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DYNAMIC SUBCARRIER AND BIT ALLOCATION FOR THROUGHPUT MAXIMIZATION IN MULTIUSER OFDM SYSTEMS USING ANT COLONY OPTIMAL ALGORITHM

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Abstract. *In this paper, an efficient dynamic resource allocation scheme for multiuser orthogonal frequency division multiplexing (OFDM) systems is investigated. There have been many researches to maximize total system throughput with only limited transmission power. In addition to the limited power, we add required minimum transmission bits for each user as another constraint for the quality of service (QoS) requirement. Greedy based algorithms are usually considered as methods that maximize total system throughput, but our algorithm outperforms the greedy based algorithm by using one of the heuristic algorithms called ant colony algorithm (ACA). The proposed algorithm maximizes the overall system throughput under the given total transmission power while satisfying QoS requirements such as required bit error rate (BER) and minimum transmission bits for each user. Also, it is shown that the proposed algorithm provides better performance in terms of system outage probability, throughput fairness per user, and subcarrier availability through numerical simulation results.*

Keywords: Subcarrier and bit allocation, Throughput maximization, Heuristic algorithm, Ant colony algorithm, Orthogonal frequency division multiplexing

1. **Introduction.** The growth of wireless and mobile applications leads to high-speed communication networks, and the significantly increased demand for the wireless networks requires higher efficiency of limited radio resources. Since the future wireless communications support a large number of subscribers for meeting the increased demand as well as fulfilling the higher quality of service (QoS) requirements, intelligent resource management algorithms are needed [1]. Orthogonal frequency division multiplexing (OFDM) scheme is introduced and considered as a promising multiple access scheme for future wireless communication networks. It is because of the capability to allocate transmission power and throughput optimally among subcarriers using channel and multiuser diversity. Adaptive subcarrier and bit allocation schemes demonstrate the significant increase of system performance in terms of efficiency of higher resource utilization [2].

There are two distinctly different approaches for adaptive subcarrier and bit allocation which are divided into marginal adaptive (MA) optimization algorithm [3-5] and rate adaptive (RA) optimization algorithm [6-10]. The objective of MA is to minimize the overall transmission power satisfying the data rate requirement of each user. On the other hand, the objective of RA is to maximize overall throughput on the total transmission power.

In RA optimization algorithm, Tase's algorithm [11] dose not concern QoS requirement such as the required minimum transmission bits, but Zhang [12] proposed a two