JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

New Approach to Solve the Transportation Problem by Using NECM

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Abstract: The transportation problem is a special type of LPP where the objective is to minimize the cost of distributing a product from several sources or origins to several destinations. Transportation problem deals with transport things at least cost as much as possible. The North –West Corner Method (NWCM) is the first method or way to transport things from the one corner to another corner. In this paper The North–West Corner Method and the North East Corner Method (NECM) are adopted to compute the Initial Basic Feasible Solution (IBFS) of the transportation problem.

Keywords: NWCM; Least Cost; NECM; IBFS; Transportation Problem.

I. INTRODUCTION

The linear program to minimize the transportation costs from different origins to the different destinations in respecting the constraints of availability and demand, is called the transportation problem [1]. In this problem, the availability can be equal to the demand (balanced problem), the availability may be superior to the demand and the availability may be less than the demand. Important application of the linear programming is to formulate the transportation problem and find the least solution of the problem. The basic transportation problem was originally stated by Hitchcock [2] and later discussed in detail by Koopman [3]. An earlier approach was provided by Kantorovich [4]. The linear programming formulation and the associated systematic method for solution were first given in Dantzig [5]. The recent approaches were respectively given by Polaniyappa and Venoba [6].

TABLE I. TABLE OF THE GENERAL TRANSPORTATION PROBLEM

Origins \ Destinations	D_1	D_2	…	D_j	…	D_n	Supply: a_i
O_1	c_{11}	c_{12}	…	c_{1j}	…	c_{1n}	a_1
O_2	c_{21}	c_{22}		c_{2j}		c_{2n}	a_2
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
O_i	c_{i1}	c_{i2}	…	c_{ij}	…	c_{in}	a_i
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
O_m	c_{m1}	c_{m2}	…	c_{mj}	…	c_{mn}	a_m
Demand: b_j	b_1	b_2	…	b_j	…	b_n	$\sum_{i=1}^{m} a_i = \sum_{j=1}^{m} b_j$

In table I, a_i denotes the quantity of commodities available at the origin i, b_j is the quantity of commodities requested at the destination j and c_{ij} is the transportation cost from the origin i to the destination j. A set of non-negative values, i=1, j=1; that satisfies the constraints is called a feasible solution to the transportation problem.

A feasible solution which minimizes the total cost is called optimal solution. A non-degenerate basic feasible solution is a basic feasible solution to a (m × n) transportation problem that contains exactly m+n-1 allocations in independent positions.

II. METHODOLOGY

Steps involved in NECM:

Step 1: The generalized Transportation problem should be balanced.

Step 2: For the North-East Corner Method, allocate to cell C_{1n} and take x_{mn} = min (a_m, b_n).

Step3: If x_{mn}= a_m, then the row m is deleted. Then move downward i.e. C_{2n} for next allocation and change b_n by b_n-a_m.

If x_{mn} = b_n, the column n is deleted. Then move to east horizontally C_{1n-1} for next allocation and change a_m by a_m-b_n.

Step 4: If a_m = b_n, then x_{mn} = a_m = b_n: the row m and the column n both deleted. In this case we have a degenerate basic feasible solution.

Step 5: Repeat the entire process until all demand and supply exhausted.

Steps involved in NWCM:

Step 1: The generalized Transportation problem should be balanced.

Step 2: For the North-West Corner Method, allocate to cell C_{11} and take x_{11} = min (a_1, b_1).

Step3: If x_{11} = a_1, then the first row is deleted. Then move downward i.e. C_{21} for next allocation and change b_1 by b_1-a_2.

If x_{11} = b_1, the column first is deleted. Then move horizontally C_{12} for next allocation and change a_1 by a_1-b_1.

Step 4: If a_1 = b_1, then x_{11} = a_1 = b_1: the row first and the column first both deleted. In this case we have a degenerate basic feasible solution.

Step 5: Repeat the entire process until all demand and supply exhausted.

III. ILLUSTRATIONS, RESULTS AND COCLUSION

NORTH-EAST CORNER METHOD (NECM)

Fi \ D_j	D_1	D_2	D_3	a_i
F_1	10	8	6	20
F_2	9	5	5	10
F_3	4	10	3	20
b_j	25	12	13	$\sum_{i=1} a_i = \sum b_j = 50$

It is a balanced transportation problem: $\sum a_i = \sum b_j = 50$.

Here, we have a matrix of order 3×3 i.e. 3 factories and 3 destinations.

Now firstly we will start from the uppermost Right corner of the matrix i.e. C_{13} and moved From NORTH to EAST. Allocate to cell C_{13} according to Demand and Supply i.e. min (13,20). So, we will allocate 13 units to 6. Delete the column D_3.

Now move to East i.e. cell C_{12} because we left with demand of 7 units. Allocate 7 units to 8 and cross out the row as demand completed. Allocate to cell C_{22} i.e. 5 units to 5 and cross out the column D_2.

Now, move to East i.e. towards cell C_{21} and allocate 5 units to 9 and cross out second row. At last, we left with demand and supply of 20 units at cell C_{31} So allocate 20 units to 4. Therefore, we have allocations as

X_{12} = 7, X_{13} = 13, X_{21} = 5, X_{22} = 5, X_{31} = 20.

Hence, the total Cost = 8×7+6×13+9×5+5×5+4×20

= 56+78+45+25+80

= 284.

Which gives the non-degenerated Solutions as Rim requirement is equal to m+n-1, where m is number of rows and n is number of columns.

North West Corner Method (NWCM)

F_i \ D_j	D_1	D_2	D_3	a_i
F_1	10	8	6	20
F_2	9	5	5	10
F_3	4	10	3	20
b_j	25	12	13	$\sum_{i=1} a_i = \sum b_j = 50$

Start from the cell C_{11} and allocate 20 units to 10 and cross out the row as Supply exhausted in first row. Move downward to cell C_{21} and allocate 5 units to 9 and cross out the column D_1. Move to WEST side i.e. to cell C_{22} and allocate 5 units to 5 and cross out the second row allocate at cell C_{32} and give 7 units to 10 and cross out Column D_2. At last, we left with demand and supply of 13 units at cell C_{33} and allocate 13 units to 3.

Allocations are $X_{11} = 20$, $X_{21} = 5$, $X_{22} = 5$, $X_{32} = 7$, $X_{33} = 13$.

Total Cost = 20×10+9×5+5×5+10×7+13×3

= 200+45+25+70+39

= 379.

Which also gives the non-degenerated solutions as Rim requirement is equal to m+n-1 where m is number of rows and n is number of columns.

IV. CONCLUSION

In this paper, we gave the NECM which is a new method used in solving transportation problem. For this NECM, we analysis that if we move or start from the extreme end corner of Table i.e. Upper most corner of Right-Hand side of matrix and move towards East or Downward North then there will be Less/Least cost as compared with NWCM and will be difference in total cost means Initial Basic Feasible Solution of the problem.

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