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Research Article

A Proficient Approach To Obtain Initial Basic Feasible Solution Of A Transportation Problem.

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ABSTRACT

Transportation Problem is a vibrant aspect which has been widely considered in Operations Research field. It has been planned to put on different real life time problems. There are various methods identified from the literature to find Initial Basic Feasible Solution (IBFS) of the transportation problem. A Novel Approximation Method and ASM Method to find Initial Basic Feasible Solution and it has attained significance of least transportation cost reasonably other IBFS methods. The main aim of the transportation problem is to decrease the cost or the period of the transportation. The methods that are already been used are complex and very expansive in the execution of the sum. In this study, we use "Proficient Method" in which the key focus of this is to minimize the cost of combinations for the source and destination of the solution. By applying this Proficient Method we obtain the best initial basic feasible solution relatively other IBFS methods. And the time consumption for working with the proficient method is also comparatively less. Thus Proficient Method can be successfully used to solve the transportation problem in different business for the distribution of products.

Keywords: IBFS, Linear Programming, ASM, Novel and Transportation problem.

INTRODUCTION

The Transportation problem was designed to minimize the transportation cost which is the kind of linear programming.

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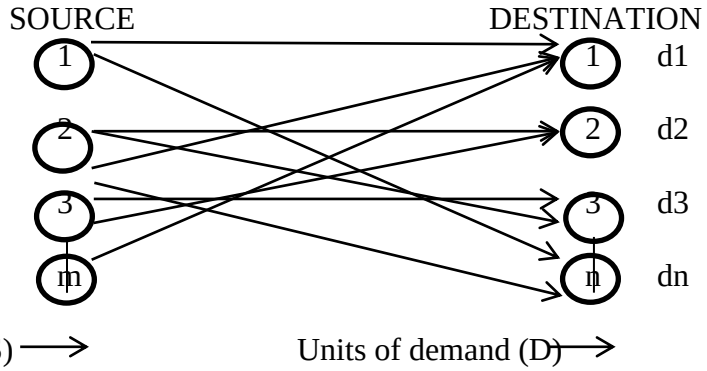
The main objective of this problem is to reduce the transportation cost of assumed commodity by the number of cause or derivation [1]. To solve the transportation problem there are many methods and techniques that has been developed. The main aim of transportation problem is to

save the computation time and to provide the closest to optimal or perfect optimal solution [2]. F.L.Hitchcock, was the first developed the transportation problem in his paper with the topic "The distribution of product from several sources to the numerous localities" in 1941. T.C.Koopmans, in 1947 accessed his historic paper with topic as "Optimum utilization of the transportation system". These two papers were the highlights in the growth of the various methods to explain a transportation problem. The researchers have developed different methods to find an outcome of an initial basic feasible solution which shows the costs into account.

NETWORK REPRESENTATION

The Network representation of the transportation problem in the figure: 1. there are m is taken as number of sources and n is taken as number of destination which is demonstrated by the node. The links of source and destination is represented by arc. By connecting the source i to the destination j to carry two pieces of evidence in the transportation cost per unit.



$\sum_{j=1}^{n} x_{ij} = a_1; i=1,2,\ldots,m$

$\sum_{i=1}^{n} x_{ij} = b_1; j=1,2,\ldots,n$

$x_{ij} \geq 0$

The main objective of the network representation model is to adjust the unidentified x_{ij} which will reduce the total transportation cost while satisfying the supply and demand limitations.

LITERATURE REVIEW

The Transportation problem is one of popular and important method in the operation research. The research deals with the transportation of goods from source to destination. Now the transportation problem aims that the cost of transportation should be minimal which should satisfy the demand and supply. Some of the places where transportation problem is utilized are in the inventory, assignment, traffic, factories etc., the primary goals of the transportation is to find IBFS and to keep the lower level of cost in this step. Therefore in this study the comparison of IBFS with three methods have done. The methods are named as ASM [2], Novel approximation Methods [3] and Proficient Method. The ASM method the process begins with the reduced matrix. The Novel method begins with the deduction of highest element with others. In most of the cases the new method is better than the ASM and Novel methods where we get the least cost or minimum cost [2-3]. The Proficient Method is best among all other methods.

I. ASM Method:

Step 1: Develop a transportation table.
Step 2: In a row select a minimum value and subtract with all the element of that row and form the row reduced matrix.
Step 3: From the row reduced matrix select a minimum value of the column and subtract with all the elements and form the column reduced matrix.
Step 4: Select the zero cell check the demand and supply, to take minimum value on basis of comparison.
Step 5: Delete the row if supply value is less than demand, Delete the column if supply value is more than demand and do it for the entire zero cell.
Step 6: The steps should be done unless all the demands are satisfied and the supplies are exhausted.

II. Novel Method:

Step 1: Develop a transportation table.
Step 2: Interchanging odd rows and even rows based on supply.
Step 3: Interchanging odd column and even columns based on demand.
Step 4: From the table select a least value and subtract with other element and zero cell which formed.
Step 5: Take the final table and allocate the supply and demand till all the cell becomes zero cell.

III. Proficient Method (Proposed Method):

Step 1: Develop a transportation table.
Step 2: Select the highest element and subtract with all the other elements.
Step 3: Select the highest element of each column and subtract with other elements in the same column.
Step 4: From the table select a least value and subtract with other element and zero cell which formed.
Step 5: Take the final table and allocate the supply and demand till all the cell becomes zero cell.

