A New Technique for Finding Initial Basic Feasible Solution to Transportation Problem

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ABSTRACT

Solving transportation problem using the new technique, results in minimum transportation cost than the least cost method (either less than or equal to minimum cost of LCM). It is illustrated by considering a numerical example. The solution obtain by this method is very close to the exact solution.

Keywords---- Least Cost Method, Optimal Solution, Reduction Method.

I. INTRODUCTION

Transportation problem is a type of linear programming problem that may be solved by using simplex technique called transportation method. It includes major application in solving problems involving several product sources and several destinations of products, this type of problem is frequently called the transportation problem. The two common objectives of such problems are either (1) minimize the cost of shipping m units to n destinations or (2) maximize the profit of shipping m units to n destinations. The aim of this study is to determine the minimum transportation cost in an easy and efficient manner.

II. STANDARD FORM OF TRANSPORTATION PROBLEM

Objective function:

Minimize \( \sum \sum C_{ij} X_{ij} \)

Subject to the constraint:

\( \sum X_{ij} = a_i, \ i = 1,2,\ldots,m \)

\( \sum X_{ij} = b_j, \ j = 1,2,\ldots,n \)

\( X_{ij} \geq 0, \ i = 1,2,\ldots,m; \ j = 1,2,\ldots,n \)

Where, \( C_{ij} = \) Unit transportation cost for each source 1 to destination \( j \).

\( X_{ij} = \) Number of units from source to destination.

\( a_i = \) Supply from sources.

\( b_j = \) Demand from destination.

III. ALGORITHM

Step 1: Formulate the given problem and set up in a matrix form. Check whether the given problem is balanced or unbalanced transportation problem. If unbalanced add, dummy source (rows) or dummy destination (columns) as required.

Step 2: Obtain the initial basic feasible solution by new method and determine the smallest cost in the demand or supply of the transportation table.

Step 3: Select the least value in the demand or supply and make allocation in the cell having least cost in the selected row or column.

Step 4: Delete the row or column which has no values for destination or source.

Step 5: With the new reduced table again repeat the steps to allocate the available values, until all the rim requirements are satisfied.

Step 6: Obtain the initial basic feasible solution for the transportation problem.

IV. EXAMPLE PROBLEM

1. Find the optimal solution using the new method and compare your values with least cost method?
Solution:

Step 1:

Now, delete the exhausted Row 1 which gives a new reduced table as shown below. Again repeat the steps.

Step 2:

Now, delete the exhausted Row 1 which gives a new reduced table as shown below. Again repeat the steps.

Step 3:

Table after deleting Column A
Step 4: 
Table after deleting Row 3

Step 5: 
Finally, after deleting Column B, we have

Now only source (4,3) is left. Allocating 4 and 3 satisfies the demand of 12

Step 6: 
The initial Basic Feasible Solution using new method of transportation problem is given as follows:
V. LEAST COST METHOD

Transportation Cost = (2x7) + (3x4) + (8x1) + (7x4) + (7x1) + (7x2)
= 14 + 12 + 8 + 28 + 7 + 14
= Rs. 83

2. Solve the initial basic solution using new method and compare their values with least cost method?
Solution:
Step 1:

Now, delete the exhausted column 3 which gives a new reduced table as shown below. Again repeat the steps.

Step 2:

Step 3:
Table after deleting row 1
Step 4: 
Table after deleting column 2

\[
\begin{array}{ccc}
& 26 & 80 & 81 \\
& 90 & 60 & \\
\end{array}
\]

DEMAND 23 30

Step 5: 
Finally, after deleting row 2, we have

\[
\begin{array}{ccc}
& 5 & 81 \\
& 25 & 60 & 0 \\
\end{array}
\]

DEMAND 30 0

Now only source A34 is left. Allocating 3 and 4 satisfies the demand of 30.

Step 6: 
The initial Basic Feasible Solution using new method of transportation problem is given as follows:

\[
\begin{array}{cccccc}
& & & & & \\
& 23 & 15 & 1 & 42 & 33 \\
& 23 & 80 & 42 & 26 & 5 \\
& 90 & 40 & 65 & 25 & 60 \\
\end{array}
\]

DEMAND 23 31 16 30 100

\[
\text{Transportation Cost} = (23 \times 1) + (23 \times 80) + (16 \times 26) + (5 \times 81) + (8 \times 40) + (25 \times 60)
\]

\[
= 23 + 1840 + 416 + 405 + 320 + 1500
\]

\[
= \text{Rs. 450}
\]

VI. LEAST COST METHOD
VII. CONCLUSION

In this paper, we discussed about the new way of assign a transportation cost to the given problem. We have analyzed that using the Least Cost Method and the New Method, Transportation cost where found to be less than or equal to the Least Cost Method. The new method results in providing an optimal solution in an easy and efficient manner.

REFERENCES