



Managing the Building Constraints in India by Comparing With Developed Countries Using Ant Colony Method of Optimization

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Abstract: The Indian construction industry is an integral part of country's economy and its growth and a conduit for a substantial part of India's development investment. The industry plays a pivotal role in developing the country's infrastructure, a pre-requisite for high levels of economic growth. In the construction project cost is the most important factor to be considered in the planning of every project. There is a constant rise in the use of innovative contract methods which provide incentives for maximizing quality. There is an increasing pressure to improve the project performance due to the innovative contracting methods which necessitate developing models incorporating quality along with time and cost. The aim of project is the comparison of building constraints in India with the developed countries using Ant colony optimization in MAT LAB. This paper proposed an Ant colony method of optimization it is a metaheuristic optimization technique inspired from biological behavior of ant, approaching shortest path for food finding, using chemical substance-pheromone laid by ant on her path. A. Optimization is a systematic effort made to improve profit margins and obtain the best results under given circumstances. Building energy, Material cost, Labour cost and plant cost of project delivery are among the crucial aspects of each project. In this paper, new metaheuristic ant algorithm is used to compare the parameters with developed countries and to optimize the cost, building energy of buildings in India.

Keywords: Mat lab, Ant colony optimization, Material cost, Labour cost, Plant cost

1. Introduction

India is the developing country and in the economy of country construction projects and industries play a vital role. Resources and cost are two main concerns in a construction and they are used for planning a project. This has increased the importance of resources and Cost optimization in construction projects. Is necessary to estimate the cost and time of each activity through which the whole duration and total cost of the project are determined to complete the planning task. Optimization is a systematic effort made to improve profit margins and obtain the best results under given circumstances or situations. "Cost Optimization can be defined as the achievement of real and permanent reduction in the unit cost of services provided without damaging their suitability for the in planned use".

Developing countries construction will be entirely different to that of other countries for example, implementation of energy in buildings, project cost, materials etc. optimization and a comparative study will be conducted for developing countries and it will also have to be improving the construction. There is availability of various techniques for optimization and project control software, still many construction projects do not achieve their cost and time objectives. Optimizing performance of the different techniques adopted at one stage of the construction process may not be beneficial if the methods used are not to up the efficient level. The methodology and the type of the

used in a construction is also plays very important role for the successful completion of a project.

Various optimization approaches have been used to solve the construction scheduling problem, and they can be classified as mathematical, heuristic and metaheuristic methods. The most important and efficient technique for optimization is Ant colony optimization in this paper will also have to be using this optimization technique. The ACO metaheuristic is based on generic problem representation and the definition of the ant's behavior. ACO adopts the foraging behavior of real ants. When multiple paths are available from nest to food, ants do random walk initially. During their trip to food as well as their return trip to nest, they lay a chemical substance called pheromone, which serves as a route mark that the ants have taken. Subsequently, the newer ants will take a path which has higher pheromone concentration and also will reinforce the path they have taken. As a result of this autocatalytic effect, the solution emerges rapidly.

2. Related works

Shrivastava R, Singh S. , Dubey C. G. (2012) In this paper, new metaheuristic multi-colony ant algorithm is developed for the optimization of three objectives time-cost quality with quantity as a tradeoff problem S. Thomas Ng And Yanshuai Zhang (September 2008) main objective of the paper is to Optimize Construction Time and Cost of project

3. Methodology

The research work was divided into five stages. First, Selection of parameters to be optimized mainly considering the parameters are,

- Material cost
- Labour cost
- Plant cost
- Building energy

Secondly, the above data has to be collected from many literatures. Thirdly, the identification of the optimization technique. Fourth step, comparison of the India and other developed countries based on parameters. Last step optimizing of these parameters using ant colony optimization. General problems are extracted from specific problems identified and recommendations are formulated to improve the construction of building in developing countries.

Fourth step in this project is the optimization of cost and building energy of a building by using of ant colony optimization.

