	10	16	60
Total Cost (Optimum Cost)						111

Table 1.7

Example 2: Consider the following balanced pay off matrix to minimize the cost.

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	3	4	6	8	9	20
S_2	2	10	1	5	8	30
S_3	7	11	20	40	3	15
S_4	2	1	9	14	16	13
Demand	40	6	8	18	6	78

Table 2

The resulting initial feasible solution is given below.

	D_1	D_2	D_3	D_4	D_5	Supply
S_1	3 $\boxed{11}$	4	6	8 $\boxed{9}$	9	20
S_2	2 $\boxed{22}$	10	1 $\boxed{8}$	5	8	30
S_3	7	11	20	40 $\boxed{9}$	3 $\boxed{6}$	15
S_4	2 $\boxed{7}$	1 $\boxed{6}$	9	14	16	13
Demand	40	6	8	18	6	

Table 2.1

Optimum Cost:

S	1	1	2	2	3	3	4	4
D	1	4	1	3	4	5	1	2
COST	33	72	44	8	360	18	14	6
							Optimum Cost	555

Table 2.2

Example 3: Consider the following balanced pay off matrix to minimize the cost.

	D_1	D_2	D_3	D_4	Supply
S_1	10	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

Table 3

The resulting initial feasible solution is given below,

	D_1	D_2	D_3	D_4	Supply
S_1	10 $\boxed{5}$	30	50	10 $\boxed{2}$	7
S_2	70	30	40 $\boxed{7}$	60 $\boxed{2}$	9
S_3	40	8 $\boxed{8}$	70	20 $\boxed{10}$	18
Demand	5	8	7	14	

Table 3.1

Optimum Cost:

S	1	1	2	2	3	3
D	1	4	3	4	2	4
COST	50	20	280	120	64	200
					Optimum Cost	734

Table 3.2

3. Comparison with existed methods:

Comparison with North West Corner method (NWC):

EXAMPLE	NWC	NILMxMiA	ACCURACY %
1	153	111	137.84
2	878	555	158.20
3	970	734	132.15
AVERAGE ACCURACY			145.18

Table 4.1

Comparison with Least Cost Method (LCM):

EXAMPLE	LCM	NILMxMiA	ACCURACY %
1	78	111	70.27
2	555	555	100.00
3	814	734	110.90
AVERAGE ACCURACY			93.72

Table 4.2

Comparison with Vogal's Approximation Method (VAM):

EXAMPLE	VAM	NILMxMiA	ACCURACY %
1	68	111	61.26
2	267	555	48.11
3	734	734	100.00
AVERAGE ACCURACY			69.79

Table 4.3

4. Results and Discussion:

Overall Accuracy	
With NWC	145.18
With LCM	93.72
With VAM	69.79
Average Accuracy	102.89

Table 5.1

The proposed algorithm gives **2.89%** more accuracy in optimal feasible solution than the existed Optimization Methods.

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