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Comparative Analysis of Assignment Problem for Maximization Case

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Abstract: *Assignment Problem is special kind of linear programming problem For maximization case, Here we Proposed a new method for finding the optimum solution for the given assignment problem. This method employs a much slimmer way of approaching the problem thereby making it preferred option on addressing assignment problem. This method is very easy to understand as compared to other methods, for better understanding example is included at the end of this paper.*
Keywords: *Assignment problems, cost matrix, maximum profit, optimization.*

I. Introduction

The assignment problem is defined as assigning each facility to one and only one job so as to optimize the given measures of effectiveness, when n facilities and n jobs are available and given the effectiveness of each facility for each job.Let there be n facilities (machines) to be assigned to n jobs. Let cij is cost of assigning ith facility to jth job and xij represents the assignment of ith facility to jth job. If ith facility can be assigned to jth job, xij=1, otherwise zero. The objective is to make assignments that minimize the total assignment cost or maximize the total associated gain.

Thus an assignment problem can be represented by n x n matrix which continues n! Possible ways of making assignments. One obvious way to find the optimal solution is to write all the n! Possible arrangements, evaluate the cost of each and select the one involving the minimum cost.

II. Algorithm

Step I:
Consider the given cost matrix. if the given assignment problem is unbalanced assignment problem then convert it to balanced assignment problem.
Step II:
New matrix is constructed from the already present cost matrix. This is obtained by subtracting each row by the maximum cost of its row.
Step III:
From the matrix Zero position are considered. Identify the zero which has unique position, and allocation is done to that position. Delete the corresponding rows and column after allocation. This process is done till all the jobs get assigned.
Step IV:
Identify the next successor values of the the zero position. Allocation is done to the row which has the maximum successor value.
Step V:
If two or more successor values are same then consider next to next successor values of the zero position.
Allocation is done to the row which has the maximum successor value.
Step VI:
After allocation, the reduced matrix should satisfy to have each row to have zero at least, if not the row that doesn't have zero is obtained by subtracting minimum elements from all of its elements.
Step VII:
Repeat from step 3 to step 6 until all the jobs get assigned
Step VIII:
Calculate the Allocation Cost or optimized Cost

III. Numerical Example

Four jobs are processed on Four Machines. Find the optimum assignment of jobs to machine and corresponding profit.

Jobs/Machines	M1	M2	M3	M4
A1	42	35	28	21
A2	30	25	20	15
A3	30	25	20	15
A4	24	20	16	12

Find the optimum assignment of jobs to machine and corresponding profit.

Solution

Step 1: Row reduction

Jobs/Machines	M1	M2	M3	M4
A1	0	7	14	21
A2	0	5	10	15
A3	0	5	10	15
A4	0	4	8	12

Position of zero

Row	Column	Successor of Zero
A1	M1	7
A2	M1	5
A3	M1	5
A4	M1	4

The maximum values of successor of zero is seven belongs to job A1 and machine M1.therefoe assign job A1 to M1.and delete row A1 and Column M1.

Step 2:

Jobs/Machines	M2	M3	M4
A2	5	10	15
A3	5	10	15
A4	4	8	12

Subtract the minimum element from each row from all other element in that row.

Jobs/Machines	M2	M3	M4
A2	0	5	10
A3	0	5	10
A4	0	4	8

Position of zero

Row	Column	Successor of Zero
A2	M2	5 (10)
A3	M2	5 (10)
A4	M2	4

The maximum values of successor of zero is ten belongs to job A2 and machine M2 and job A3 and machine M2.randomly take any one. Therefore assign job A2 to M2.and delete row A2 and Column M2.

Step 3:

Jobs/Machines	M3	M4
A3	5	10
A4	4	8

Subtract the minimum element from each row from all other element in that row.

Jobs/Machines	M3	M4
A3	0	5
A4	0	4

Position of zero

Row	Column	Successor of Zero

A3	M3	5
A4	M3	4

The maximum values of successor of zero is five belongs to job A3 and machine M3.therefoe assign job A3 to M3.and delete row A3 and Column M3.and finally only one row and one column left out so assign job A4 to M4.

Optimum Solution

Job	Machine	Cost
A1	M1	42
A2	M2	25
A3	M3	20
A4	M4	12
	Total	Rs.99/-

Comparison: If we solve this problem using Hungarian method then also the optimum cost is Rs 99/-.but this method is easy to understand than Hungarian method.

IV. Conclusion

In this paper a new method is introduced for solving assignment problem for maximization case. This method is very easy to understand. From this paper it can be concluded that this method provide optimal solution for a given assignment problem in less steps for maximization assignment problem. This new method consumes less time for obtaining optimal solution for a given maximization assignment problem.

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