IJCSN International Journal of Computer Science and Network, May 2014
ISSN (Online) : 2277-5420
www.IJCSN.org
Conference Proceeding – RDFCORDGE - 2014

Cost Estimation of Transportation Model by Vogel's Approximation Method

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Abstract - The transportation problem with Vogel's Approximation Method (VAM) is a special class of Linear Programming Problem. The importance of determining efficient solutions for large scale transportation problems is borne out by many practical problems in industries, the military, etc. With this motivation, a few variants of VAM incorporating the total opportunity cost (TOC) concept were investigated to obtain fast and efficient solutions. Computational experiments were carried out to evaluate these variants of VAM. Researchers determined the amounts transported from each source to each sink. Also researchers discussed how to satisfying the supply and demand restrictions, minimize the total transportation cost.

Keywords – *Basic Feasible Solution, Penalty, Unit cost, Vogel's approximation method.*

1. Introduction

Transportation problem is a particular class of linear programming, which is associated with day-to-day activities in our real life and mainly deals with logistics. It helps in solving problems on distribution and transportation of resources from one place to another. The goods are transported from a set of sources (e.g., factory) to a set of destinations (e.g., warehouse) to meet the specific requirements. In other words, transportation problems deal with the transportation of a single product manufactured at different plants *(supply origins)* to a number of different warehouses *(demand destinations).* The objective is to satisfy the demand at destinations from the supply constraints at the minimum transportation cost possible. To achieve this objective, we must know the quantity of available supplies and the quantities demanded. In addition, we must also know the location, to find the cost of transporting one unit of commodity from the place of origin to the destination. The model is useful for making strategic decisions involved in selecting optimum transportation routes so as to allocate the production of various plants to several warehouses or distribution centers.

Suppose there are more than one centers, called **'origins'** , from where the goods need to be transported to more than one places called **'destinations'** and the costs of transporting or shipping from each of the origin to each of the destination being different and known. The problem is to transport the goods from various origins to different destinations in such a manner that the cost of shipping or transportation should be minimum.

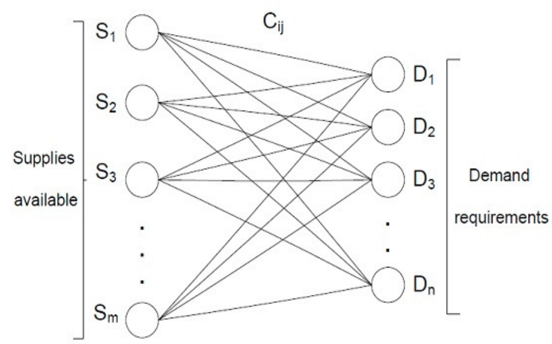

Figure1. – Network Model of the Transportation Problem

2. Methodology

A. Algorithm

There are specialized algorithms for transportation problem that are much more efficient than the simplex algorithm. The basic steps to solve transportation problem are:

Step 1. Determination the initial feasible solution.

Step 2. Determination optimal solution using the initial solution.

In this study, basic idea is to get better initial solutions for the transportation problem. Therefore, study focused on Step 1 above. Several heuristic methods are available to get an initial basic feasible solution. Although some heuristics can find an initial feasible solution very quickly, oftentimes the solution they find is not very good in terms of minimizing total cost. On the other hand, some heuristics may not find an initial solution as quickly, but the solution they find is often very good in terms of minimizing total cost. Well-known heuristics methods are North West Corner, Best Cell Method, **Vogel's Approximation Method** (VAM).

B.Vogel's Approximation Method (VAM)

VAM is based on the concept of penalty cost or regret. A penalty cost is the difference between the largest and next largest cell cost in a row or column. VAM allocates as much as possible to the minimum cost cell in the row or column with the largest penalty cost. Detailed processes of VAM are given below:

Step 1: Balance the given transportation problem if either (total supply>total demand) or (total supply<total demand)
Step 2: Determine the penalty cost for each row and column by Subtracting the lowest cell cost in the row or column from the next lowest cell cost in the same row or column.
Step 3: Select the row or column with the highest penalty cost (breaking ties arbitrarily or choosing the lowest-cost cell).
Step 4: Allocate as much as possible to the feasible cell with the lowest transportation cost in the row or column with the highest penalty cost.
Step 5: Repeat steps 2, 3 and 4 until all requirements have been meet.
Step 6: Compute total transportation cost for the feasible allocations.

