

Supat Patvichaichod 2008: The Development and Implementation of Hybrid Encoding Genetic Algorithm with Multi-Relations. Doctor of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Associate Professor Poranat Visuwan, Ph.D. 133 pages.

The aim of this research is to develop and implement the hybrid encoding genetic algorithm with multi-relations in order to solve a traveling salesman problem with multiple arches between vertices, various weight in each arch, and constant or time-dependence weights. The developed algorithm employs two types of encoding methods: integer encoding which indicates the vertices and binary encoding which indicates the arches. The parent chromosomes are chosen by random. The one-point crossover method is used only for the binary encoding whilst the exchange mutation technique is used only for the integer encoding. Experimentally, the problem sizes range from 20 to 30,000 vertices.

From the experiment, the proper input parameters include a population size relating to the problem size, generations in range of 300 and 400, probabilities of crossover in range of 20 to 60 percents, and probabilities of mutation in range of 30 to 80 percents depending on the problem size. In addition, the developed algorithm can effectively solve problems. For the problem sizes under 100 vertices, the algorithm can reduce the traveling costs of about 50 percent. For the problem sizes between 100 and 1,000 vertices, the algorithm results in 20 percent traveling cost saving. For the problem size over 1,000 vertices, less than 20 percent traveling cost saving is achieved, whilst at the 30,000 vertices the traveling cost is reduced by 6.07 percent. Thereafter, the developed algorithm is applied for the problem of the pickup and delivery vehicle routing with traffic conditions by using the proper input parameters from the experiment. The results reveal the reduction in traveling cost, ranging from 45.3 to 49.4 percents.

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Thesis Advisor's signature

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