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Comparison of Optimization Path Using Transportation Problem and Game Theory

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ABSTRACT

The current technique for tackling transportation issue is northwest corner strategy, slightest cost strategy, Vogel's estimate strategy. The improvement forms in arithmetic, software engineering and financial aspects are explaining adequately by picking the best component from set of accessible choice components. The most critical and fruitful applications of the optimization technique refers to transportation issue (TP) and extraordinary class of the direct programming (LP) in the task explore (OR). The primary target of transportation issue arrangement techniques is to limit the cost or the season of transportation. In game theory, diversion hypothesis has seen fabulous triumphs in transformative science and financial aspects, and is starting to upset different orders from brain research to political science. The problems are having either saddle point or without saddle point. A new method is proposed to compare transportation problem and game theory.

Keywords: Transportation Problem, Game Theory, Saddle Point, Optimal Solution.

I. INTRODUCTION

Transportation problem is a linear programming problem and has three methods. To find the initial basic feasible solution of balanced transportation problems are northwest corner method, least cost method, Vogel's approximation method. The above methods are efficient to give an optimal solution. This type of problem can be solved for a general network. Transportation model is used in the following ways:

- To decide the transportation of new material from various centers of different manufacturing plan.
- To decide the transportation of finished goods from different manufacturing plan for the different distribution centers.

These two are the uses of transportation model. The objective is minimizing transportation cost. Game theory is the study of models of conflicts and cooperating between intelligent rational decision makers. Game theory has 3 types of decision making situations such as deterministic situation, probabilistic situation, uncertainty situation. The minimum value of each row and maximum value of each column in the particular approach can be chosen that maximizes the minimum gains. This is called the maximin value of the game. The same approach is used to minimize the maximum losses. If the maximin value equals the minimax value then the game is said to have a saddle point. The corresponding strategies are called optimum strategy. The amount of a payoff from an equilibrium point is known as the value of the game.

II. RELATED WORK

The essential transportation issue was initially created by Hitchcock (1941). Productive strategies for arrangement are gotten from the simplex calculation and were created in 1947. The transportation issue can be changed over as a standard straight programming issue, which can be illuminated by the simplex technique. As a result of its extremely extraordinary scientific structure, it was perceived early that the simplex strategy connected to the transportation issue can be made very proficient as far as how to assess the vital simplex-technique data. Charnes et al(1954) built up the stepping stone method which gives an elective method for deciding the simplex-technique data.

Dantzig(1963) utilized the simplex technique in the transportation issue as the primal simplex transportation strategy. an underlying fundamental practical answer for the transportation issue can be gotten by utilizing the north west corner run, row minima, column minima, matrix minima, or the vogel's estimate strategy.

Ashram et al (1989) presented another calculation for taking care of the transportation issue. The proposed technique utilized just a single task, the gauss Jordan rotating strategy, which was utilized as a part of simplex technique. The last table can be utilized for the post optimality investigation of transportation issue. This calculation is quicker than simplex, broader than venturing stone and fewer complexes than both in taking care of general transportation issue.

III. PROPOSED METHOD

The proposed work is to find the optimal value for both transportation problem and game theory in balanced problem. In transportation problem, three methods are used such as northwest corner method, least cost method, Vogel's approximation method.
Terminology used in the transportation model is

- Feasible solution: itsatisfies the constraints of supply and demand is called feasible solution.
- Basic feasible solution:Numbers of positive allocations are (m+n-1).
- Optimal solution:it minimizes the total transportation cost.
- Balanced transportation problem: atransportation problem in which the total supply from all sources is equal to the total demand in all the destinations.
- Unbalanced transportation problem: problems which are not balanced
- Matrix terminology: in the matrix, the squares are called cells and form columns vertically and rows horizontally.
- Degenerate basic feasible solution: if the number of allocation in basic feasible solutions is less than (m+n-1).

Northwest corner method: It is to compute a basic feasible solution, where the basic variables are selected from northwest corner. The major advantage is very simple and easy to use.

Procedure:

- Allocate as much as possible to the cell in the upper left hand corner, supply and demand conditions.
- Allocate as much as possible to the next adjacent feasible cell.
- Repeat step two until all rim requirements are met.

