iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 **Issue:** X **Month of publication:** October 2016

DOI:

Volume 4 Issue X, October 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

A New Technique to Obtain Initial Basic Feasible Solution for the Transportation Problem

A. Seethalakshmy[1], N. Srinivasan[2]
[1]Research Scholar, Department of Mathematics, St. Peter's university, Avadi, Chennai, India
[2]Professor, Department of Mathematics, St. Peter's university, Avadi, Chennai, India

Abstract— ***The SS method is a direct method proposed for deriving an initial solution towards transportation problem. This method solves the problem initially. Herewith in this research paper, a transportation matrix is reduced by column reduction to form a transformed matrix by allocating the zero by position in a systematic procedure. Salient features of this method depict lesser calculation time, easy applicability, and avoiding degeneracy to name a few. Depiction with examples provides easy understanding of this method.***
Keywords— Transportation problems, supply, Demand, New method, Reduction.

I. INTRODUCTION

With a defined origins and destinations, avoiding a logistical mayhem by optimally allocating/ matching the demand and supply forms the basis of transportation. Here case in being with each origin having certain supply and similarly each destination having its demand. To evolve and quantify the model with minimal cost, not restricting the supply and demand whereas by satisfying all of the demand and the supply would be the fruition of the overall objective towards this model.

Considering the decision variable X_{ij} of transportation model the ith supply at the source to the jth demand at the destination.

The below listed methods are used to deduce the initial feasible solution of a transportation problem:

North West Corner Method
Least Cost Method
Vogel's Approximation Method

As moving towards our objective eventually, an optimal solution is obtained by MODI method or stepping stone method. Amongst the two the former (MODI) method is overly popular, resulting in gargantuan articles being published on this subject.

The Assignment problem is first solved by Hitchcockin 1941. Subsequently, this was further evolved and well-developed by Koopmans (1949) and Dantzig (1951). For the majority of the large scale of the transportation problem, Simplex method would not suit. Furthermore, towards the evolution of better its better applicability in 1954, Charnes and Cooper had developed Stepping Stone method. This was more efficient of their previous counterparts. The quest to develop a more feasible and efficient solution led to Heuristic method developed by Kirca and Stair from the Goyal's version of VAM (Reinfeld and Vogel, 1958).

Herewith in this research paper we have sequenced the sections as follows:

In Section 2 we present the mathematical form of TP. Section 3 deals and discuss the algorithm, Section 4 illustrates some of the numerical examples and finally Section 5 concludes with a brief discussion on the results thus obtained.

II. MATHEMATICAL FORM OF TRANSPORTATION PROBLEM

The LP problem is as follows

$$\text{Minimize } Z = \sum_{i=1}^{m} \sum_{j=1}^{n} C_{ij} X_{ij}$$

Subject to the constraints

$$\sum_{j=1}^{n} X_{ij} \leq S_i \quad \text{For all i}$$
$$\sum_{i=1}^{m} X_{ij} \geq d_j \quad \text{For all j}$$
$$X_{ij} \geq 0$$

A transportation problem is said to be balanced if

$$\sum_{i=1}^{m} S_i = \sum_{j=1}^{n} d_j$$

www.ijraset.com
IC Value: 13.98
Volume 4 Issue X, October 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

III. ALGORITHM

Step 1

Construct the matrix of the transportation problem from given problem. In case if the problem is unbalanced we make it balanced.

Step 2

Find the minimum element in each column and construct a table such that minimum element is subtracted from each cost matrix of the corresponding column.

Step 3

Each column is to be discussed

Locate the zero of (i , j)th position and consider the unique position of the matrix in the column. Allocate the minimum of the supply and demand for that distinct position. Delete the corresponding columns or rows where the supply or demand is satisfied.

The remaining table is then discussed. The process is continued to the remaining table till m + n -1 cells are allocated and all the supply and demand is satisfied.

Step 4

If there is contrary to the above condition, that is if there is no distinct row for the corresponding column then look at which column have the same row, the allocation is given to the position where allocation can be a minimum of supply or demand. If the supply or demand is equal, then choose the other zero because it leads to the degeneracy. After allocating delete the corresponding row or column where the supply or demand is satisfied.

Step 5

Repeat steps 2 to step 4 till all the supply and demand is satisfied.

Step 6

Finally, calculate the total minimum cost as a sum of the product of cost and corresponding allocated value of supply or demand.

$$\text{Total cost} = \sum_{i=1}^{n}\sum_{j=1}^{n} C_{ij}\, X_{ij}$$

IV. NUMERICAL EXAMPLES

Example 4.1

Obtain an initial basic feasible solution for the following problem.

