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Differential Evolution – A diversity approach

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Abstract Insert your abstract here. Include keywords, PACS and mathematical subject classification numbers as needed.

Keywords Diversity · Differential Evolution · Evolutionary

1 Introduction

Evolutionary Algorithms (EAs) are built to deal with optimization problems, which are designed from many scientific and application fields, such as science, economic and engineering [1,2]. Principally, EAs can be classified into following categories, such as Genetic Algorithms (GAs) [3, 4] , Evolutionary Strategies (ESs) [5], Genetic Programming (GP) [6], Evolutionary Programing (EP) [7], Differential Evolution (DE) [8] and other natural-inspired algorithms [9]. DE was introduced by Storn and Price [8], also is cosidered as one of the most effective EAs used to deal with real-world optimization problems, mainly for its convergency properties. Similarly than with other EAs, DE follows the natural evolution process which involves mutation, recombination and selection to evolve a population throuth an iterative progress until the criteria stop is reached. However, the peculiarity of DE is that employs the difference of vectors parameters to explore the search space, being very similar than its precursor algorithms namely the Nelder-Mead [10] and the Controled Random Search (CRS) [11]. In spite of the popularity and effectiveness of DE, there exists several weakness that had been partially solved througth learning techniques. One of the first weakness and possibly the most important is that

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the performance of DE is very sensitive to choice of the strategy parameters depending in the objective function [12]. Several strategies as adaptive and self adaptive have been proposed to alliviate this drawback [13, 14]. However, none of these strategies has shown superior results than the rest.

A second weakness of DE algorithms reside in the reproduction process, since that are based in vector differences the search process is affected, therefore a limited number of solutions can be produced. In fact, this transformation of a continuous to discrete problem can lead to converge to local optima or lost of diverse solutions better known as premature convergence. On the other hand, there exist situations where the search process could not progress and the population remains diverse, its phenomena is known as stagnation [15]. It well known that stagnation ocurrs since that a small population size is applied, while larger populations are not prone to stagnate.

**The strength is internally induces, the mutation depends on the content of the population, due the limited number of different trial slutions within one generation, producing a stagnatin ref 19. **Influence of the population size and stagnation ref20 **Premature loss of diversity ref 2. **Techniques to deal with this hybridization with anneling procedures to reduce the selection pressure ref37 **Generational replacement ref3. **Incrementing the population size ref19. **Organization of the paper.ss

2 Differential Evolution

*Fundamentals. - Fully description of Differential Evolution. —— Description of differential evolution. *Decription of the single-objective problem. *Explain each stage in DE. * *

——Diversity Revision *Explain the influence of the paramters. *Show the implication of these operators with the population diversity. *Talk about hybrid and adaptive strategies.

3 Differential Evolution Trends

4 Proposal

5 Experimental Study

6 Conclusion

6.1 Subsection title

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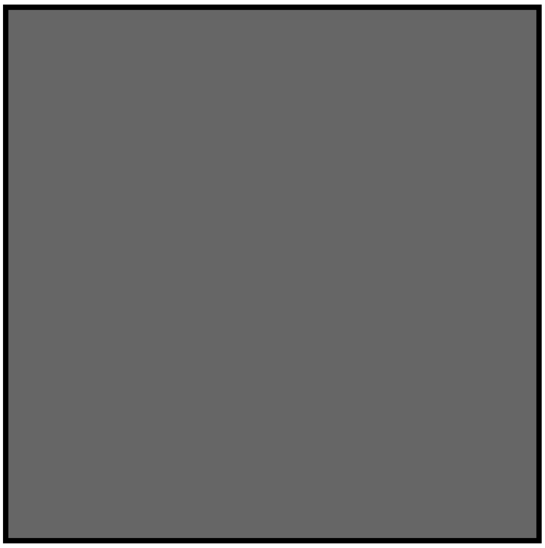

Fig. 1 Please write your figure caption here

Table 1 Please write your table caption here

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$$a^2 + b^2 = c^2 \tag{1}$$

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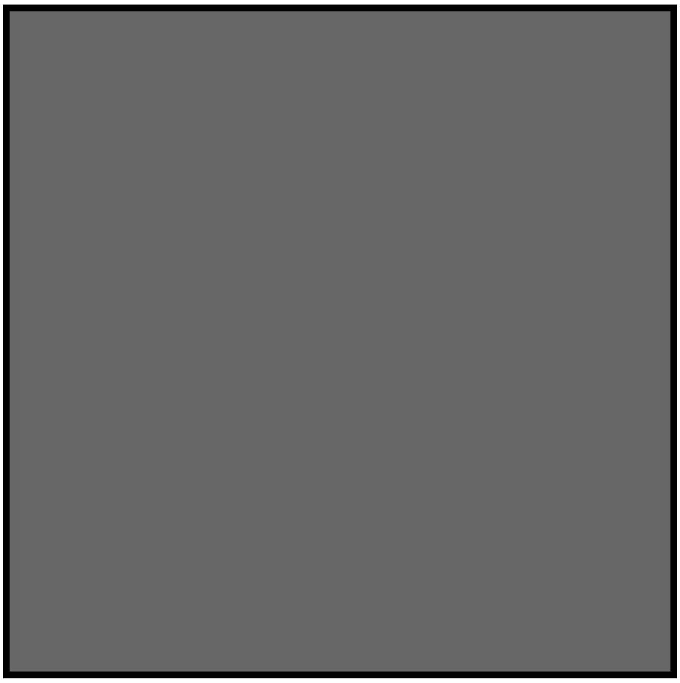

Fig. 2 Please write your figure caption here

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