Review of International Geographical Education | RIGEO | 2020

RIGE

ISSN: 2146 - 0353

Review of International GEOGRAPHICAL EDUCATION

www.rigeo.org

Divided Star Graph Model for Solving Assignment Problem with Centroid Ranking Method

[1]M. Mary Helen Meera Bai1, [2]DR. S. Ananthalakshmi2, [3]Dr. M. Kalai Selvi

[1]Research Scholar
Reg No:19122072092002
Department of Mathematics,
Govindammal Aditanar College for Women,
Affliated to Manonmaniam Sundaranar University,
Abishekapatti, Tirunelveli – 627 012.

[2]Assistant Professor,
Department of Mathematics,
Annai Hajira Women's College,
Melapalayam, Tirunelveli.

[3]Associative Professor,
Department of Mathematics,
Govindammal Aditanar College For Women,
Tiruchendur.

Email Id : [1]maryhelanmeerabai@gmail.com, [2]ananthivasan@gmail.com, [3]kesritharan@gmail.com

Abstract

This article provided an alternative approach to handling assignment problems by outlining the Centroid Ranking Method, which divides a star network directly, along with an algorithm and procedures for solving the issue. The nodes represent jobs and people, while the edges indicate the cost of allocating them to tasks following the division approach. The approach is to choose the edge with the lowest cost (costs) and remove it along with any nodes that are connected to it. Then, remove any additional edges that are related with the nodes.

Keywords: Subjects covered include optimization, centroids, star graphs, divided methods, and assignment problems.

1. INTRODUCTION:

The assignment problem arises because available resources (such as men, machines etc.) have varying degree of efficiency for performing different activity. Therefore, cost, profit or time of performing different activity is different. Thus, the problem is how the assignments should be

made so as to optimize the given objective. The assignment problem is completely specified by its two components, the assignment which represents the underlying combinatorial structure and the objective function to be optimized which models "the best possible way."

The assignment problem is a particular type of the transportation problem where the objective is to assign a number of resources to an equal number of activities so as to as to minimize total profit of allocation. In the assignment model, worker s represent sources and jobs destination. The supply (demand) amount at each source (destination) exactly equal 1. The cost of "transporting" worker to job is. In effect, the assignment model can be solved directly as a regular transportation model (or as a regular linear programming problem). Nevertheless, the fact that all the supply and demand amounts equals 1 has led to the development of a simple solution method called Hungarian method.

Centroid ranking method:

The centroid of a triangle fuzzy number $\tilde{a} = (a, b, c; w)$ as $G_2 = (\frac{a+b+c}{3}, \frac{w}{3})$. The ranking function of the generalized fuzzy number $\tilde{a} = (a, b, c; w)$ which maps the set of all fuzzy numbers to a set of real numbers is defined as $R(\tilde{a}) = (\frac{a+b+c}{3})(\frac{w}{3})$.

Algorithm of Divided Star Graph Method - DSG Method:

Step 1: Convert the fuzzy number by centroid ranking method

Step 2: First divide all the numbers by two and write the whole number.

Example: $[\frac{19}{2}] = 9$.

Step 3: Find the smallest number (cost) of each row. Subtract this smallest number from every number in that row. Next, find the smallest number (cost) of each column. Subtract this smallest number from every number in that column.

If there are some rows and columns without assignment, then we cannot get the optimum solution.

Step 4: Number of lines = Order of a Matrix. Then we go to the next step.

Step 5: Converting the problem into star graph .

Step 6: Optimize the solution

Numerical Method:

The Let there are four faculty members A, B, C, D and we have to assign four subjects I, II, III, IV to each of them. Each faculty member has obtained the scores by the Chairman, Course Director and the students of the department based on the performance in previous semester.

	I	II	III	IV
A	(1, 4, 7)	(3, 6, 9)	(7, 10, 13)	(2, 5, 8)
B	(8, 11, 14)	(5, 8, 11)	(4, 7, 10)	(6, 9, 12)
C	(9, 12, 15)	(0, 3, 6)	(1, 4, 7)	(4, 7, 10)
D	(7, 10, 13)	(8, 11, 14)	(2, 5, 8)	(3,6, 9)

By centroid ranking method:

$R(\tilde{a}) = (\frac{a+b+c}{3})(\frac{w}{3})$ Let w= 1

$$R(1,4,7) = (\frac{1+4+7}{3})(\frac{1}{3}) = \frac{12}{9} = 1.33$$

$$R(3,6,9) = (\frac{3+6+9}{3})(\frac{1}{3}) = \frac{18}{9} = 2$$

$$R(2,5,8) = (\frac{2+5+8}{3})(\frac{1}{3}) = \frac{15}{9} = 1.66$$

$$R(8,11,14) = \left(\frac{8+11+14}{3}\right)\left(\frac{1}{3}\right) = \frac{33}{9} = 3.66$$

$$R(5,8,11) = \left(\frac{5+8+11}{3}\right)\left(\frac{1}{3}\right) = \frac{24}{9} = 2.66$$

$$R(4,7,10) = \left(\frac{4+7+10}{3}\right)\left(\frac{1}{3}\right) = \frac{21}{9} = 2.33$$

