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An Alternative Approach for finding initial basic feasible solution of Balanced transportation problem.

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ABSTRACT:
This paper discusses about a new method for finding the intial basic feasible solution of cost minimization transportation problem with minimum transportation cost.Numerical examples are also provided to prove that the proposed algorithm gives a better result than existing algorithms.

Keywords: Cost minimization tramsportation problem, basic feasible solution.

Introduction:

Transportation problem is a special type of linear programming problem in which goods are transported from fixed number of sources to fixed number of destinations in such a way that total cost of transportation is minimized.The basic transportation problem was originally developed by Hitchcock in 1947[1] and then the systematic solution procedures from the simplex algorithm were further developed primarily by Dantzig[2] and then by Charnes,Cooper and Henderson in 1953[3].

The well recognized methods for finding initial basic feasible solution are North West Corner Rule(NWCR),Row minima,Column Minima,Matrix minima(Least Cost method) and Vogel᾽s Approximation Method.

Mathematical formulation of transportation problem:

.Let there are m sources $S_1, S_2, \_\_\_\_\_\_, S_m$. and n destinations $D_1, D_2, D_3 \_\_\_\_\_, D_n$.

Transportation problem can be represented mathematically as LPP as follows

Minimize : $Z = \sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij}\, x_{ij}$

Subject to

$\sum_{j=1}^{n} x_{ij} \leq a_i$, $\quad i=1,2,3....m$

$\sum_{i=1}^{m} x_{ij} \geq b_j$, $\quad j=1,2,3......n$

$x_{ij} \geq 0$ for all i,j

ai = quantity of commodity available at origin i
bj = requirement of commodity at destination j
cij =cost of transportation of one unit of commodity from ith source to jth destination .
xij = number of units of commodity to be transported from ith source to jth destination

Algorithm for the proposed method:

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Step1:Construct the transportation table from given transportation problem.

Step2:Select the least even cost from all the cost in the table.

Step3:Subtract the least even cost from even costs in the table.

Step4:Compare the minimum of supply or requirement whichever is minimum,then allocate the minimum supply or requirement at the place of minimum value of related row or column.

If tie at the place of minimum value in supply or requirement, then allocate at minimum cost corresponding to that row or column.

Step5:After completing step4 delete the row where supply from a given source is exhausted or delete the column where requirement for a given destination is satisfied.

Step6:Repeat step4 and step5 until all the suppliers are exhausted and all the requirements are satisfied.

Step7:Finally compute the total transportation cost as the sum of the product of cell allocations and unit cost.

Numerical Examples:

Example1: Consider the following cost minimization transportation problem

Destinations

Sources	D_1	D_2	D_3	D4	Supply
S_1	12	17	29	7	8
S_2	54	19	24	39	10
S_3	29	5	49	9	11
Requirement	4	7	6	12	29

Solution of the problem by proposed method is represented in the following table

Sources	D_1	D_2	D_3	D4	Supply
S_1	$12_{(4)}$	17	29	$7_{(4)}$	8
S_2	54	$19_{(4)}$	$24_{(6)}$	39	10
S_3	29	$5_{(3)}$	49	$9_{(8)}$	11
Requirement	4	7	6	12	29

Total transportation cost=12×4+7×4+19×4+24×6+5×3+9×8

=Rs.383

Example2: Consider the following cost minimization transportation problem

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Sources	D_1	D_2	D_3	D_4	D_5	Supply
S_1	4	5	7	9	10	15
S_2	3	11	2	6	9	30
S_3	8	12	21	41	4	12
S_4	3	2	10	15	17	14
Requirement	35	6	8	15	7	71

Solution of the problem by proposed method is represented in the following table

Sources	D_1	D_2	D_3	D_4	D_5	Supply
S_1	$4_{(15)}$	5	7	9	10	15
S_2	$3_{(7)}$	11	$2_{(8)}$	$6_{(15)}$	9	30
S_3	$8_{(5)}$	12	21	41	$4_{(7)}$	12
S_4	$3_{(8)}$	$2_{(6)}$	10	15	17	14
Requirement	35	6	8	15	7	71

Total transportation cost=4×15+3×**7**+2×8+6×15+8×5+4×7+3×8+2×6

=Rs.291

Result Analysis:

Comparison among the solutions obtained by Proposed method and the other existing methods and also with the optimal solution by means of above examples is shown in the following table

Method	Total transportation cost(in Rupees)	
	Ex.1	Ex2
North West Corner Rule	455	830
Row Minima	560	433
Column Minima	447	471
Matrix Minima	487	461
Vogel's Approximation Method	383	291
Proposed method	383	291
Optimal Solution	383	291

Conclusion:

In this paper a new algorithm for finding an initial basic feasible solution of cost minimization transportation problem is introduced.By applying this method we can find initial basic feasible solution in an easy and efficient manner.

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