		Distribution			
Factories		D_1	D_2	D_3	Supply
	F_1	6	4	1	50
	F_2	3	8	7	40
	F_3	4	4	2	60
	$Req.$	20	95	35	

Step 1: Column reduction

		Distribution			
Factories		D_1	D_2	D_3	Supply
	F_1	3	0	0	50
	F_2	$\boxed{20}$ 0	4	6	~~40~~ 20
	F_3	1	0	1	60
	$Req.$	~~20~~	95	35	

Locate the position of zero

Distribution	Factories
D_1	F_2
D_2	F_1, F_3
D_3	F_1

Delete D_1

Volume 4 Issue X, October 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Step 2: Column reduction

		Distribution		
Factories		D_2	D_3	Supply
	F_1	$\boxed{15}$ 0	$\boxed{35}$ 0	~~50~~ 15
	F_2	$\boxed{20}$ 4	6	~~40~~ 20
	F_3	$\boxed{60}$ 0	1	60
	$Req.$	95	~~35~~	

Locate the position

Distribution	Factories
D_2	F_1, F_3
D_3	F_1

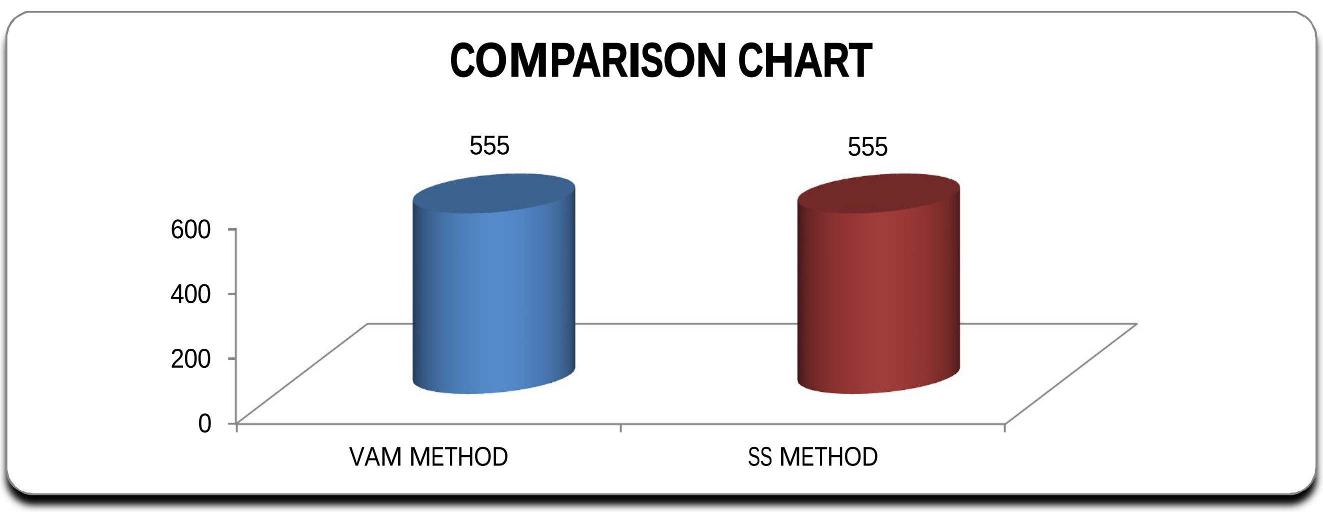
Delete D_3

Step 3:

		Distribution			
Factories		$D1$	$D2$	$D3$	Supply
	F_1	6	$\boxed{15}$ 4	$\boxed{35}$ 1	50
	F_2	$\boxed{20}$ 3	$\boxed{20}$ 8	7	40
	F_3	4	$\boxed{60}$ 4	2	60
	$Req.$	20	95	35	

Minimum cost = $15 \times 4 + 35 \times 1 + 20 \times 3 + 20 \times 8 + 60 \times 4$

Minimum cost = 555



Example 4.2

Obtain optimal solution for the given transportation problem

		Destination				
Source		D_1	D_2	D_3	D_4	Supply
	S_1	15	10	17	18	20
	S_2	16	13	12	13	60
	S_3	12	17	20	11	70
	$Demand$	30	30	40	50	

Solution

Step 1: Column reduction

	D_1	D_2	D_3	D_4	supply
S_1	3	$\boxed{20}$ 0	5	7	~~20~~
S_2	4	3	$\boxed{40}$ 0	2	~~60~~ 20
S_3	0	7	8	0	70
$Demand$	30	~~30~~ 10	~~40~~	50	

