Proceedings of GLOGIFT 07
November 15-17, 2007
UP Technical University
Noida, pp. 599-601

AN INNOVATIVE APPROACH TOWARDS THE COMPUTER AIDED MULTI-GOAL FACILITIES PROBLEM CONSIDERING THE SHIFTING COST OF MACHINE

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ABSTRACT

Plant layout is an important aspects of the design of industrial plant. Facility layout problem have gained much interest in recent years because of industrial trends and production environment, unpredictable variation in the market demand. The market variation is influenced by the production mix and this can be a critical issue when designing the plant layout. The shifting cost of the machine aspects is given weightages in this paper. The multi goal facilities problem is considered in this paper.

Keywords: Plant layout, facilities, market variation, shifting cost of machines, multi goal facilities problem.

Introduction

Plant layout is an important aspect of the design of industrial plant. Facility layout problem have gained the much interest in the recent years because of industry trend and production environment, unpredictable variation in the market demand may have the strong influence open the production mix and this can be a critical issue when designing the plant layout.

Plant layout should take account of most effective inter-relationships:-

1. Arrangements of Physical facilities
2. Movement of Materials
3. Flow of information required to obtain performance over the entire range of activities.

The facility layout problem is concerned with finding the most efficient arrangement of 'n' indivisible departments with unequal area requirements within a facility.

Steps of Proposed Heuristic Approach

1. Development of heuristic approach which determines the distribution parameters and the variability of distribution for multi-goal design problems.
2. Development of new equation which is derived from the first principle taking into account the concept as proposed by Sayin, in which weightages given to flow and closeness rating

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for consideration of multi-objective criteria, by combing the congruent objectives i.e. qualitative and quantitative for finding the variance and standard deviation at different levels of weightage to attributes of multi-goal problems.

3. Development of computer programme in language which is suitable for consideration of only flow, only closeness rating or combination of both with weightages.
4. Finding optimum multi-goal cost for the final layout at all levels of weightage by pair wise interchange method.
5. To check the optimality of the multi-goal solution at all levels of weightages in order to arrive at a correct solution and to give suboptimal solution with corresponding.
6. Testing of the approach on varieties of problems for different combination of flow, distance and closeness rating data.
7. To find parameter of distribution i.e. Mean, Median, Mode and to ascertain the Nature of distribution by plotting the histogram.
8. To develop one single programme for finding the optimal or sub-optimal solution, checking optimally and to ascertain the pattern of cost distribution.

Effect of Shifting Cost of Machine

Development of heuristic approaches for facility design problems, which incorporates the cost of shifting and installation of Machines. Development of approach for addition of multi facilities in the modified existing layout for the optimum arrangement of facilities considering geographical factors of the area like soil conditions and contours of area along with size and shape of facilities to be added like elliptical, circular , rectangular etc. A mathematical equation for determining standard deviation and distribution parameters for solving the facilities design problems in the case of equal and unequal areas of facilities.

Estimation of Assignment Cost

The material handling cost is assumed to be an incremental linear function of the distance traveled.

The assignment cost is given by

$$C=\text{Ó}^{n-1}\ \text{Ó}^{n}\ F_{ij}\ d_{ij} \text{————————[1]}$$

$$I=1\ \ j=i+1$$

Where,

F_{ij} = Flow between facilities i and j.

D_{ij} = Distance between facilities I and j.

The assignment cost considering the flow and distance between the new and existing facilities is given by

$$C_{EN=}\ \text{Ó}^{n-1}\ \text{Ó}^{n}\ F_{ij}\ d_{ij} + \text{Ó}^{n-1}\ \text{Ó}^{n}\ F_{ij}^{EN}\ d_{ij}^{EN} \qquad i=1\ j=i+1 \qquad i=1\ \ j=i+1$$

$$+\ \text{Ó}^{n-1}\ \text{Ó}^{n}\ F_{ij}^{NN}\ d_{ij}^{NN} \text{……[2]}$$

$$i=1\ j=i+1$$

F_{ij}= Flow between existing facilities and j

D_{ij}^{EN} = Distance between existing facilities I and j

F_{ij}^{EN} = Flow between existing and New facilities I and j

D_{ij}^{NN} = Distance between existing and New facilities I and j

F_{ij}^{NN} = Flow between New facilities I and j

D_{ij} = Distance between New facilities I and j

By using 1 and 2 the assignment cost can be evaluated.

The Mean of assignment cost (Mc) is calculated given below.

$$M_c = \frac{C1+C2+ C3+ \text{————————————+ Cz-n}}{\text{No. of Alternatives (z-n)}}$$

Where z = No. of cells on the layout.

Results and Discussion

A new heuristic approach has been developed which determines the distribution parameters and the variability of distribution for addition of facilities to existing layout, which is also simultaneously modified.

The effectiveness of the proposal methodology has been demonstrated by means of couple of examples pertaining to design and layout optimization, the results shows that the proposal algorithm. The cost of shifting of machine also considered.

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