FINDING THE SHORTEST HAMILTONIAN CIRCUIT
OF SELECTED PLACES IN PENANG USING
A GENERIC BEE COLONY OPTIMIZATION FRAMEWORK

Li-Pei Wong\textsuperscript{a1}, Malcom Yoke Hean Low\textsuperscript{b2} and Chin Soon Chong\textsuperscript{c3}

\textsuperscript{a}School of Computer Sciences
Universiti Sains Malaysia
11800 USM, Penang, Malaysia

\textsuperscript{b}School of Computer Engineering
Nanyang Technological University
Nanyang Avenue, Singapore 639798

\textsuperscript{c}Singapore Institute of Manufacturing Technology
71 Nanyang Drive, Singapore 638075

E-mail: \textsuperscript{1}lpwong@cs.usm.my, \textsuperscript{2}yhlow@ntu.edu.sg, \textsuperscript{3}cschong@SIMTECH.a-star.edu.sg

Abstract

Identifying the shortest Hamiltonian circuit is a task which appears in various types of industrial and logistics applications. It is a NP-hard problem. This paper intends to find the shortest Hamiltonian circuit of the selected 68 towns/cities in Penang state, Malaysia using the generic Bee Colony Optimization (BCO) framework. The proposed BCO framework realizes computationally the foraging process and waggle dance performed by bees and it is enriched with elitism, local optimization and adaptive pruning. A modification has been applied to the framework whereby a past solutions reinforcement policy is integrated. Also, the local optimization method is enhanced with the utilization of a Tabu list. The results from this study serve as an significant input to the preparation of logistics plan when a natural disaster occurs. Aiding resources can be delivered to affected areas, one after another, in a more appropriate and systematic manner and thus leads to cost and time saving. The results show that proposed BCO framework is able to produce a circuit (based on great-circle distance) with length of 263.332016km within 1.32s. The performance of the proposed BCO framework is comparable to the Genetic Algorithm and Lin-Ker heuristic.

Keywords: Bee colony optimization, Hamiltonian circuit, Metaheuristic, Generic framework, Penang