Locate the position of zeros

Destination Source

D_1 S_3
D_2 S_1
D_3 S_2
D_4 S_3

Delete S_1 and D_3

Step 2: Column reduction

	D_1	D_2	D_4	supply
S_2	4	$\boxed{10}$ 0	$\boxed{10}$ 2	~~20~~ ~~10~~
S_3	$\boxed{30}$ 0	4	$\boxed{40}$ 0	~~70~~ ~~40~~
$Demand$	~~30~~	~~10~~	~~50~~ ~~10~~	

Destination Source

D_1 S_3
D_2 S_2
D_4 S_3

Volume 4 Issue X, October 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

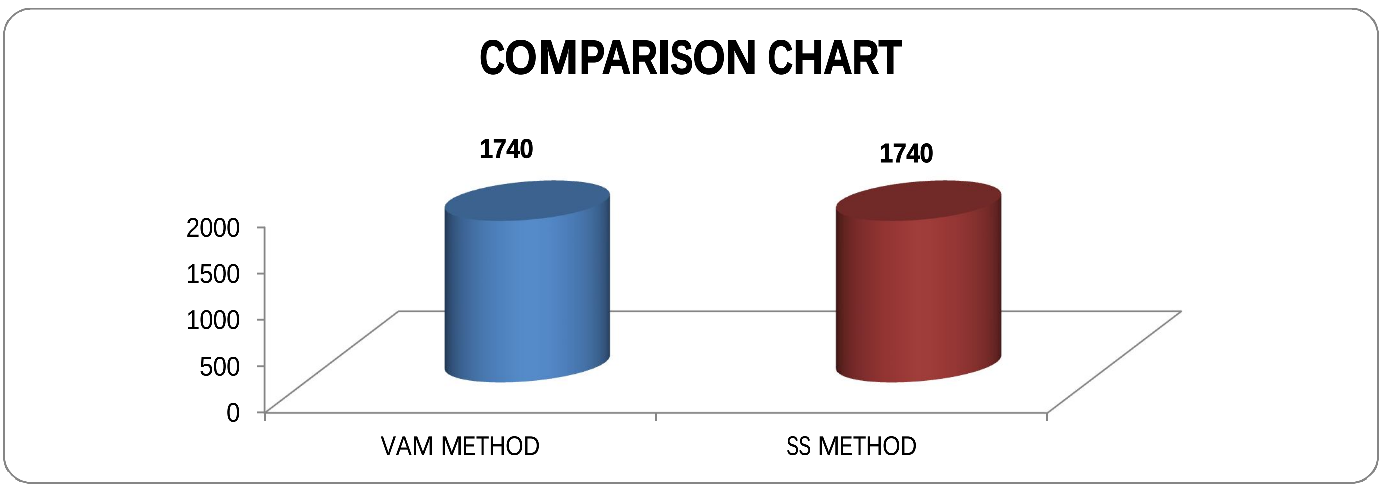
Delete D_2

Step 3:

	D_1	D_2	D_3	D_4	supply
S_1	15	20 10	17	18	20
S_2	16	10 13	40 12	10 10	60
S_3	30 12	17	20	40 11	70
$Demand$	30	30	40	50	

Minimum cost = 20 × 10 + 10 × 13 + 40 × 12 + 10 × 10+ 30 × 12 + 40 × 11

Minimum cost = 1740



V. CONCLUSION

We have proposed and shown a direct method in solving the initial solution for the transportation problems through this research paper. Wherein this method can be used and applied to all transportation problems and of its kinds. The SS algorithm delves along a systematic procedure with the uncomplicated comprehensible attribute. This research paper in a conclusive way unravels to pinpoint on the methodical approach on providing initial basic feasible solution directly in fewer steps. The initial solution thus obtained through this method is same as VAM method. The quintessential benefactor attribute of this SS method is its lesser time taken, with astute comprehensibility giving the edge for the decision makers. In a truthful attempt on providing a new method for solving transportation, we propose this which is unique from all known previous methods.