Table 1

19	30	50	10
70	30	40	60
40	8	70	20

Total supply = total demand = 34

Table 2

19 $\boxed{5}$	30 $\boxed{2}$	50	10
70	30 $\boxed{6}$	40 $\boxed{3}$	60
40	8	70 $\boxed{4}$	20 $\boxed{1}$

Total cost = 19*5 + 30*2 + 30*6 + 40*3 + 70*4 + 20*14
= 95 + 60 + 180 + 120 + 280 + 280
Total cost = 1015

Least cost method: Network least technique is processing an essential doable arrangement of a transportation issue where the fundamental factors are picked by the unit cost of transportation. The minimum cost method finds a better starting solution by concentrating on the cheapest routes.

Procedure:

- Identify the box having minimum unit transportation cost(C_{ij}) .
- If there are two or more minimum cost, select the row and column corresponding to the lower numbered row.
- If they appear in this same row, select the lower numbered column.
- Select the value coincide with X_{ij} extremely area to the supply and demand constraints.
- If demand is satisfied , delete the column .
- If supply is exhausted , delete the row.
- Repeat step 1 to 6 until all restriction are satisfied.

Table 3

19	30	50	10
70	30	40	60
40	8	70	20

Total supply = total demand = 34

Table 4

19	30	50	10 $\boxed{7}$
70 $\boxed{2}$	30	40 $\boxed{7}$	60
40 $\boxed{3}$	8 $\boxed{8}$	70	20 $\boxed{7}$

Total cost = 10*7 + 70*2 + 40*7 + 40*3 + 8*8 + 20*7
= 70 + 140 + 280 + 120 + 64 + 140
Total cost = 814

Vogel's approximation method: This technique is an enhanced adaptation of the minimum cost strategy that by and large however not generally creates better beginning solutions.it depends on the idea of limiting open door costs for a given supply line or request section is characterized as the contrast between the most reduced cost and the following least cost elective.

Procedure:

- The given transportation issue in unthinkable shape.
- Compute the contrast between the base cost and the following least cost comparing to each line and every section is known as punishment cost.
- Choose the greatest difference. Suppose it compares to the i^{th}row. Choose the cell with least cost in the i^{th}row. Again if the most extreme relates to a column, choose the cell with the base cost in this section.
- Suppose it is$(I,j)^{th}$ cell. Allocate min (ai,bj) to this cell. If the min(ai,bj) to this cell. If the min(ai,bj)=ai, then the availability of the i^{th} origin is exhausted and demand at the j^{th} destination remains as bj – ai and the i^{th} row is deleted from the table. If min(ai,bj)=bj, then the demand and the j^{th} destination is fulfilled and the availability at the i^{th} origin remains to be ai-bj and jth column is deleted from the table.
- Rehash stages 2, 3, and 4 with the staying table until the point that all inceptions are depleted and all requests are satisfied.

Table 5

19	30	50	10
70	30	40	60
40	8	70	20

Total supply = total demand =34

Table 6

19 $\boxed{5}$	30	50	10 $\boxed{2}$
70	30	40 $\boxed{7}$	60 $\boxed{2}$
40	8 $\boxed{8}$	70	20 $\boxed{10}$

Total cost = 5*19 + 10*2 + 40*7 + 60*2 + 8*8 + 20*10
= 95+20+280+120+64+200
Total cost = 779

In game theory, to finding the initial basic feasible solution of balanced problem. The solution having saddle point or not. Terminology is used in game theory:

- **Game***:* Any arrangement of conditions that has an outcome reliant on the activities of two of more chiefs (players).
- **Players***:* A strategic decision-maker within the context of the game.
- **Strategy***:* An entire arrangement of move a player will make given the arrangement of conditions that may emerge inside the diversion.
- **Payoff***:* The payout a player receives from arriving at a particular outcome.
- **Information set***:* The data accessible at a given point in the amusement. The term data set is most generally connected when the amusement has a successive part.
- **Equilibrium***:* The point in a game where both players have made their decisions.

Procedure:

- Select the minimum element of each row(*).
- Select the maximum element of each column(+).
- Marked (*) and (+) both the position of the element is a saddle point.

Table 7

19	30	50	10
70	30	40	60
40	8	70	20

Table 8

19	30	50	10^{*}
70^{+}	30^{*+}	40	60^{+}
40	8^{*}	70^{+}	20

Row minima = column maxima = 30
The given problem is a saddle point.
Value of the saddle point = 30.

IV. CONCLUSION

This paper introduces a new concept of Linear programming problems to find the solution of transportation problem can be solved with three different methodologies are northwest corner strategy, minimum cost strategy, Vogel's approximation strategy. These three methods are given different types of solutions in balanced problem. Compared with the transportation problem and game theory, the problem can be given the best optimal solution by using game theory.Game theory provides the value of the saddle point.

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