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OPTIMIZATION TECHNIQUE BY MODIFIED VOGELS APPROXIMATION METHOD FOR SOLVING SUPPLY-DEMAND PROBLEM

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ABSTRACT

*Transportation problem is a well-known topic and is used very often in solving problem of Engineering and Management Science. In this paper, a new method, Modified Vogel's Approximation Method **(MVAM)** is used to solve the transporting the items form cookies and confectionary stockiest to the retailers. Further, comparative study among the new procedure and the ot\her existing procedure is established. The procedure for the solution is illustrated with a real valued problem.*

INTRODUCTION

The transportation problem is a special type of linear programming problem, where the objective is to minimize the cost of distributing a product from a number of sources to a number of destinations. The method of finding an initial basic feasible solution of transportation problem which considers the North-West-Corner cost cell at every stage of allocation. Then the Least Cost Method (LCM) consists in allocating as much as possible in the lowest cost cell of the transportation table in making allocation in every stage. Vogel's Approximation Method (VAM) provides comparatively better initial basic feasible solution.

Hence we have taken same transportation model and used MVAM to find its initial basic feasible solution and compared its result with above three methods, but MVAM gives minimum transportation cost and also optimal and, in some problems the result of MVAM is same as VAM but better than NWCM and LCM. Hence we used the new algorithm that provides a better initial basic feasible solution, for both the Balanced/Unbalanced, Degeneracy/Non-degeneracy transportation problem. The objective is to determine the optimum transportation cost to transfer the products from the sources to the destinations.

Modified Vogel's Approximation Method (MVAM)

Algorithm

- Compute penalty of each row and a column. The penalty of each row will be equal to the difference between the two largest shipping costs but the penalty of each column is equal to the difference between smallest costs.
- Identify the row or column with the largest penalty and assign minimum possible value to the variable having smallest shipping cost in that row or column.
- Cross out the satisfied row or column.
- Compute new penalties with same procedure until one row or column is left out.

Case-study problem:

1. A cookies and confectionary company has four stockiest located at Deepak Traders-Brindavan Road-Salem, Quality Foods Bakery and Sweets-Second Agraharam-Salem, Flora Marketing-Salem, Lakshmi Packaging Private Limited-Salem. which supply to vendors (retailers) located at Vignesh Bakes, Nandhni Snacks, Hema Beda Stall, Viji Cakes and Bakery. Weekly stockiest capacities to supply the biscuits are 200, 150, 250 and 400 units, respectively. Retailers demands for the biscuits 300, 200, 250 and 250. The unit transportation costs in Rupees are given below. Now we calculate the optimum distribution for the cookies and confectionary company in order to optimize (minimize) the total transportation cost.

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Cost table	Vignesh Bakes I	Nandhni Snacks II	Hema Beda Stall III	Viji Cakes and Bakery IV
Deepak Traders A	3	2	4	6
Quality Foods Bakery and Sweets B	2	4	5	3
Flora Marketing C	3	5	2	6
Lakshmi Packaging Private Limited D	2	3	6	4

Solution:

Cost table	Vignesh Bakes I	Nandhni Snacks II	Hema Beda Stall III	Viji Cakes and Bakery IV	Supply
Deepak Traders A	3	2	4	6	200
Quality Foods Bakery and Sweets B	2	4	5	3	150
Flora Marketing C	3	5	2	6	250
Lakshmi Packaging Private Limited D	2	3	6	4	400
Demand	300	200	250	250	1000

Since Total Supply = Total Demand = 1000, the given problem is balanced. By MVAM, the initial basic feasible solution is shown as,

	I	II	III	IV
A	[$\in_1$] 3	[200] 2	4	6
B	[150] 2	4	5	3
C	[$\in_2$] 3	5	[250] 2	6
D	[150] 4	3	6	[250] 4

The Initial Transportation Cost for balanced transportation problem = Rs.2800.

2. Three warehouses supply Cadbury chocolates to four supermarkets. The table indicates that the cost of transporting per unit between warehouse and supermarkets, warehouse capacities and requirements of the supermarkets. However, due to the bridge construction in Salem, a major bridge has been damaged preventing deliveries from warehouse A to supermarket 3, from warehouse C to supermarket 2. Within these limitations, we are planning to determine the optimum transportation cost for the delivery scheme.

Cost Table	Bharathi Supermarket I	9 to 9 Supermarket II	Suji Supermarket III	Sathiyasai Supermarket IV	Supply
Cadbury Fudge Mints, Seeragapadi A	3	8	9	15	300
KikatRessert Delight Chocolate,Yercaud B	2	3	8	7	100

Banana Chocolate, Main Bazar C	6	9	7	7	150
Ragi Chocolate Milk Shake, AllagapuramKattur D	2	5	6	9	50
Demand	100	150	170	100	

Solution:

Cost Table	Bharathi Supermarket I	9 to 9 Supermarket II	Suji Supermarket III	Sathiyasai Supermarket IV	Supply
Cadbury Fudge Mints, Seeragapadi A	3	8	9	15	300
KikatRessert Delight Chocolate,Yercaud B	2	3	8	7	100
Banana Chocolate, Main Bazar C	6	9	7	7	150
Ragi Chocolate Milk Shake, AllagapuramKattur D	2	5	6	9	50
Demand	100	150	170	100	600

Total Supply = 600 and Total Demand = 520, supply$\neq$ demand, so that the given problem is unbalanced. Introduce a dummy demand point having 80 units of demand, solving by MVAM, the initial basic feasible solution is shown,

	I	**II**	**III**	**IV**	**Dummy**
A	100 3	120 8	9	15	80 0
B	2	3	8	100 7	0
C	6	9	150 7	$\in$ 7	0
D	2	30 5	20 6	9	0

The Initial Transportation Cost for unbalanced transportation problem = Rs. 3280.

RESULTS AND CONCLUSION

We compare the results of the two problems with already existing methods for finding initial basic feasible solution and the MODI method result and listed in the following table:

Problems	Size of the problem	NWCM	LCM	VAM	MODI	MVAM	REMARK
1.	4×4	3850	2800	2800	2800	2800	Optimum
2.	4×4	3590	3980	3320	2980	3280	Near to optimum

The results of VAM, MVAM and MODI are close together optimal values but better than the old methods. Moreover this method is very easy to understand and the solution is very near to optimum.

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