$$R(6,9,12) = \left(\frac{6+9+12}{3}\right)\left(\frac{1}{3}\right) = \frac{27}{9} = 3$$

$$R(9,12,15) = \left(\frac{9+12+15}{3}\right)\left(\frac{1}{3}\right) = \frac{36}{9} = 4$$

$$R(0,3,6) = \left(\frac{0+3+6}{3}\right)\left(\frac{1}{3}\right) = \frac{9}{9} = 1$$

$$R(1,4,7) = \left(\frac{1+4+7}{3}\right)\left(\frac{1}{3}\right) = \frac{12}{9} = 1.33$$

$$R(4,7,10) = \left(\frac{4+7+10}{3}\right)\left(\frac{1}{3}\right) = \frac{21}{9} = 2.33$$

$$R(7,10,13) = \left(\frac{7+10+13}{3}\right)\left(\frac{1}{3}\right) = \frac{30}{9} = 3.33$$

$$R(8,11,14) = \left(\frac{8+11+14}{3}\right)\left(\frac{1}{3}\right) = \frac{33}{9} = 3.66$$

$$R(2,5,8) = \left(\frac{2+5+8}{3}\right)\left(\frac{1}{3}\right) = \frac{15}{9} = 1.66$$

$$R(3,6,9) = \left(\frac{3+6+9}{3}\right)\left(\frac{1}{3}\right) = \frac{18}{9} = 2$$

After putting these values, we get the assignment problem

	I	II	III	IV
A	1.33	2	3.33	1.66
B	3.66	2.66	2.33	3
C	4	1	1.33	2.33
D	3.33	3.66	1.66	2

Step 1: First divide all the numbers by two and write the whole number.

	I	**II**	**III**	**IV**
A	0	1	1	0
B	1	1	1	1
C	2	0	0	1
D	1	1	0	1

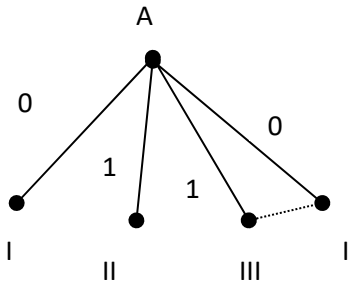
Step 2: Find the smallest number (cost) of each row. Subtract this smallest number from every number in that row. Next, find the smallest number (cost) of each column. Subtract this smallest number from every number in that column.

.

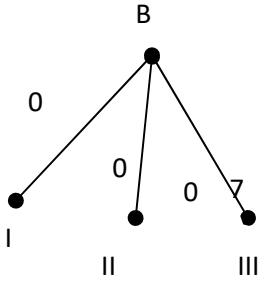
	I	II	III	IV
A	0	1	1	0
B	0	0	0	0
C	2	0	0	1
D	1	1	0	1

	I	II	III	IV
A	0	1	1	0
B	0	0	0	0
C	2	0	0	1
D	1	1	0	1

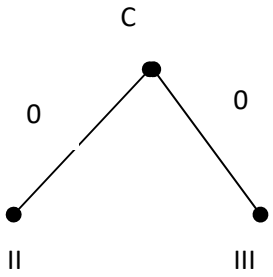
Step 3: Converting the problem into star graph .



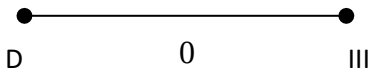
Assinging A to IV, delete node A and IV. Then the resultant graph is



Assinging B to I , delete node B and I. Then the resultant graph is



Assinging C to II, delete node C and II. Then the resultant graph is



Assinging D to III

A – IV, B – I, C – II, D - III

The optimal solution is 1.66 + 3.66 + 1.00 + 1.66 = 7.98.

REFERENCES

[1] Abdur Rashid, An Alternative Approach for Solving UnbalancedAssignment Problems, *Jahangirnagar University Journal of Science*, **40** (2)(2017), 45-56.

[2] Anju Khandelwal, An Amalgamated Approach for Solving UnbalancedAssignment Problem, *Malaya Journal of Mathematik*, **6** (2) (2018), 321-325.https://doi.org/10.26637/mjm0602/0003

[3] Anwar Nsaif Jasim, A New Method to Solve Assignment Models, *AppliedMathematical Sciences*, **11** (54) (2017), 2663-2670.https://doi.org/10.12988/ams.2017.78252

[4] H.D. Afroz and Md. Anwar Hossen, New Proposed Method for SolvingAssignment Problem and Comparative Study with the Existing Methods, *IOSRJournal of Mathematics (IOSR-JM)*, **13** (2) (2017), 84-88.https://doi.org/10.9790/5728-1302048488

[5] N. Sujatha and A.V.S.N. Murthy, An Advanced Method for FindingOptimal Solution of Assignment Problem, *International Journal of Science andResearch*, **5** (5) (2016), 1352-1353. https://doi.org/10.21275/v5i4.6041604

[6] R. S. Porchelvi and M. Anitha, Optimal Solution for Assignment Problemby Average Total Opportunity Cost Method, *Journal of Mathematics andInformatics*, **13** (2018), 21-27. https://doi.org/10.22457/jmi.v13a3

[7] Rajendra B. Patel, Solution of Assignment Problem with New Method,Compared with Traditional Existing Method, *International Journal of AdvanceEngineering and Research Development*, **5** (2) (2018).