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A Novel Procedure for Finding Initial Basic Feasible Solution To Vogel's Approximation Method

KEYWORDS: Vogel's Approximation Method, Optimal Solution, Reduction Method.

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ABSTRACT *Transportation problem can be solved by using the new technique, which shows same result as Vogel's approximation method for finding minimal transportation cost. It is illustrated by considering a numerical example. It is analyzed that the solution obtain by this method is close to the initial basic feasible solution obtained by the VAM method.*

INTRODUCTION:

The transportation problem is one of the most frequently encountered application in real life situations and is a special type of linear programming problem. The transportation problem indicates the amount of consignment to be transported from various origins to different destinations so that the total transportation cost is minimized without violating the availability constraints and the requirement constraints.

The two common objectives of such problems are either
(1) minimize the cost or

(2) maximize the profit.

GENERAL FORM OF TRANSPORTATION PROBLEM:

Objective function :

$$\text{Minimize} \sum\sum C_{ij}X_{ij}$$

Subject to the constraint:

$\sum X_{ij} = a_i$, i = 1,2,……,m

$\sum X_{ij} = b_j$, j = 1,2,……,n

$X_{ij} \geq 0,\ i = 1,2,\ldots,m\,;\, j = 1,2,\ldots,$

ALGORITHM:

Step 1 : Formulate the given problem and set up in a matrix form. Check whether the given problem is balanced or unbalanced transportation problem. If unbalanced add, dummy source (rows) or dummy destination (columns) as required.

Step 2 : Obtain the initial basic feasible solution by new method and determine the smallest cost in the demand or supply of the transportation table.

Step 3 : Select the least value in the demand or supply and make allocation in the cell having least cost in the selected row or column.

Step 4 : Delete the row or column which has no values for destination or source.

Step 5 : With the new reduced table again repeat the steps to allocate the available values, until all the rim requirements are satisfied.

Step 6 : Obtain the initial basic feasible solution for the transportation problem.

Example problem :

1. Find the optimal solution using the new method and compare your values with vogel's approximation method?

	A	B	C	SUPPLY
1	16	20	12	200
2	14	8	18	160
3	26	24	16	90
DEMAND	180	120	150	

Solution :

Step 1:

	A	B	C	SUPPLY
1	16	20	12	200
2	14	8	18	160
			90	
3	26	24	16	~~90~~
DEMAND	180	120	~~150~~ 60	

Now , delete the exhausted Row 3 which gives a new reduced table as shown below. Again repeat the steps

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Step 2:

	A	B	C	SUPPLY
1	16	20	12 (60)	~~200~~ 140
2	14	8	18	160
DEMAND	180	120	~~60~~	

Step 3 :
Table after deleting Column C

1	16	20 (120)	140
2	14	8	~~160~~ 40
DEMAND	180	~~120~~	

Step 4:
Finally, after deleting Column B, we have

	A	SUPPLY
1	16 (140)	~~140~~
2	14 (40)	~~40~~ 0
DEMAND	~~180~~	
	~~140~~	
	0	

Now only source (1,1) is left. Allocating 1 and 1 satisfies the demand of 180

Step 5:
The initial Basic Feasible Solution using new method of transportation problem is given as follows :

	A	B	C	SUPPLY
1	16 (140)	20	12 (60)	200
2	14 (40)	8 (120)	18	160
3	26	24	16 (90)	90
DEMAND	180	120	150	

Transportation Cost = (140x16) + (60x12)+ (40x14) + (120x8) + (90x16)

= 2240+ 720 + 560 + 960+ 1440

= Rs. 5920

VOGEL'S APROXIMATION METHOD :

	A	B	C	SUPPLY				
1	16 (140)	20	12 (60)	~~200~~ 140	4	4	4	~~18~~
2	14 (40)	8 (120)	18	~~160~~ 40	6	4	4	14
3	26	24	16 (90)	~~90~~	8	~~10~~	-	-
DEMAND	~~180~~ 40	~~120~~	~~150~~ 60					
	2	~~12~~	4					
	2	-	4					
	2	-	~~6~~					
	2	-	-					

Transportation Cost = (140x16) + (60x12) + (40x14) + (120x8) + (90x16)

= 2240 + 560 + 960 + 720 + 1440

= Rs. 5920

2. Solve the initial basic solution using new method and compare their values with vogel's approximation method?

				SUPPLY
11	13	17	14	250
16	18	14	10	300
21	24	13	10	400
DEMAND 200	225	275	250	950

Solution :

Step 1:

				SUPPLY	
200 1	13	17	14	~~250~~	50
16	18	14	10	300	
21	24	13	10	400	
DEMAND ~~200~~ 0	225	275	250		

Now , delete the exhausted column 1 which gives a new reduced table as shown below. Again repeat the steps

Step 2 :

			SUPPLY	
50			~~50~~	0
~~13~~	~~17~~	~~14~~		
18	14	10	300	
24	13	10	400	
DEMAND ~~225~~ 175	275	250		

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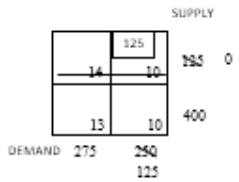
Step 3 :

Table after deleting row 1

Step 4:

Table after deleting column 1



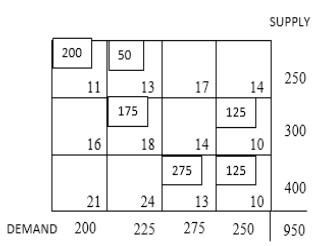
Step 5:

Finally, after deleting row 1, we have

Now only source A_{23} is left. Allocating 3 and 3 satisfies the demand of 275

Step 6:

The initial Basic Feasible Solution using new method of transportation problem is given as follows :

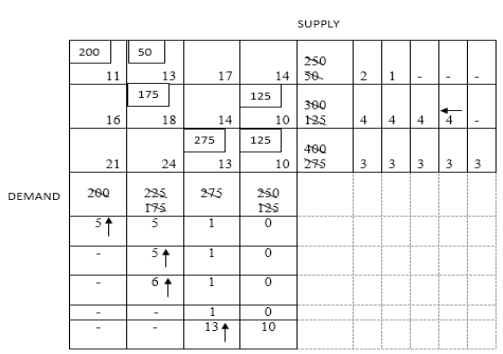


Transportation Cost = (200x11) + (50x13) + (175x18) + (125x10) + (275x13) + (125x10)

= 2200 + 650 + 1250 + 1250 + 3150 + 3575

= Rs. 12075

VOGEL'S APROXIMATION METHOD :



Transportation Cost = (200x11) + (50x13) + (175x18) + (125x10) + (275x13) + (125x10)

= 2200 + 650 + 1250 + 1250 + 3150 + 3575

= Rs. 12075

CONCLUSION :

In this paper, we discussed about the Different way of assign a transportation cost to the vogel's approximation problem. We have found that using the vogel's approximation Method and novel procedure, Transportation cost where found to be same as that of VAM Method. This way finding an initial basic feasible solution gives clear idea of transportation. It is a quick way of finding the minimum cost of the given problem

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