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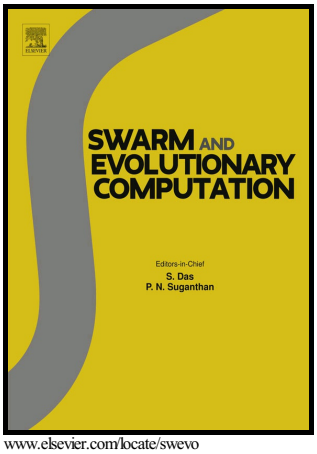

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An Elitist Nondominated Sorting Genetic Algorithm for QoS Multicast Routing in Wireless Networks

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Abstract

Due to the increasing popularity of real time multimedia applications, Quality-of-Service (QoS) based multicast routing has emerged as an active area of research. The fundamental requirements of many multimedia applications are cost minimization and bounded end-to-end delay. In addition, video data traffic is sensitive to packet loss and delay variance. Hence, multiobjective optimization seems to be the most appropriate method for such complex problems. We, therefore, formulate QoS based multicast routing as a multiobjective optimization problem using Elitist Nondominated Sorting Genetic Algorithm (NSGA-II). To enhance the performance of NSGA-II, we propose a new encoding scheme that aims to achieve a diversified solution set and faster convergence of search towards optimal Pareto front. It has also been observed that identical solutions cause loss of diversity which degrades the performance of NSGA-II algorithm. To overcome this drawback, the second enhancement based on replacement strategy is used. In this approach, one copy of identical solution is retained and new random solutions are introduced in the population to obtain a well distributed Pareto front. The results of new encoding scheme and replacement strategy are compared with other existing evolutionary multiobjective algorithms to demonstrate the effectiveness of the proposed approach. To further strengthen the usefulness of modified algorithm, the experimental results are validated using statistical significance tests.

Index Terms—**NSGA-II, QoS, multiobjective optimization, multicast routing, wireless network.**

I. INTRODUCTION

Most of the multimedia applications such as video conferencing, distance education and online gaming have stringent Quality-of-Service (QoS) requirements. The goal of QoS routing is to select paths that have enough resources to satisfy the QoS requests and to achieve global efficiency in resource utilization at the same time. Accomplishment of QoS requirement is a challenging task in wireless networks due to lack of fixed infrastructure, limited availability of the resources, and imprecise network information which makes the problem more complex [1].