Selecting the most proper location to construct hospitals and health centers in a city by Genetic Algorithm

Fatemeh Bagheri¹, Mehdi Dehghan², Majid Ziaratban³*

1. Instructor, Department of Computer Engineering, Faculty of Engineering, Golestan University, Gorgan, Iran.
2. Student of Computer Engineering, Department of Computer Engineering, Faculty of Engineering, Golestan University, Gorgan, Iran.
3. Assistant Professor, Department of Electrical Engineering, Faculty of Engineering, Golestan University, Gorgan, Iran.

Abstract

Background & Objective: Major management decisions in organizations not only in the present but also in the future have a profound impact on different aspects of the organization. A slight mistake in making decisions may lead to the loss of resources of the organization, including financial and human resources. In the present study, we evaluated the problem of choosing the most convenient location for the construction of hospitals and health centers as one of the most important issues in the field of health. Regarding the numerous factors in decision making and the myriad of possible solutions to this problem and also disability of human in solving such problems, a genetic optimization algorithm has been used to calculate the best location for the construction of hospitals.

Methods: This study was simulated according to the actual conditions which may exist in a city. Given the existence of a city with N × N dimensions and having several hospitals and health centers in the city, the issue was raised for the construction of three hospitals. Important factors which could influence the decision making were health status, referring times and land prices. Furthermore, the most proper locations for the construction of three hospitals were calculated using the genetic algorithm.

Results: Three characteristics including the level of health, referring times and land prices were randomly assigned to all urban areas. The coordinates of available health centers in the city were also identified. Another point was the lack of proximity of hospitals in the city. Setting the threshold of 0.2 units for the minimum distance between hospitals (current and new), this restriction was applied. After performing the algorithm with the governing conditions, three optimal points were found.

Conclusion: Considering the importance of locations for the construction of hospitals and health centers in the city and the existence of various factors for selecting the most appropriate place, application of strategies and algorithms which may be helpful in finding the best solution among the myriad of solutions in inevitable. According to the fact that human beings alone or by simple mathematical methods are not capable of taking all the features together and examine the search space to find the best result, we achieved the best solution in the city by setting the parameters of the genetic algorithm and taking into account all important factors.

Key words: Optimization issues, Genetic Algorithm, Finding the best location, Health centers construction

Corresponding Author: Majid Ziaratban
Address: Department of Electrical Engineering, Faculty of Engineering, Golestan University, Gorgan, Iran.
E-mail: m.ziaratban@gu.ac.ir