

A Study on the Optimal locations for Distribution Center in Thailand using Genetic Algorithm

Maharakham University Sarinya Sala-ngam
College of Industrial Technology, Nihon University ○Jun Toyotani,
Phitsinee Kalaphat, Areerat Seatan

1. Introduction

An effective logistics strategy will drive company profits, reduce cost and provide the best service for customers. Therefore, create and improve for the right strategy is very important for logistics companies. Site selection for the logistics center is one of the most effective strategy in logistics management.

In Southeast Asia, Thailand economy has been increasingly growing and having been taking the leader among the Southeast Asian countries. Moreover, the location of Thailand is the center and surrounded by other countries in Southeast Asia. Therefore, Thailand is considered to be the optimal site selection for logistics hubs in Southeast Asia for improving logistics management and providing the best services to customers. However, there are few researchers who are researching for site selection in Thailand, and the logistics strategies include services are insufficient now. From these reasons, the logistics hubs, in other words distribution centers for Southeast Asia are not established in Thailand.

The propose of this study is to select the optimal locations for distribution center in Thailand. Moreover, the center of each Thailand provinces are chosen as a representative location. In order to select the optimal locations, Genetic Algorithms (GA) is applied by calculated the total traveling distance.

2. Literature review

Sarinya¹⁾ verified a multi-tiered optimal hub network in a Three economic zone based on an optimal location model with the global SCM as the core. Aiura²⁾ conducted research on selecting the optimal location for multistage logistics centers used in GA.

These studies have been carried out mainly in developed countries, but have not been seen in the case of developing countries.

Therefore, in this study, it is assumed that the optimal location simulation of the distribution center in Thailand is done by using GA.

3. Research Methodology

3.1 Genetic Algorithm (GA)

Genetic Algorithm: GA is a technique to search for the optimal solution for complex problems by imitating the mechanism of natural selection by inheritance and survival of the right person in the evolution of biology. Prepare multiple individuals that represent candidate solutions to a proposition with genes and their chromosomes. Search for the optimal solution while repeating operations such as mutation, crossover and suddenly give priority to individuals with high fitness.

3.2 Research Scope

This study is a case study of those coordinated location, which means that search longitude and latitude by web service in the whole country area of Thailand. And those data which correct from each province are concluded in excel file. Then, each prefecture (sales office) was randomly divided into 5 groups, and the average value of the position coordinates of each group was calculated by using the Excel program. After calculating the average value, the distance between two points which mean the distance from each sales office to the group's distribution center was calculated.

In this study, the distance was automatically calculated by the program to search the optimal location simulation of distribution center based on genetic algorithm. The program is called Visual Basic for Application in Excel. Each prefecture (sales office) is repeated by gene, the number of each office is repeated, and the belonging group is randomly processed and rearranged by generating a genetic pattern of the first generation called permutation replication of the genetic algorithm.

A Study on the Optimal locations for Distribution Center
in Thailand using Genetic Algorithm

Sarinya SALA-NGAM, Jun TOYOTANI, Phitsinee KALAPHAT and Areerat SEATAN

After calculating the total distance and fitness from each sales office of each group to the distribution center of the group, the sorting was performed based on the total distance.

In nature, individuals with a high degree of adaptation to the environment survive and proliferate, and conversely, individuals with a low degree of adaptation are trapped and disappear from the population. According to the so-called genetic algorithm, the pattern with the shortest total distance was selected as the elite with the highest fitness. However, in addition to selecting the elite within the population, in order to advance the evolution, a part of the genetic pattern is recombined, so-called crossover.

Therefore, it rearranged based on total distance and repeated elite after the gene crossover pattern

4 Result

The result is shown in Fig. 1 and divided into 5 groups and 5 distribution centers. Group 1 will be shown in green and the distribution center will be located in Songkhla Province. In Group 2, it is shown in purple, and the distribution center is located in Surat Thani Province. Group 3 will be shown in yellow and the distribution center will be located in Bangkok. Group 4 is shown in pink, and the distribution center is located in Mahasarakham province. The last, group 5 is shown in blue, and the distribution center is located in Phrae province. Group 3 will be shown in yellow and the distribution center will be located in Bangkok. Group 4 is shown in pink, and the distribution center is located in Mahasarakham province. The last group 5 is shown in blue and the distribution center will be located in Phrae

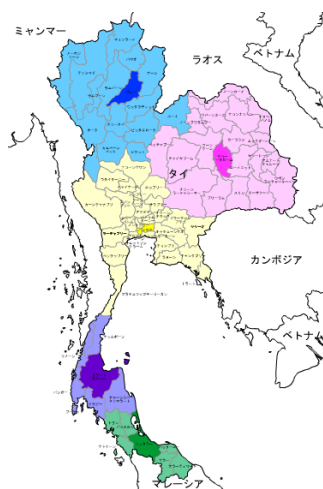


Fig.1 The optimal locations for distribution center in Thailand

5 Conclusion

In this study, genetic algorithm was adopted and target to 77 prefectures in Thailand, the prefectural offices of each prefecture were selected as representative points, and performed the optimal location simulation of the distribution center. The result shows that the optimal distribution center can be placed in each region. In case of transportation company plan to set up an optimal distribution center, the results of this study can be applied.

For next action, based on this study, we will investigate whether simulation parameters are effective not only by distance but also by using productivity and cost. In addition, instead of 5 groups, we are planning to make proposals that can be further divided.

References

- 1) Sarinya Sala-ngam, “最適グローバルハブネットワークシステムの選定に関する基本研究”, 博士後期課程論文, 日本大学大学院生産工学研究科 (2016), pp.26-32.
- 2) 相浦喜徳, 佐藤馨一, 唐澤豊, 角田直登, “GA に用いた多段階物流センター最適立地選定に関する研究”, 土木計画学研究・論文集 (1999), pp. 273-278.
- 3) 岡村和英 (株式会社テクリエ), 遺伝的アルゴリズムを始めよう(2017).