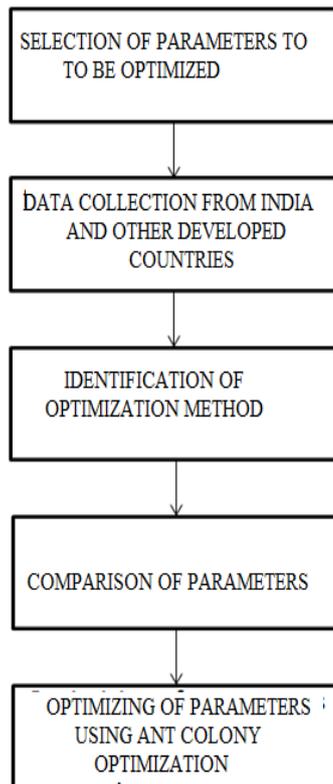


Fig1. Different stages of project

4. Ant Colony Optimization

Ant colony optimization technique is inspired from the way that ant colonies find the shortest route between the food source and their nest.

The biologists studied extensively for a long time the way in which ants manage collectively to solve difficult problems in a natural way which is too complex for a single individual. Ants being completely blind individuals can success fully

discover as a colony the shortest path between their nest and the food source.

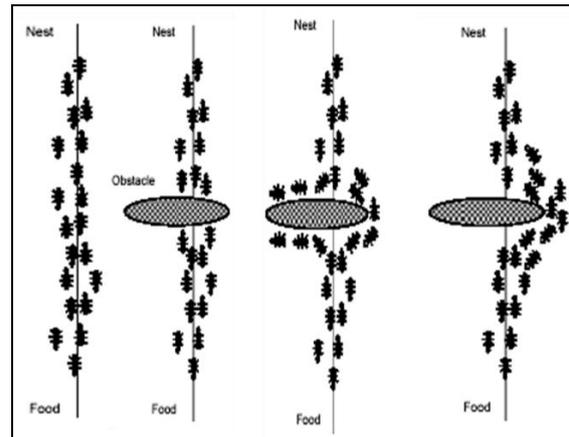


Fig.2 Natural behaviour of Ant

They manage this through their typical characteristic of employing a volatile substance called pheromones. They perceive these substances through very sensitive receivers located in their antennae. The ants deposit pheromones on the ground when they travel which is used as a trail by other ants in the colony. When there is choice of selection for an ant between two paths it selects the one where the concentration of pheromone is greater.

5. Construction Cost in Different Countries

Construction Costs Construction costs are the portion of hard costs normally associated with the construction contract, including the cost of materials and the labour and equipment costs necessary to put those materials in place.

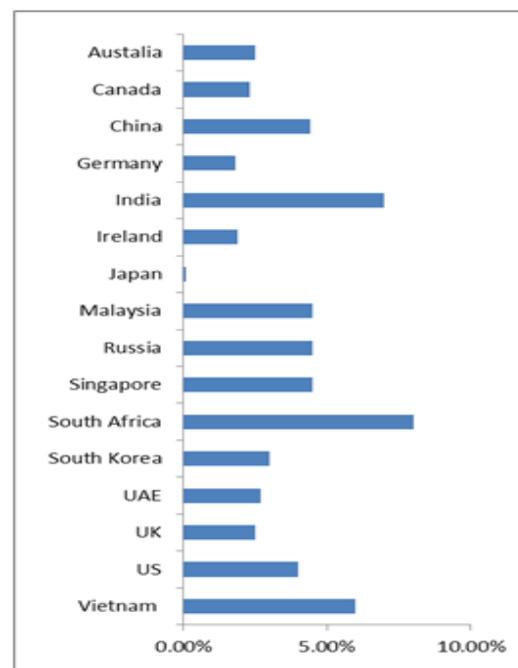


Figure 1. Construction cost variation in different countries

6. Optimization Procedure

The following flow chart shows the general procedure of optimization by using ant colony optimization

