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Research Article

OPERATIONS RESEARCH SOLVE BY TRANSPORTATION PROBLEM

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ABSTRACT

An assignment problem is a particular case of a transportation problem where the given resources are allocated to an equal number of activities with an aim of minimizing total cost, distance, time or maximizing profit.

INTRODUCTION

An assignment problem is a particular case of a transportation problem where the sources are assignees and the destinations are tasks, furthermore, every source has supply of 1 and every destination has a demand of 1. Also the objective is to minimize the total cost or to maximize the total profit of allocation.

The problem of assignment arises because the resources that is available such as men, machines. Therefore the cost profit or time or salesmen to different sales area performing different activities is also different transportation problem solve by different assignment.

Travelling Salesmen Problem

A travelling salesmen problem may be solved as an assignment problem with two additional conditions on the choice of assignment. That is, how should a travelling salesmen travel starting from his home city. Visiting is city only once and returning to his home city so that the total distance covered is minimum.

Given n cities and distance d_{ij} from city i to city j, the salesmen starts from city 1, then only permutation of 2, 3,……………..n represents the number of possible way of his tour. Thus there are ! (n-1) possible way of his tour. Now the problem is to select and optimal route that is able to achieve the objective of the salesmen.

To formulate and solve this problem let us define:

$$x_{ij} = \begin{cases} 1 & \text{if salesmen travel from city i to city j} \\ 0 & \text{Otherwise} \end{cases}$$

Since each city can be visited only once, we have

$$\sum_{i=1}^{n-1} x_{ij} = 1,\ j = 1, 2, 3,\ldots\ldots\ldots..n : i \neq j$$

again, since the salesmen has to leave each city except city n, we have

$$\sum_{j=1}^{n} x_{ij} = 1,\ i = 1, 2, 3,\ldots\ldots\ldots..n - 1 : i \neq j$$

The objective function is then

$$\text{Minimize} \quad Z = \sum_{i=1}^{n-1} \sum_{j=1}^{n} d_{ij}x_{ij}$$

here, we do not required $d_{ji} = d_{ij}$ therefore $d_{ij} = \infty$ for i = j ,

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however all d_{ij}s must be non-negative $d_{ij} \geq$, 0 and $d_{ij} + d_{jk} \geq =$ d_{jk} for all i , j, k

