Modified form of Average Transportation Cost Method (ATCM)- an Efficient Method for Finding an Initial Basic Feasible Solution for Transportation Problem

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Abstract

In my previous research paper entitled "A Comparative Study Of Initial Basic Feasible Solution Methods For Transportation Problems By Using A New Method Named Average Transportation Cost Method (ATCM)", we had developed a new technique for obtaining an initial basic feasible solution for a balanced transportation problem which is optimal or too close to optimal as compared to existing ones namely VAM, PAM and MTCM. In this research paper entitled" An efficient method which is the modified form of Average Transportation Cost Method (ATCM) ", we established an improved form of ATCM which is more efficient and reliable as compare to ATCM for computing initial basic feasible solution which is optimal for balanced transportation problem and easy to handle by a non-mathematician in a shorter time period. A numerical example is given to show the efficiency of the method.

Keywords - *Balanced Transportation Problem, Basic Feasible Solution, ATCM, VAM, PAM, MTCM method, Proposed method.*

I. INTRODUCTION

Transportation problems have been widely studied in Computer Science and Operations Research. It is one of the fundamental problems of network flow problem which is usually use to minimize the transportation cost for industries with number of sources and number of destination while satisfying the supply limit and demand requirement. Transportation models play an important role in logistics and supply-chain management for reducing cost and improving service. Some previous studies have devised solution procedure for the transportation problem with precise supply and demand parameters. Efficient algorithms have been developed for solving the transportation problem when the cost coefficients and the supply and demand quantities are known exactly. In real world applications, the supply and demand quantities in the transportation problem are sometimes hardly specified precisely because of changing economic conditions.

The basic TP was first developed by **F.L. Hitchcock** in **1941**, then separately by **T.C. Koopmans** in **1947** and then the systematic solution procedures from the simplex algorithm were further developed, primarily by **G.B. Dantzig** in **1951** and then by **Charnes et al**. In the solution procedure of TP, IBFS is known as the fundamental stage for finding an optimal solution. The well recognized classical methods, for finding an IBFS for the transportation problems are North West Corner Rule (NWCR), Least Cost Method (LCM) and Vogel's Approximation Method (VAM). Again researchers worked and are working on transportation problem to develop new algorithm to find a better IBFS for TPs, and these methods may be used to solve maximization transportation problems and also time minimization transportation problems. Like other researchers, in this paper an effective procedure for finding an IBFS for the cost minimizing TPs is proposed.

A. Balanced and Unbalanced Transportation Problem:

A Transportation Problem is said to be balanced transportation problem if total number of supply is same as total number of demand otherwise it is said to be unbalanced transportation problem.

B. Basic Feasible Solution:

Any solution $X_{ij} \geq 0$ is said to be a feasible solution of a transportation problem if it satisfies the constraints. The feasible solution is said to be basic feasible solution if the number of nonnegative allocations is equal to (m+n-1) while satisfying all rim requirements, i.e., it must satisfy requirement and availability constraint. There are three ways to get basic feasible solution.

1) North West Corner Rule
2) Minimum Cost Method or Matrix Minima Method
3) Vogel's Approximation Method or Regret Method

II. METHODOLOGY

Algorithm for Proposed Method:

Step 1. Firstly make the table balanced. Now compute penalty of each row. Here the penalty will be equal to the average of minimum two costs in the row.

Step 2. Similarly compute penalty for each column. Here also the penalty will be equal to the average of minimum two costs in that column.

Step 3. Identify the row or column with the maximum penalty and assign possible value to the variable having smallest shipping cost in that row or column. If two or more rows corresponding equal penalty then select the cell with minimum cost of that maximum penalty row.

Step 4. Cross out the satisfied row or column.

Step 5. Write the reduced table and compute new penalties with same procedure until all the allocations have been made . Determine the total minimum cost of occupied cells satisfying m+n-1allocations.

Note: Penalty means the average of the minimum two costs in a row or a column.

