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A NEW APPROACH FOR SOLVING INTERVAL BASED ASSIGNMENT PROBLEM BY USING COMPLETE BIPARTITE graph

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ABSTRACT: In this paper introduced solving interval based Assignment problem in another way by using complete bipartite graph directly with algorithm. The edges are represented the cost of assigning person to task, the nodes are represented the tasks and persons. The solution will be by choosing the minimum cost (edge) from the costs (edges) and delete the selected edge as well as nodes associated with the corresponding edge, then delete all other edges associated with the nodes. Also, compare the optimal solution with this new interval method and an existing interval assignment method.

***Keyword* - Assignment problem, Hungarian assignment method (HA-method), Complete Bipartite graph, Optimization.**

I. INTRODUCTION

The assignment models is a special state of a linear programming models and its similar to the transportation model. Assignment models deals with the topic how to assign n workers to n jobs such that the cost incurred is minimized. It was developed and published in 1955 by H. Kuhn, who gave the name "Hungarian method" because the method in general based on the earlier works of two Hungarian mathematicians: D. Konig and J. Egervary and is therefore known as Hungarian method of assignment models.In most cases that parameters of the problem are not available in precise values, they are expressed in interval. While dealing with assignment problem, the most important tool namely range convert the interval into their equivalent cost entries. Amutha et al. [1] has studied a method of solved extension of the interval in assignment problem.

II. INTERVAL ARITHMETIC

The interval form of the parameters may be written as where is the left value [$\underline{x}$] and is the right value [x] of the interval respectively.

Let [$\underline{x}$; $\bar{x}$] and [$\underline{y}$; $\bar{y}$] be two elements then the following arithmetic are well known

(i) $[\underline{x}, \bar{x}] + [\underline{y}, \bar{y}] = [\underline{x} + \underline{y}; \bar{x} + \bar{y}]$

(ii$[\underline{x}, \bar{x}] - [\underline{y}, \bar{y}] = [\underline{x} - \underline{y}; \bar{x} - \bar{y}]$

(iii) $[\underline{x}, \bar{x}] \times [\underline{y}, \bar{y}] = [\min\{\underline{xy}, \underline{x}\bar{y}; \bar{x}\,\underline{y}, \bar{x}\,\bar{y}\}, \max\{\underline{xy}, \underline{x}\bar{y}; \bar{x}\,\underline{y}, \bar{x}\,\bar{y}\}]$

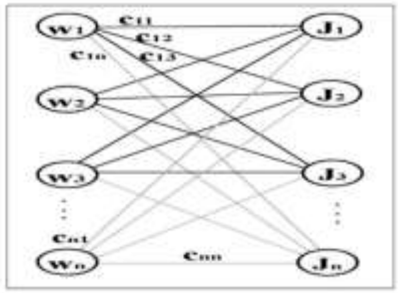
Consider a problem of assignment of n resources to m activities so as to minimize the overall cost or time in such a way that each resource can associate with one and only one job based on interval.

A. Interval Based Assignment Problem by using Complete Bipartite graph

In this section, proposed interval Interval Based Assignment Problem by using Complete Bipartite graph

1. Subtract the lowest value from the highest value of the interval and then convert the entire interval cost matrix to single value cost matrix.
2. Subtract the smallest element of each row from every element of the corresponding row.

3. Subtract smallest element of each column from every element of the corresponding column.
4. Converting the problem into a Complete bipartite graph.



- The value of C_{ij} is after Subtracting smallest element of each column from every element of the corresponding column.
- Choose the lowest cost $C_{ij} = 0$ between workers and tasks. Delete the selected edge as well as the nodes associated with edge.
- Repeat the previous step to obtain each worker associated with only one task.
- When more than one zero exist in C_{ij}, select the edge which contains maximum value associated with zero node. Next delete the selected edge as well as the nodes associated with edge.
- After assigning each worker associated with only one task, the final assigning value of the task is as it is.
- Find the optimal solution.

B Example **.** *Consider the following interval assignment problem. Assign the four jobs to the four machines so as to minimize the total cost.*

	I	II	III	IV
1	[10,20]	[10,15]	[2,15]	[0,15]
2	[1,4]	[3,12]	[5,23]	[4,7]
3	[5,15]	[2,9]	[3,6]	[6,8]
4	[2,7]	[4,15]	[4,13]	[2,9]

Converting the interval assignment problem to usual cost matrix by using range.

Step 1.

	I	II	III	IV
1	10	5	13	15
2	3	9	18	3
3	10	7	3	2
4	5	11	9	7

Step (2): Row reduction

	I	II	III	IV
1	5	0	8	10
2	0	6	15	0
3	8	5	1	0
4	0	6	4	2

Step (3): Column reduction

	I	II	III	IV
1	5	0	7	10
2	0	6	14	0
3	8	5	0	0
4	0	6	3	2

1 → II has zero. Delete 1 and II
Step 5:

2 → I and 2 → IV have zero. Delete either 2 and I or 2 and IV.
Here min{8,0} = 0
Delete 2 → IV
Step 6:

The final optimal solution is
1 → I – 5
2 → II – 3
3 → III – 3
4 → IV – 5
Therefore, the minimal Assignment:5+3+3+5=16.

III CONCLUSION

A numerical example has been presented for demonstrating the solution procedure of the proposed method. This proposed method can also be applicable for the maximization and unbalanced assignment problem

REFERENCES

[1]. M.S.Bazaraa, John J.Jarvis, Hanif D.Sherali, Linear programming and network flows, A John Wiley & Sons, Inc., Publication, forth edition, 2010, 513-542.
[2]. P.K. Gupta, Operations Research, Krishna Prakashan media (P) Ltd.Meerut , 2008, 485-534.
[3]. ShwetaSingh,G.C.Dubey, Rajesh Shrivastava, Comparative analysis of Assignment problem, IOSR Journal of Engineering, Vol 2, Issue 8, 2012 pp1-15.
[4]. A.Seethalakshmy , Dr.N.Srinivasan, A New Methodology for solving A Maximization Assignment Problem,MNK Publication Volume-5,Issue-6,2016, 10-13.
[5]. Humayra Dil Afroz, Dr. Mohammad Anwar Hossen, New proposed method for solving Assignment problem and comparative study with the existing methods, IOSR, Journal of mathematics volume B, ISSUE 2, 84-88.