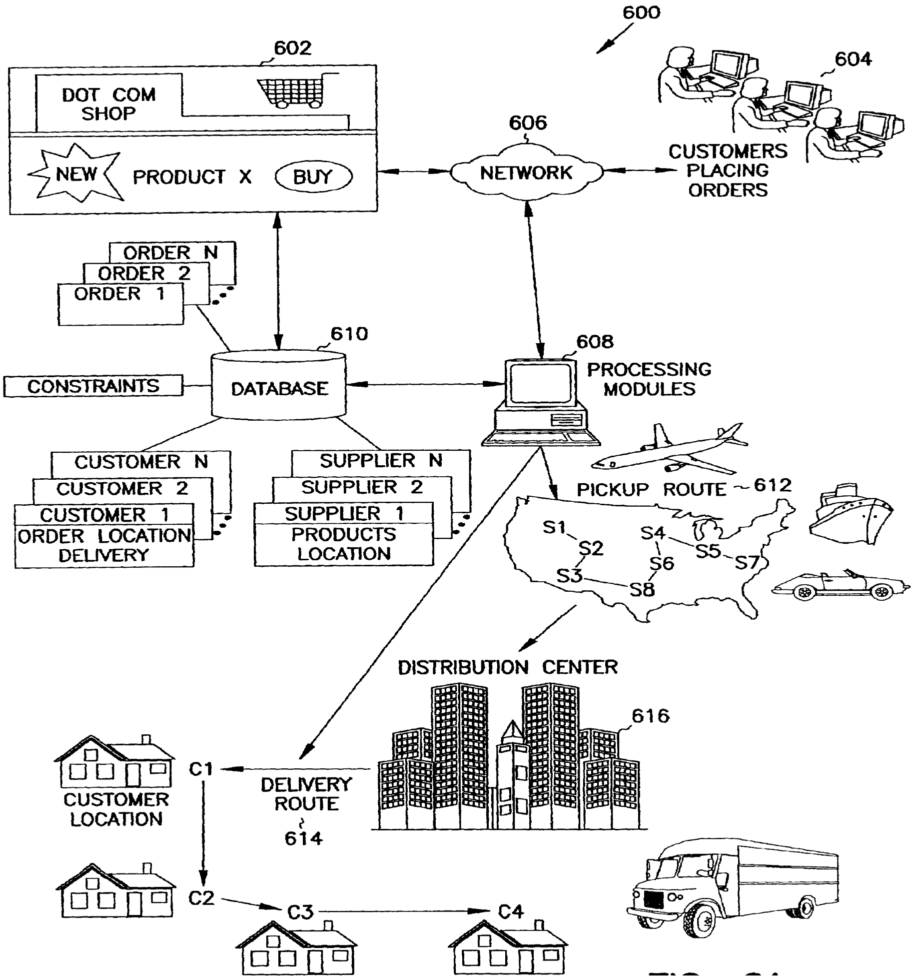


Fig 1

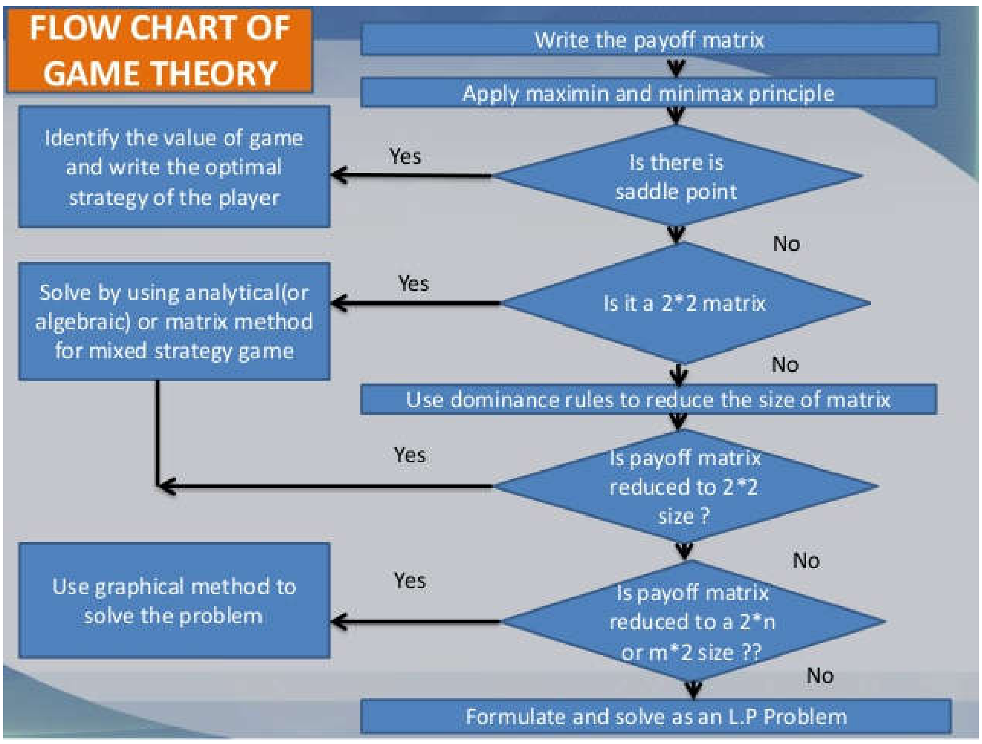


Fig 2

Travelling salesmen problem flow chart.

Game Theory

Mathematically, a mixed strategy for a player, with two or more possible course of action is the set s of n non-negative real number whose sum is unity, n being the number of pure strategies of the player. If p_j = (j = 1, 2, 3,………..….n) is the probability with which the pure strategy, j would be selected then : s = (p_1, p_2, p_3,……………..p_n) where $p_1+p_2+p_3+$……..……..+ p_n = 1 and $p_j \geq$, 0 of is a particular p_j = 1 (j = 1, 2, 3,…………..n) and all others are zero. Then players is said to select pure strategy j. A flow chart using game theory approach to solve a problem is show fig. 02.