RESULTS AND DISCUSSIONS

Problem-1

Consider the following transportation cost matrix [5].

Destination/ source	**D1**	**D2**	**D3**	**Supply**
S1	6	8	4	14
S2	4	9	8	12
S3	1	2	6	5
Demand	6	10	15	31

Solutions:

ASM METHOD [2].

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Row reduced matrix

Destination	D1	D2	D3	supply
S1	6	8	4	14
S2	4	9	8	12
S3	1	2	6	5
Demand	6	10	15	31

Source	D1	D2	D3	Supply
S1	2	4	0	14
S2	0	5	4	12
S3	0	1	5	5
Demand	6	10	15	31

Column reduced matrix:

Source	D1	D2	D3	Supply
S1	2	4	0	14
S2	0	5	4	12
S3	0	1	5	5
Demand	6	10	15	31

Source	D1	D2	D3	Supply
S1	0	3	0	14
S2	0	4	0	12
S3	0	0	1	5
Demand	6	10	15	31

Final table:

Source	D1	D2	D3	Supply
S1	6 6	8	4 8	14 8 0
S2	4	9 5	8 7	12 7 0
S3	1	2 5	6	5 0
Demand	6 0	10 5 0	15 7 0	31

IBFS:

= (6*6) + (8*4) + (5*9) + (7*8) + (5*2)

=36 + 32 + 45 + 56 + 10

=179

NOVEL METHOD [3].

Source	D1	D2	D3	Supply
S1	6	8	4	14
S2	4	9	8	12
S3	1	2	6	5
Demand	6	10	15	31

Interchanging odd row & even row by supply

Source	D1	D2	D3	Supply
S3	1	2	6	5
S2	4	9	8	12
S1	6	8	4	14
Demand	6	10	15	31

Interchanging odd column and even column by demand

Source	D3	D2	D1	Supply
S3	6	2	1	5
S2	8	9	4	12
S1	4	8	6	14
Demand	15	10	6	31

Select a least value either in row or column and subtract with other element

Source	D3	D2	D1	Supply
S3	5	1	0	5
S2	4	5	0	12
S1	0	4	2	14
Demand	15	10	6	31

Final table:

Source	D3	D2	D1	Supply
S3	6	2	1 5	5 0
S2	8 1	9 10	4 1	12 11 10 0
S1	4 14	8	6	14 0
Demand	15 1 0	10 0	6 1 0	31

IBFS:

= (5*1) + (8*1) + (10*9) + (1*4) + (14*4)

= 5 + 8 + 90 + 4 +56

= 163

PROFICIENT METHOD (Proposed Method):

Source	D1	D2	D3	Supply
S1	6	8	4	14
S2	4	9	8	12
S3	1	2	6	5
Demand	6	10	15	31

Select the highest element in each column

Source	D1	D2	D3	Supply
S1	3	1	5	14
S2	5	0	1	12
S3	8	7	3	5
Demand	6	10	15	31

Select the highest element of each column & subtract

Source	D1	D2	D3	Supply
S1	5	6	0	14
S2	3	7	4	12
S3	0	0	2	5
Demand	6	10	15	31

Final table:

Source	D1	D2	D3	Supply
S1	5	6	0 14	14 0
S2	3 6	7 5	4 1	12 6 5 0
S3	0	0 5	2	5 0
Demand	6 0	10 5 0	15 1 0	31

IBFS:

= (14*0) + ((6*3) + (5*7) + (1*4) + (5*0)

= 0 + 18 + 35 + 4 + 0

= 57

Problem -2 [4]

Source	D1	D2	D3	D4	Supply
S1	20	22	17	4	120
S2	24	37	9	7	70
S3	32	37	20	15	50
Demand	60	40	30	110	240

Problem -3[3]

Source	D1	D2	D3	D4	Supply
O1	3	5	7	6	50
O2	2	5	8	2	75
O3	3	6	9	2	25
Demand	20	20	50	60	150

Problem -4[1]

Source	A	B	C	D	Supply
S1	1	2	1	4	30
S2	3	3	2	1	50
S3	4	2	5	9	20
Demand	20	40	30	10	100

Problem -5[5]

Source	D1	D2	D3	Supply
S1	6	4	1	50
S2	3	8	7	40
S3	4	4	2	60
Demand	20	95	35	150

RESULT AND DISCUSSION

The results are verified by the proposed algorithm of two examples. The IBFS of the two examples are calculated using ASM, NOVEL & PROFICIENT method

Problem-1

ASM	179
NOVEL	163
PROFICIENT	57

Problem-2

ASM	3460
NOVEL	3680

PROFICIENT	680

Problem-3

ASM	695
NOVEL	630
PROFICIENT	170

Problem-4

ASM	180
NOVEL	180
PROFICIENT	50

Problem-5

ASM	610
NOVEL	590
PROFICIENT	180

CONCLUSION

In this paper, ASM method, Novel approximation method and Proficient Method (Proposed Method) are proposed to create an efficient and minimal IBFS to the transportation problem whereas it plays a major role in the field of optimization. These three methods are compared for IBFS and the Proficient Method offers the least cost of all the other methods that are compared. In future works, the proposed method can be integrated with Stepping Stone and MODI Methods to evaluate the optimal solution to calculate the performance.

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