III. NUMERICAL EXAMPLE

Problem-1: Consider the following cost minimizing transportation problem with four sources and three destinations:

Destinations

Sources	**S1**	**S2**	**S3**	**S4**	**Supply**
D1	3	6	8	5	20
D2	6	1	2	5	28
D3	7	8	3	9	17
Demand	15	19	13	18	Total=65

Using Proposed Method the final solution is presented in the following table:

Destinations

Sources	**S1**	**S2**	**S3**	**S4**	**Supply**
D1	2			18	20
D2	9	19			28
D3	4		13		17
Demand	15	19	13	18	Total=65

Therefore the total transportation cost determined by the Proposed Method is:
Min. Z = (3)(2) + (5)(18) + (6)(9) + (1)(19) + (7)(4) + (3)(13)
=6 + 90 + 54 + 19 + 28 + 39
= Rs. 236

IV. RESULT

The proposed method provides an initial basic feasible solution either optimal or too close to optimal for balanced transportation problem within shorter iterations without making the calculation lengthy and time consuming too.

V. CONCLUSIONS

By using the proposed method we conclude that we obtain an efficient and modified algorithm for finding an initial basic feasible solution which is optimal or too close to optimal as compare to existing methods

namely Average Transportation Cost Method, VAM etc. within shorter time period and easy to use. Further, the proposed method is good enough in some cases of unbalanced transportation problem.

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REFERENCES

[1] Operations Research by Prem Kumar Gupta and D.S. Hira, Page 228-235.
[2] Goyal (1984) improving VAM for the Unbalanced Transportation Problem, Ramakrishnan (1988) discussed some improvement to Goyal's Modified Vogel's Approximation method for Unbalanced Transportation Problem.
[3] Putcha, Aditya K. "SPECIAL CASES OF LP PROBLEM." INDR 262 Optimization Models and Mathematical Programming, 2010: 1234-1240.
[4] Turkey, Mertin. "NEW ALTERNATE METHODS OF TRANSPORTATION." traansportation problem, 2008: 1008-1012.
[5] Operations Research by Kanti Swarup, P.K. Gupta, Manmohan, Page 247-293.
[6] Priyanka Malviya, Dr. Sushma Jain (June 2016). A Comparative Study Of Initial Basic Feasible Solution Methods For Transportation Problems By Using A New Method Named Average Transportation Cost Method, International Journal of Fundamental & Applied Research, (ISSN- 2320-7973 Volume-4 Issue -4 Month – June 2016 pp. (28– 36)).
[7] Mollah Mesbahuddin Ahmed, Aminur Rahman Khan, Faruque Ahmed, Md. Sharif Uddin, Incessant Allocation Method for Solving Transportation Problems, American Journal of Operations Research, 2016, 6, 236-244.
[8] Abdul Sattar Soomro, Gurudeo Anand Tularam, Ghulam Murtaa Bhayo; A comparative study of initial basic feasible solution methods for transportation problems, Mathematical Theory and Modeling ISSN 2224-5804 (Paper) ISSN 2225-0522 (Online) Vol.4, No.1, 2014.
[9] Mrs. Rekha Vivek Joshi, Optimization Techniques for Transportation Problems of Three Variables, IOSR Journal of Mathematics (IOSR-JM) e-ISSN: 2278-5728, p-ISSN:2319-765X. Volume 9, Issue 1 (Nov. – Dec. 2013), PP 46-50.
[10] Reena G Patel, P. H. Bhathwala, The Advance Method for the Optimum Solution of a Transportation Problem, International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611
[11] Sudhakar VJ, Arunnsankar N, Karpagam T (2012). A new approach for find an Optimal Solution for Transportation Problems, European Journal of Scientific Research 68254-257.
[12] M.A. Hakim, An Alternative Method to Find Initial Basic Feasible Solution of a Transportation Problem, Annals of Pure and Applied Mathematics, Vol. 1, No. 2, 2012,203-209.
[13] Abdallah A. Hlayel, Mohammad A. Alia, Solving transportation problems using the Best Candidates Method, Computer Science & Engineering: An International Journal (CSEIJ), Vol.2, No.5, October 2012.
[14] Mohammad Kamrul Hasan, Direct Methods for Finding Optimal Solution of a Transportation Problem are not Always Reliable. International Refereed Journal of Engineering and Science (IRJES) ISSN (Online) 2319-183X, (Print) 2319-1821 Volume 1, Issue 2 (October 2012), PP.46-52
[15] Veena Adlakha, Krzysztof Kowalski (2009), Alternate Solutions Analysis For Transportation problems, Journal of Business & Economics Research – November, Vol. 7.