Chinese postman's problem

In 1962, A chiness mathematician called Kuan Mei-ko was interested in a postman delivering mail to a number of streets. Such that the total distance walked by the postman was as short possible. How could the postman ensure that the distance walked was minimum.

Following example: - A postman has to start at A, walk along all 13 streets and return to A. The numbers on each edge represent the Length, in meters, of each street. The problem is to find a train that uses all the edges of a graph with minimum Length

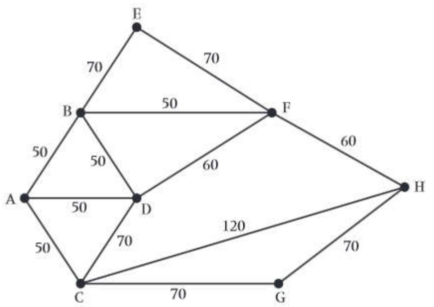
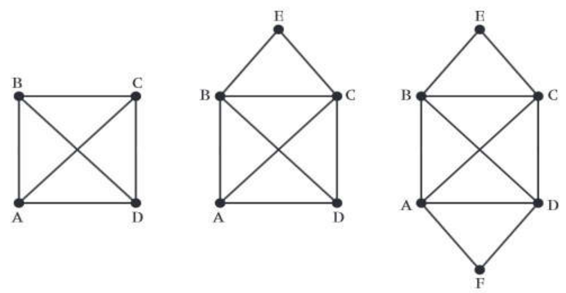


Fig 3

We will return to solving this actual problem later, but initially we will look at drawing various graphs. The Chinese postman is traversable graphs given below.



Graph 1 Graph 2 Graph 3

From these Graph we find;

- It is impossible to draw graph 1 without either taking the pen off the paper or re- tracing an edge.
- We can draw graph 2, but only by starting at either A or D-in each case the path will end at the other vertex of D or A.
- Graph 3 can be drawn regardless of the starting position and you will always return to the start vertex.
- In order to establish the differences, we must consider the order of the vertices for each graph. The following

Vertex	Order
A	3
B	3
C	3
D	3

Graph 1

Vertex	Order
A	3
B	4
C	4
D	3
E	2

Graph 2

Vertex	Order
A	4
B	4
C	4
D	4
E	2
F	2

Graph 3

When the order of all the vertices is even the graph is Traversable. When there are two odd vertices we can draw the graph but the start and end vertices are different. When there are four odd vertices the graph can't be drawn without repeating an edge.

Chinese Postman Algorithm

An algorithm for finding an optimal Chinese postman route is.

Step 1:- List all odd vertices.

Step 2:- List all possible paring of odd vertices.

Step 3:- For each pairing find the edges that connect the vertices with the minimum weight.

Step 4:- Find the pairing such that the sum of the weights is minimized.

Step 5:- On the original graph add the edges that have been found in step 4.

Step 6:- The length of an optimal Chinese postman route is the sum of all the edges added to the total found in step 4.

Step 7:- A route corresponding to this minimum weight can then be easily found.

Now we apply the algorithm to the original problem in fig. 01.as;

Step 01 the odd vertices are A and H.

Step 02 there is only one way of pairing these odd vertices namely AH.

Step 03 the shortest way of joining A to H is using the path AB, BF, FH a total length of 160.

Step 04 these edges on to the original network in this fig

Step 05 the length of the optimal Chinese postman route is the sum of all the edges in the original network. Which is 840 mtr. Plus the answer found in step 4, which is 160 mtr., Hence the length of the optimal Chinese postman route is 100 mtr.

Step 06 one possible route corresponding to this length is ADCGHCABDFBEFHFBA, but many other possible routes of the sum minimum length can be found.

CONCLUSIONS

The main aim of this paper is to present the importance of operations research theoretical idea in transportation problem. Researcher may set some information related to operations research and transportation problem and can get some ideas related to their field of research.

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