

Bee life-based multi constraints multicast routing optimization for vehicular ad hoc networks

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Abstract

A vehicular ad hoc network (VANET) is a subclass of mobile ad hoc networks, considered as one of the most important approach of intelligent transportation systems (ITS). It allows inter-vehicle communication in which their movement is restricted by a VANET mobility model and supported by some roadside base stations as fixed infrastructures. Multicasting provides different traffic information to a limited number of vehicle drivers by a parallel transmission. However, it represents a very important challenge in the application of vehicular ad hoc networks especially, in the case of the network scalability. In the applications of this sensitive field, it is very essential to transmit correct data anywhere and at any time. Consequently, the VANET routing protocols should be adapted appropriately and meet effectively the quality of service (QoS) requirements in an optimized multicast routing. In this paper, we propose a novel bee colony optimization algorithm called bees life algorithm (BLA) applied to solve the quality of service multicast routing problem (QoS-MRP) for vehicular ad hoc networks as NP-Complete problem with multiple constraints. It is considered as swarm-based algorithm which imitates closely the life of the colony. It follows the two important behaviors in the nature of bees which are the reproduction and the food foraging. BLA is applied to solve QoS-MRP with four objectives which are cost, delay, jitter, and bandwidth. It is also submitted to three constraints which are maximum allowed delay, maximum allowed jitter and minimum requested bandwidth. In order to evaluate the performance and the effectiveness of this realized proposal using C++ and integrated at the routing protocol level, a simulation study has been performed using the network simulator (NS2) based on a mobility model of VANET. The comparisons of the experimental results show that the proposed algorithm outperformed in an efficient way genetic algorithm (GA), bees algorithm (BA) and marriage in honey bees optimization (MBO) algorithm as state-of-the-art conventional metaheuristics applied to QoS-MRP problem with the same simulation parameters.

Keywords

- Vehicular ad hoc network;
- Bees life algorithm;
- Multicast routing problem;
- Quality of service;
- Multi-objective;
- Swarm bee optimization

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