3. Flow Chart

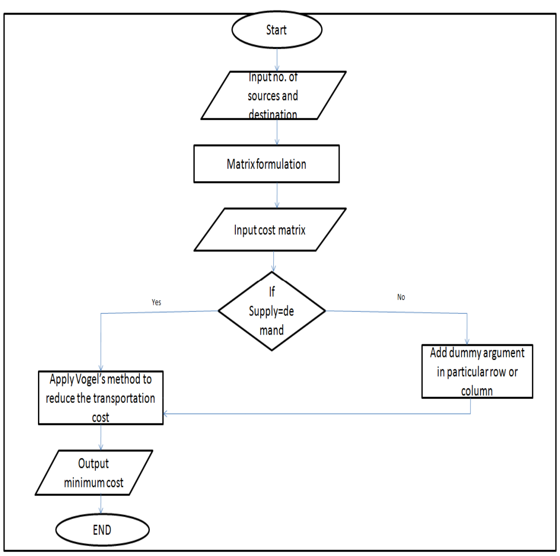

Figure 2 - Flow Chart of VAM Method

4. Result

In this project we enter the no. of source and the no. of destination then matrix are created according to users input. Users input the value in the table and perform the cell allotment process. The result shown in figure 5.

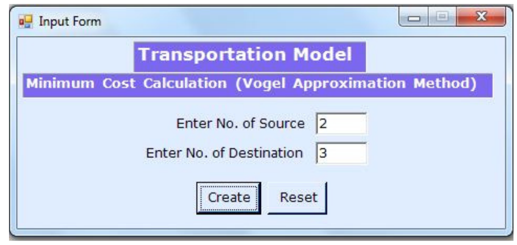

Figure 3 - Input form for creating m × n table

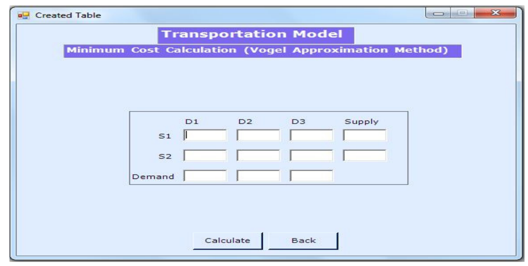

Figure 4 - 2×3 generated table

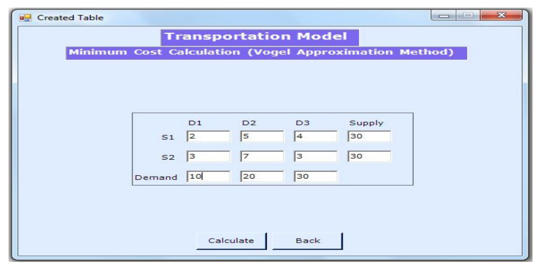

Figure 5 - 2×3 Transportation Problem with value

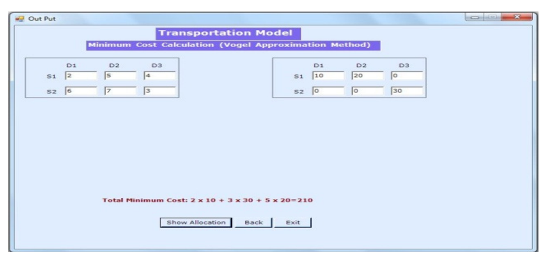

Figure 6 - Calculated Value with cell allotment

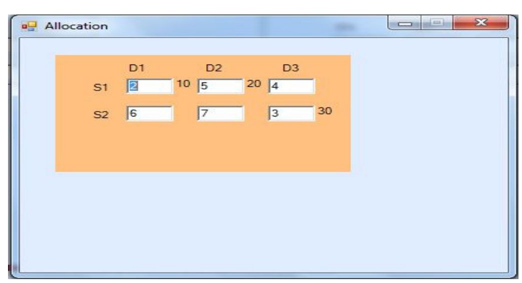

Figure 7 - Allocation

5. Conclusion

It is the special class of LP (linear programming) problem deals with the situation in which commodities are shipped from source to destination. Objective is to determine the amounts shipped from each source to each destination. Need to minimize the total shipping cost and need to satisfy both the supply limits and the demand requirements.

6. Acknowledgment

It gives us immense pleasure to express our deepest sense of gratitude to the people who have contributed either directly or indirectly in successful completion of the project. We owe a debt of gratitude to **Dr. Shamita Chakraborty**, Director, MM College of Technology, who provided us a good infrastructure and resources for completion of the project. We are also grateful to **Mrs. Kiran Chhabra**, Head of the Department, Department of Computer Science & Engineering, who molded us both technically and morally for achieving greater success in life. We are highly indebted to our project guide, **Ms. Ruchi Verma**, Assistant Professor, Department of Computer Science & Engineering, for her valuable guidance & encouragement during the entire period of our project work. Her innovative ideas, precise suggestions, timely discussions, whenever we were in need are whole heartedly appreciated.

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