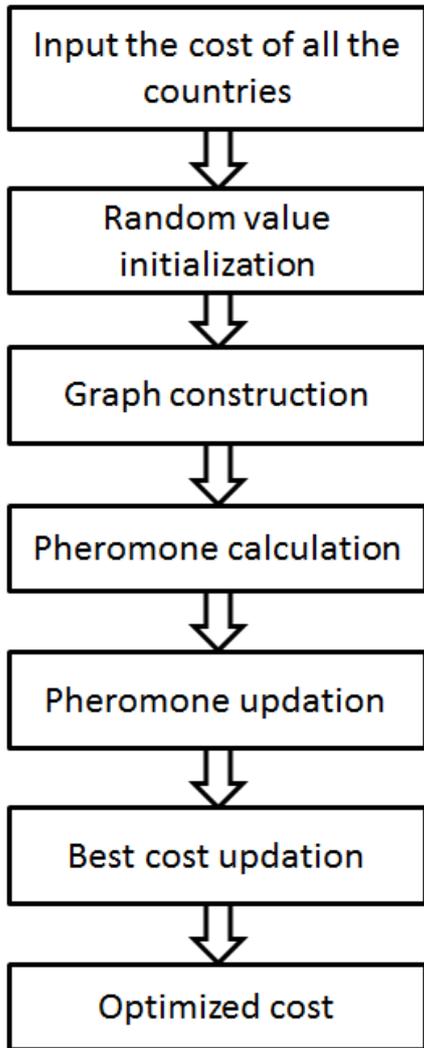


Figure2. General procedure of optimization

6.1 Screenshots of ant colony optimization in mat lab

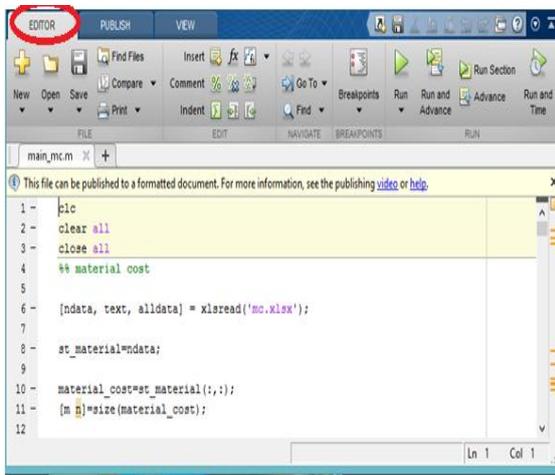


Figure3. Programme creation in MAT LAB

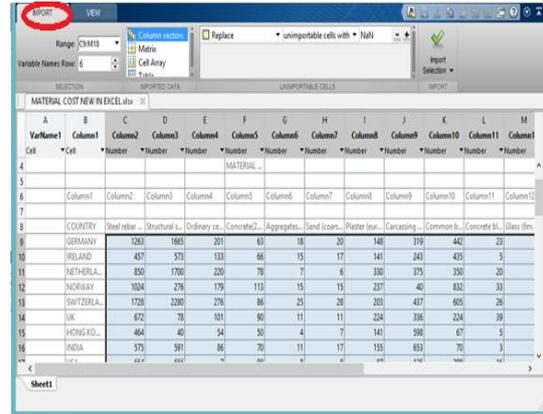


Figure4. Import input in MAT LAB

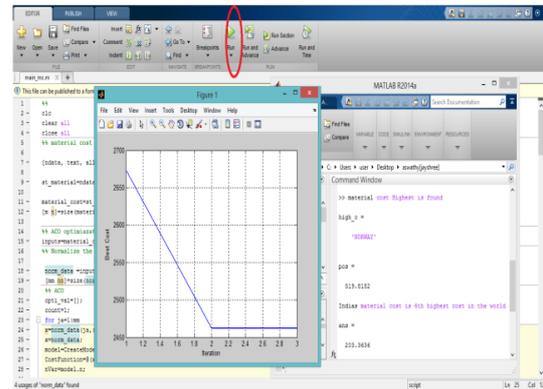


Figure5. Run the programme

7. Analysis of results

The material cost, labour cost, plant cost and building energy to be analyzed and optimized to it.

