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Systems Approach to Strategic Management

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In collaboration with
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A Dynamic Algorithm for the Multiple Capacitated Facility Location Problem

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EXTENDED ABSTRACT

The multiple capacitated facility location problem is of great importance for an enterprise in finding the most suitable location in a congested market environment and one of the classical operations research problems. The location of each of the new enterprises should offer competitive advantages for each one of

ABSTRACT FORM

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them whether they are cooperating or not, in an area that other similar enterprises already exist. Furthermore, the enterprises must attain the highest profit in the selected location, while also satisfying the consumers' demands under time constraints imposed by the market.

More specifically, this paper examines the problem of seeking the optimal location by a number of cooperating enterprises, which produce the same product with the existing enterprises in the given area. The market in the existing situation covers its demands to the highest possible degree. The quantity of the product that the market needs is also determined by the market needs and must be available in a specific time-period. The new enterprises aim to enter the market and obtain the largest possible share of this market by avoiding any overlapping between the market segments that they will serve.

The facility location problem in a market environment has been studied extensively in the bibliography and a number of algorithms have appeared for the solution of this problem. This paper proposes a network model along with the exact algorithm that was implemented for its solution. The algorithm finds the exact solution for a given facility location problem so long as that exists. The algorithm is also completed in order to find approximation solutions to the given problem. The approximation algorithm decreases significantly the execution time of the algorithm and ensures small variation from the optimum solution that is computed by the exact algorithm.

Many issues of this problem belong to the NP–hard class of algorithms and therefore this paper presents a dynamic approximation algorithm. The approximation algorithm that is presented in this paper attains approximation solutions in a small time interval. In order to compare the approximation solution to the optimal one, the optimal solution is obtained also. Then, the variation of the objective function value is compared to the optimal one.

A computational study is also performed in order to show the speedup of the approximation algorithm. Computational studies are useful tools in order to gain an insight into the practical behavior of the proposed algorithms, examine its efficiency and compare its approximation solution to the optimal one by using the same problem sets. The computational study has been performed on an Intel Core i7 2670QM 2.2 GHz, with 6 Gb RAM running under Windows 7 64-bit Edition SP1. The algorithms have been implemented using MATLAB R2011b 64-bit edition.

Keywords: Facility Location Problem, Decision Support Systems, Operations Research, Allocation.