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DIFFERENTIAL EVOLUTION USING MIXED STRATEGIES IN COMPETITIVE ENVIRONMENT

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Abstract. *Differential evolution (DE) is a powerful yet simple evolutionary algorithm for optimizing real valued optimization problems. Traditional investigations with DE have used a single mutation operator. Using a variety of mutation operators that can be integrated during evolution could hold the potential to generate a better solution with less computational effort. In view of this, in the present study, a mixed mutation strategy which uses the concept of evolutionary game theory is proposed integrating the basic differential evolution mutation and quadratic interpolation based mutation to generate a new solution. Throughout of this paper, we refer this new algorithm as Mixed Strategy Differential Evolution (MSDE). The performance of proposed MSDE is investigated and compared with basic differential evolution and some other modified versions of DE available in literature. The experiments conducted show the competence of the proposed MSDE algorithm.*

Keywords: Differential evolution, Mutation operator, Pure strategy, Mixed strategy

1. **Introduction.** In the past few decades, Evolutionary Algorithms (EAs) have become the center of attention for solving complex global optimization problems which are otherwise difficult to solve by traditional methods. These algorithms have been successfully applied to a wide range of single and multi-objective optimization problems [1-4].

Some common EAs available in literature include Genetic Algorithms [5], Evolutionary Strategies [6], Evolutionary Programming [7], Particle Swarm Optimization [8], Differential Evolution [9], etc.

In the present study, we focus on DE, proposed by Storn and Price in 1995 [9], which is relatively a new addition to the class of EAs. Within a short span of around fifteen years, DE has emerged as one of the most popular techniques for solving optimization problems. DE has been successfully applied to solve a wide range of real life application problems arising in the field of science and engineering. Some of the areas where DE has been applied successfully include aerodynamic shape optimization [10], optimization of radial active magnetic bearings [11], automated mirror design [12], optimization of fermentation by using high ethanol tolerance yeast [13], clustering [14], neural network