7.1 Material cost

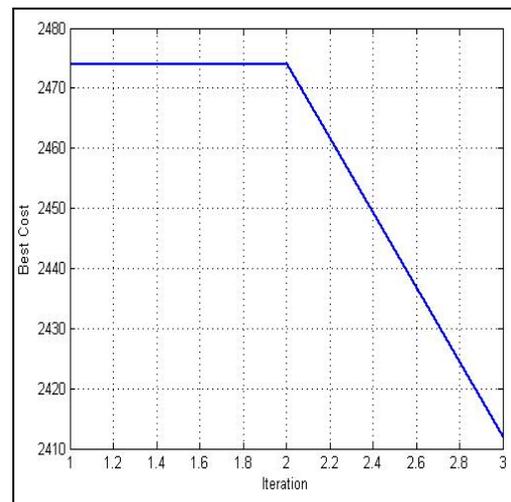


Figure6. Optimization graph of material cost

Table 1. Results for optimization of material cost

Highest material cost	Material cost of India	Optimized cost
519.8182 (Norway)	203.3636 (6 th highest cost)	72.3636

7.2. Labour cost

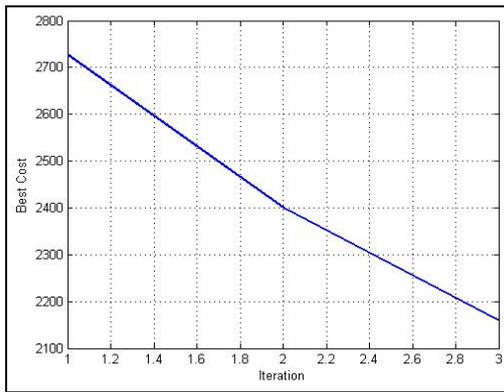


Figure 7. optimization of labour cost

Labour cost is minimum there is no need for optimization

7.3. Plant cost

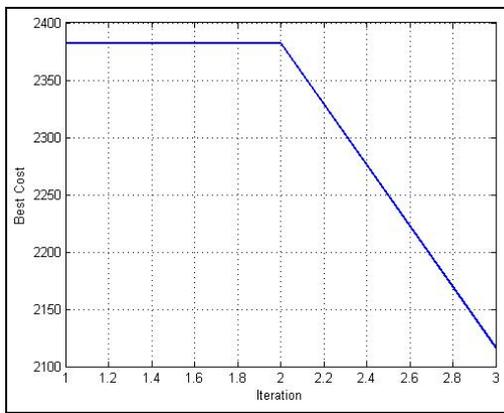


Figure 8. Optimization of plant cost

Table 2. Results for optimization of plant cost

Highest cost	Low cost	Plant cost of India	Optimized cost
1636 (USA)	673 (Hong Kong)	678 (second lowest cost India)	578

7.4. Building energy use

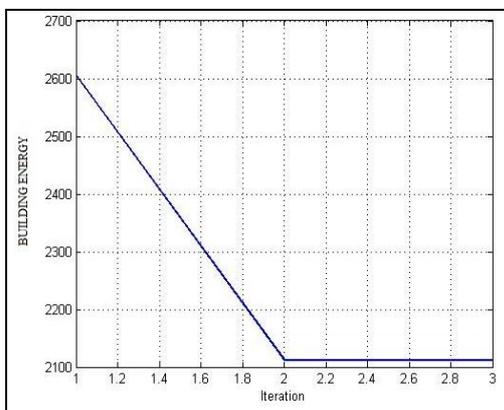


Figure 9. Optimization graph of building energy

Table 3 Results for optimization of building energy

Highest energy	Low energy	Building energy % of India	Optimized % energy
79% (US)	38% (Denmark)	74% (Second highest)	36%

8. Result and Discussion

In this study comparison of four building constraints with India and other developed countries by using Ant colony method of optimization in MAT LAB is done. In this comparison considering 9 developed countries, the following results were found.

Material cost

Before optimization India is found to be having 6th highest material cost. After optimization the Material cost of India has found to be minimum.

Labour cost

Labour cost for India was minimum comparing the other developed countries. so there was no need for optimization.

Plant cost

Before optimization India was having second lowest plant cost and after optimization India was found to be minimum.

Building energy use

Before optimization India is found to having second highest building energy use after optimization India is found to be minimum.

9. Conclusions

India was still a developing country because of the inefficient construction practices which will automatically increase the material cost, labour cost etc. Comparing to other developed countries, the construction in India is not up to the level. The main factors affecting the construction cost are material cost, labour cost and plant cost. By optimizing cost and by adopting better construction practices we can make India in to a developed country with a lower construction cost.

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