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A NOVEL FUNCTION OPTIMIZATION APPROACH USING OPPOSITION BASED GENETIC ALGORITHM WITH GENE EXCITATION

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Abstract. *Nonlinear Complex optimization problems are the key area of research in the field of optimization. Evolutionary Algorithms (EAs) are applied to solve these optimization problems successfully. The EAs suffer a lot due to their slow convergence rate, primarily due to evolutionary nature of these algorithms. It has been proved that distribution of initial population into the search space effects the evolutionary algorithm performance. This paper presents a novel initialization method for genetic algorithms, in which opposite of the population is created. The best individuals from the population and its opposite are selected as the initial population. This provides a better starting point for search through the solution space. To increase the convergence speed of EAs, a probabilistic excitation scheme for chromosomes is also introduced. This scheme tunes the population effectively during the evolutionary process. The performance of the algorithm is tested over suit of 10 functions with different dimensions. Opposition based Differential Evolution and Genetic Algorithms are used as competitor algorithms to compare the results of the proposed algorithm. Various sets of experiments are performed. The results show that the proposed method outperforms Opposition based Differential Evolution and Genetic algorithms for most of the test functions.*

Keywords: Genetic algorithms, Opposition based learning, Convergence speed, Excitation rate

1. **Introduction.** Evolutionary Algorithms are applied to the optimization problems successfully. The Genetic Algorithm (GA), one of the major techniques of EAs, was proposed by J. Holland in 1970s [11]. The GA is simple and robust enough to be applied to optimization problems. Evolutionary process of the GA requires only a few initial parameters for its execution. And it has been proven to attain superior performance to other optimization techniques when it comes to the terms of convergence speed and robustness over many real world problems like [13-15] and benchmark problems [7-9]. Almost all of the population based optimization approaches like the GA, Particle Swarm Optimization (PSO) and Ant Colony Optimization (ACO), etc. have slow convergence rate due to the probabilistic/evolutionary nature of these algorithms. So, these algorithms can be an excellent candidate for the acceleration of their convergence rate. If the convergence speed is made fast enough, then these algorithms can be a preferable choice for use in situation with real time restrictions. Many remedies have been proposed to accelerate