Sum of prime divisors & transportation problems

By :- Surinder Mohan Deep

Associate prof. in Mathematics

G.N.College, Narangwal(Ldh)

Abstract :- This paper is an attempt to find initial basic feasible solution of a transportation problem. In this paper I have tried a new method for finding solution to transportation problems. We consider all prime dividing the cost of transportation (single time if a prime divisor repeats) and then sum all these prime divisors in a particular row and column and first make allocation at place where this sum is minimum if tie occurs then give allocation in that row or column where cost is least. This method is easy to apply and most of the times solution by this method coincide with optimal solution.

Intrduction:- Linear programming is major branch of Operation research under which we optimize linear function of variables subject to some linear restrictions. Further transportation problem is a special case of linear programming which includes the transshipment of a homogenous product, which are originally available at different supply points, to various demand stations in such a manner that the total cost of transportation is least. A certain class of linear programming problem known as transportation

problems arises very frequently in practical applications. The classical transportation problem received its name because it arises naturally in the contacts of determining optimum shipping pattern. The general transportation problem can be stated as, a product may be transported from factories to retail stores. The factories are the sources and the store are the destinations. The amount of products that is available is known and the demands are also known. The problem is that different legs of the network joining the sources to the destination have different costs associated with them. The aim is to find the minimum cost routing of products from the supply point to the destination. The general transportation problem can be formulated as: A product is available at each of m origin and it is required that the given quantities of the product be shipped to each of n destinations. The minimum cost of shipping a unit of the product from any origin to any destination is known. The shipping schedule which minimizes the total cost of shipment is to be determined. The problem can be formulated as:

Min Z=$\sum_{i,j} c_{ij} x_{ij}$

 subject to

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

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

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

For each supply point i,(i = 1, 2, ..., m) and demand point j,(j = 1, 2, ..., n)

c_{ij} =unit transportation cost from i th source to j th destination

x_{ij}=amount of product transported from i th source to j th destination

a_i=amount of supply at i th source.

b_j=amount of demand at j th destination.

where a_i and b_j are given non-negative numbers and assumed that total supply is equal to total demand, i.e. Xm i=1 ai = Xn j=1 bj , then transportation problem is called balanced otherwise it is called unbalanced. The aim is to minimize the objective function satisfying the above mentioned constraints.

Example:- Consider a following 3 by 3 transportation problem

Destination→ Source ↓	a_1	a_2	a_3	Supply (a_i)
b_1	15	20	5	10
b_2	18	14	12	20
b_3	21	7	2	30
Demand(b_j)	35	15	10	60

After applying the procedure as discussed in the abstract the first allocation is done at (3,3)th, second at (2,2)th, third at

(2,1)th, fourth at (1,1) th and last at (3,1)th place, with respective allocations 10, 15, 5, 10 and 20. And we get initial solution 890/-.

Limitation:- This method is not applicable if cost of transportation is non integer.

Conclusion:- This method is easy to apply and simple to understand.

References:- Basu, M., Pal, B.B. and Kundu, A., (2007), "An algorithm for finding the optimum solution of solid fixed-charge transportation problem," Optimization, A Journal Of Mathematical Programming And Operation Research, pp. 283-291.

 Bazaraa, M., Jarvis, S., John, J. and Hanil, S.D., (1990), " Linear programming and network flows," Optimization, John Wiley sons, New York.

Cui, Q., and Sheng, Y., (2012), "Uncertain model for solid transportation problem," International Information Institute, 15 (12), pp. 342-348.

 Dantzig, G. B., (1951), Application of the simplex method to a transportation problem, Activity Analysis of Production and Allocation, Koopsmans TC (Ed.), pp. 359-373.

Das, A., Acharya, D. P., and Basu, M. N., (2015), "More-for-less paradox in a solid transportation problem," Journal Of Information And Computing Science, 10(4), pp. 271-276.