REFERENCES

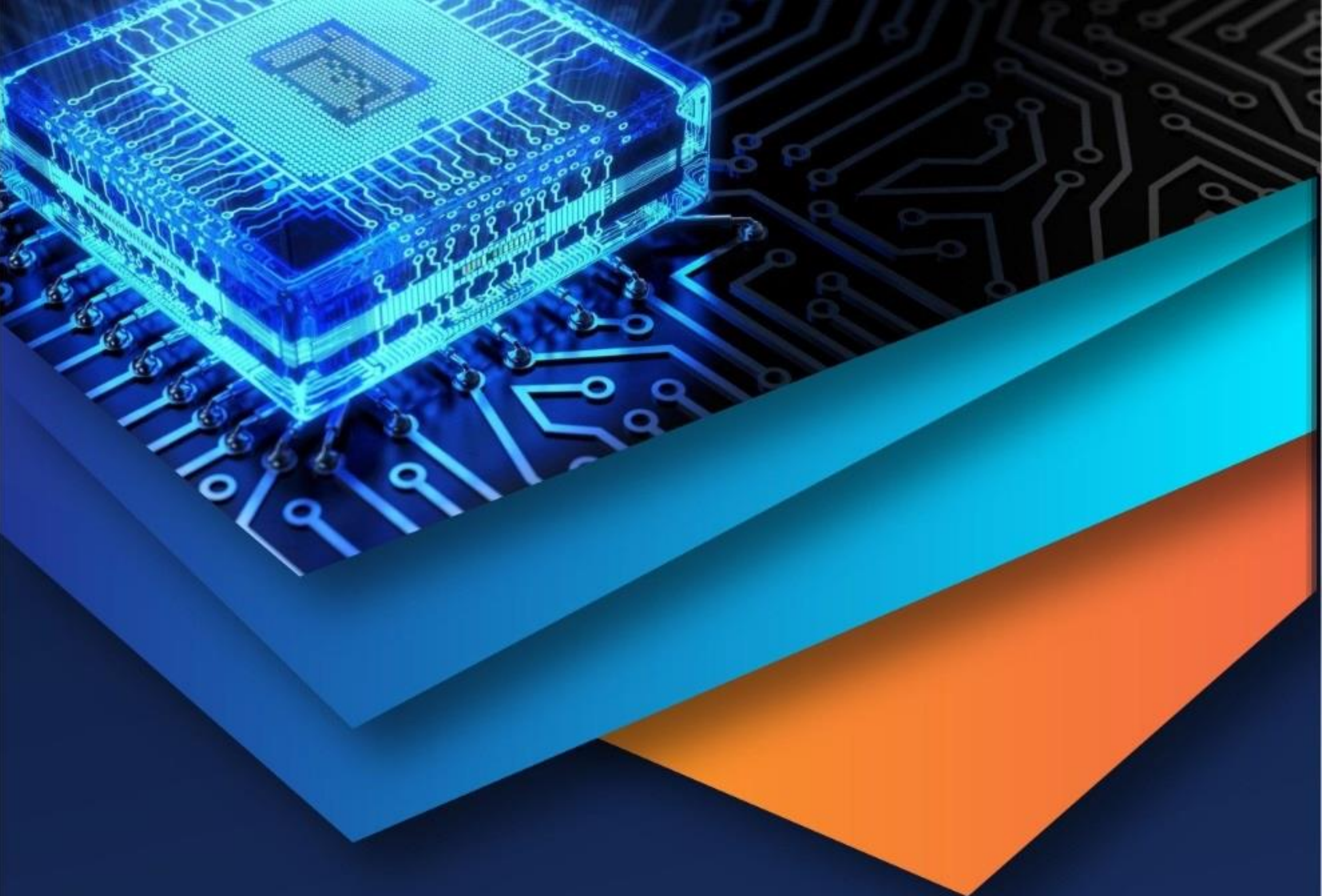
[1] H.A.Taha, Operations Research-Introduction, Prentince hall of India New Delhi, 8th edition 2007..
[2] J.K.Sharma, Operations Research-Theory and Application, Macmillian India LTD,New Delhi-2005.
[3] P.K.Gupta ,D.S Hira, Operation Research, S. Chand & Company Limited,14th Edition 1999.
[4] N.Srinivasan D.Iraninan, A new approach for solving assignment problem with optimal solution, International journal of Engineering and management research, Volume 6 Issue – 3 may – June 2016.
[5] P.K.Gupta ,D.S Hira, Operation Research, S. Chand & Company Limited,14th Edition 1999.
[6] V.J.Sudhakar,N. Arunsankar,T.Karpagam 'A new approach for finding an optimal solution for TP, European Journal of Scientific Research, ISSN 1450-216x vol.68 No 2(2012) pp.254-257

[7] P.Pandian and G. Natarajan' a new method for finding an optimal solution for TP, International Journal of Math Science and Engineering. Appls(IJMSEA),4(2010) 59-65

[8] N.M.Deshmukh 'An innovative method for solving TP- International Journal of Physics and Mathematical Sciences ISSN: 2277-2111.2012 Vol.2 (3)July-Sep pp:86-91.

[9] Smita Sood and Keerti Jain,'The maximum difference method to find initial basic feasible solution for Transportation Problem',Asian Journal of management Sciences,03[07] 2015: 8-11.

[10] Basirzadeh.H.(2012)'Ones Assignment method for Solving Assignment Problem',Applied Mathematical Sciences,6,2345 – 2355.



10.22214/IJRASET

INDEX COPERNICUS 45.98

ISRA JIF IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY