An Adaptive Genetic Simulated Annealing Algorithm for QoS Multicast Routing

Bo Peng and Lei Li

Graduate School of Engineering, Hosei University, Koganei, Tokyo 184-8584 Japan

Abstract. As a result of the emergence of many kinds of high-speed communication systems and increasing demand of distributed multimedia applications, efficient and effective support of quality of service (QoS) has become more and more essential. Many service models and mechanisms have been put forward by IETF to meeting QoS requirement, multicast service is a key one of them and is becoming a key requirement of computer network supposing multimedia application.

Multicasting consists of concurrently sending the same information from a source to a subset of all possible destinations in a computer network. Multicast utilizes a tree delivery structure, on which data packets are duplicated only at fork nodes and are forwarded only once over each link. This approach makes multicast resource—efficient in delivering data to a group of member simultaneously and can scale well to support very large multicast group. This paper focuses on the algorithms to construct low cost multicast routing tree with QoS requirements.

In this paper, we study the bandwidth, delay, delay jitter, and packet loss constrained least cost multicast routing problem which is known to be NP-complete, and present a adaptive genetic simulated annealing algorithm (AGASA) to solve the problem. The proposed genetic algorithm has the following characteristics: (1) Tree structure coding scheme, by which we can use any data structure of the tree to describe the chromosome structure, is an effective solution to the algorithm in the coding and decoding. (2) Genetic algorithm is improved, and simulated annealing algorithm is combined with. Simulated annealing algorithm has stronger local search capabilities, which avoids a partial optimum during the search process. (3) The crossover and mutation probability of adaptive genetic algorithm is improved. The selection of the crossover and mutation probability is the key to the behavior and performance of the algorithm, which has the direct impact on the convergence of the algorithm.

The simulation results show that the algorithm has fast convergence and better performance. It is able to satisfy the changing network scale.

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