Abstract

Over the last few years Cognitive Radio Network (CRN) is playing an important role in Wireless Network. This can potentially provide higher performance wireless communication networks in terms of reliability, scalability, stability and spectrum efficiency. The nodes of the cognitive radio network are equipped with a cognitive engine having the capability to handle spectrum management and change transmission parameters using intelligence methods, in particular Evolutionary Algorithms (EAs) and Bio-inspired techniques. The issues of Cognitive Radio can be classified in different categories like efficient Spectrum utilization, handling unseen node, and Energy efficiency, etc. Most of the issues identified for resource allocation and spectrum management in the CRN are associated with several multiple-objectives which are conflicting in nature and demand a trade-off solution. Some of the objectives can be figured out as throughput, BER, power consumption, and interference. Furthermore, in a solitary execution of EAs a group of Pareto optimal solutions can be found, thus this ability of EAs craft it as an inimitable contender for solving MOPs (popularly known as multi-objective GAs (MOGAs)). As MOGAs produces multiple optimal solutions, so exploration of the entire Pareto front makes it more computationally expensive. Therefore, there have been multiple efforts to make GAs faster, and one of the most promising alternatives is parallelization of MOGAs.

Our research starts with an extensive study on the available Parallel Multi-objective Genetic Algorithms (PMOGAs) and their applications to CRN. Furthermore the empirical study of PMOGA models is done and intended us for the usage in various tasks of resource allocation in CRN. This work proposes a PMOGA based method to handle the multi-objective spectrum utilization problem with constraints. Which can able to explore the entire search space in less time without compromising with the throughput. A coarse grained model is proposed to address the channel allocation problem in a dynamic environment in CRN by considering the multiple objectives with constraints. A hybrid PMOGA based model is proposed to address the multi objective issue associated with power control and resource allocation in CRN, which is another attracting point of the thesis.