ABSTRACT

Femtocell network has emerged as the promising, energy-efficient and cost-effective communication technology that contributes to the resolution of poor indoor coverage and the enhancement of capacity over existing macrocell network. As a result, femtocell symbolizes the terrific solution to bolster network coverage and capacity in next-generation wireless communication. Femtocell refers to the small base station deployed in the indoor environments including homes and offices, enabling the user to access the indoor femtocell base station without having to connect the outside macrocell base station (MBS).

The increasing demand for more reliable data rate, especially in the indoor environment has presently emerged, and this trend prompts the dense deployment of Femto Base Station (FBS). Despite promising features of next-generation wireless communication, femtocell terribly suffers from a wide variety of great challenges, such as interference both femtocell-to-femtocell and macrocell-to-femtocell interference, arisen from the employment of spectrum reuse technique. Thus, it is possible that the resource block of one user might fairly or severely overlap that of the other users in different FBSs. Nevertheless, the optimal solution to the interference problem can be achieved by searching for the most appropriate combination of resource blocks allocated for each femto user equipment (FUE). In 3GPP-LTE specification, a resource block (RB) or sub-channel can be determined as the smallest time-frequency resource unit that can be allocated to a user. In this research, we address the problem of interference by allocating the most appropriate resource blocks based on the Bacterial Foraging Optimization (BFO). BFO is the biologically inspired algorithm imitating the social foraging behavior of the bacterium called E.coli. The BFO algorithm was proposed by Dr. Passino with the original aim at solving continuous problem. Resource blocks in femtocell, however, are in the discrete domain so that initial purpose of this algorithm doesn’t fit with the resource block problem. In this research, we propose the discretely modified BFO algorithm called DBFO to maximize SINR value, increasing system performance as the interference can be

reduced significantly due to appropriate resource block allocation. The simulation results show that the proposed algorithm performs more significantly in comparison to the random resource allocation. The cumulative distribution function of interference, throughput and SINR shows that DBFO improves the over performance of femtocell network. When compared to DPSO, the results also illustrate that DBFO can improve the system performance when there are less chemotaxis steps or steps taken by each particle or bacterium. However, with more chemotaxis steps or steps taken by each particle or bacterium, DPSO can increase the performance slightly better. We can conclude that there is the trade-off between these two algorithms because DBFO can produce the significant results with less computation time while DPSO can do better while consuming more time to compute. In conclusion, DBFO is capable of enhancing the fitness value (SINR) of femtocell network and significantly mitigate the interference under certain number of chemotactic steps in comparison to DPSO.