ABSTRACT

One of the features that distinguish Geographical Information Systems (GIS) from other information systems is spatial information function. This function usually provides selection switches and solutions for GIS users. Simultaneously with GIS techniques development, GIS executive analyzes functions have also been developed interestingly. For instance, network analysis is one of these functions. Shortest Path finding is one of the network analysis functions, that is introduced as an important application in transportation problems. The problem has been evaluated using different methods for this solution, with respect to route finding analysis, input data type and other different effective parameters on a route finding algorithms’ performance.

In the present GIS route finding modules, heuristic algorithms have been used to carry out their search strategy. Owing to the lack of global sampling in the feasible solution space, these algorithms have considerable possibility of being trapped into local optima. This thesis addresses the problem of selecting route to a given destination on an actual map under a static environment. The proposed solution uses a Genetic Algorithm and Parallel Genetic Algorithm with High Performance Cluster. A part of an arterial road is regarded as a virus. A population of viruses is generated in
addition to a population of routes. A customized method based on both Genetic Algorithm and Parallel Genetic Algorithm has been proposed.

The problem has been formulated as a dynamic multi-objective problem and it has been shown how the problem can be solved using Genetic Algorithm. There are three objective functions to optimize simultaneously in this problem: route length, travel time and environmental impacts. The proposed method gives the Pareto-optimal set by using both the predicted traffic and a hybrid multi-objective Genetic Algorithm so that a driver can choose an effective route after looking at feasible ones. The results are given in comparison with single-objective Genetic Algorithm with a real road map and real traffic data in wide-area road network and the use of Multi Objective Genetic Algorithm proved to be more effective.