A STUDY ON INITIAL SOLUTION OF A TRANSPORTATION PROBLEM

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Abstract:

The Transportation algorithm minimizes the cost of transporting things from m origins to n purposes along m*n direct routes from origin to the purpose. There are three methods to solve the transportation problem and their solution can be further improved using the Modified Distribution Method (MODI Method). i.e. when a number of allocations less than m+n-1. In this case, we have to make the number of allocations equal to m+n-1. To remove degeneracy we allocate some cells with dummy allocations, whose value is nearly equal to zero. But, till now there is no specific rule for allocating these cells. In this study, a specific method has been proposed to remove this problem of degeneracy. Thus this study helps to remove the major bottleneck from the transportation algorithm.

IndexTerms **-** Transportation Problem, Modified Distribution Method, Vogel Method.

Vogel's Approximation Method (VAM)

Algorithm

Stage 1: From the transportation table we decide the punishment for each line and segment. The punishments are determined for each line (or segment) by subtracting the least cost component in that (section) from the next least-cost component in a similar line (section). Record the punishments underneath the lines (besides the sections) of the table.

Stage 2: select the line (section) with the most elevated punishment rating and dispense however much as could be expected from the supply and necessity esteems to the cell having the base expense. (In the event that there is a tie in the estimations of punishments, at that point check the following level punishment i.e., the following two least cost, the course having increasingly straightaway punishment will be picked. (New Rule for a tie of punishments)

This standard is incredibly useful in getting a fundamental possible arrangement in closeness to the ideal arrangement

Stage 3: Adjust the free market activity condition for that cell. Wipe out those lines (section) for which the free market activity necessities are met.

Stage 4: Repeat the means 1-3 with the diminished table except if all interest and supply ends up zero.

Problem

The Oberoi car company has warehouses in Amritsar (W_1) , Nanded (W_2), and Patna (W_3), and markets in Noida (M_1), Bangalore(M_2), Kolkata (M_3) and Gandhinagar (M_4)

Factory / Markets	M_1	M_2	M_3	M_4	Availability
W_1	24	23	43	14	60
W_2	34	32	12	40	80
W_3	20	22	23	41	100
Demand	40	70	80	50	Total=240

Step 1

Factory / Markets	M_1	M_2	M_3	M_4	Availability	penalty
W_1	24	23	43	14(50)	10	9
W_2	34	32	12		80	20
W_3	20	22	23		100	2
Demand	40	70	80			
penalty	4	1	9	26↑		

Step 2

Factory / Markets	M_1	M_2	M_3	M_4	Availability	penalty
W_1	24	23		14(50)	10	1
W_2			12(80)			20 ←
W_3	20	22			100	2
Demand	40	70				
penalty	4	1	9			

Step 3

Factory / Markets	M_1	M_2	M_3	M_4	Availability	penalty
W_1	24	23		14(50)	10	1
W_2			12(80)			
W_3	20(40)	22			60	2
Demand		70				
penalty	4 ↑	1				

Step 4

Factory / Markets	M_1	M_2	M_3	M_4	Availability	penalty
W_1		23(10)		14(50)		
W_2			12(80)			
W_3	20(40)	22(60)				
Demand						
penalty						

The total transportation cost is 23*10+14*50+12*80+20*40+22*60 = 4010

Modified Distribution Method (MODI Method)

The basic feasible solution obtained by the above method are not necessarily optimal, therefore, we have to check the optimality of the above solution. The most dependable method to check the optimality of the basic feasible solution is the Modified Distribution Method (MODI Method)

Problem

Solve the following transportation problem

		To			
From		1	2	3	Supply
	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
	Demand	7	9	18	34

First, we will solve this problem using Least Cost Method,

	To				
From		1	2	3	Supply
	1		7(2)	4(3)	
	2			1(8)	
	3		4(7)		
	4	1(7)		2(7)	
	Demand				34

Step 1

(2) (3) (-1)	(7) 2	(4) 3	u_1= 4
(3) (0) (3)	(3) (4) (-1)	(1) 8	u_2 = 1
(5) (0) (5)	(4) 7	(7) (1) (6)	u_3 = 1
(1) 7	(6) (5) (1)	(2) 7	u_4 = 2
v_1= -1	v_2 = 3	v_3 = 0	

(2)	(7)	(4) 5
(3)	(3) 2	(1) 6
(5)	(4) 7	(7)
(1) 7	(6)	(2) 7

Step 2

(2) (3) (-1)	(7) (6) (1)	(4) 5	u_1= 4
(3) (0) (3)	(3) 2	(1) 6	u_2 = 1
(5) (1) (4)	(4) 7	(7) (2) (5)	u_3 = 2
(1) 7	(6) (4) (2)	(2) 7	u_4 = 2
v_1= -1	v_2 = 2	v_3 = 0	

(2) 5	(7)	(4)
(3)	(3) 2	(1) 6
(5)	(4) 7	(7)
(1) 2	(6)	(2) 12

Step 3

(2) 5	(7) (5) (2)	(4) (3) (1)	u_1= 2
(3) (0) (3)	(3) 2	(1) 6	u_2 = 0
(5) (1) (4)	(4) 7	(7) (2) (5)	u_3 = 1
(1) 2	(6) (4) (2)	(2) 12	u_4 = 1
v_1= 0	v_2 = 3	v_3 = 1	

As all Δ_{ij} are positive; Total cost = 2*5 + 3*2 + 1*6 + 4*7 + 1*2 + 2*12 = 76 Hence solution obtained is optimal.

Conclusion:

The transportation problem is one of the most popular types of linear programming problem. The algorithm to get a solution to the transportation problem has been widely used to solve the transportation problem in various cases. i.e. when numbers of allocations are less than m+n-1, there was no exact rule to resolve this degeneracy. Hence, this study tries to make the transportation algorithm more efficient and user-friendly.

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