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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 one of the most important

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is that the performance of DE is very sensitive to choice of the strategy parameters depending in the objective function [12]. Several strategies to alleviate the sensitivite have been proposed. Althougth that several strategies have been proposed ref 17 and 37,

**Weakness discovered in DE. **Dependence between parameters and the quality solutions ref 15, 60. **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.

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

as required. Don't forget to give each section and subsection a unique label (see Sect. **??**).

Paragraph headings Use paragraph headings as needed.

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

References

1. N. Noman, H. Iba, Differential evolution for economic load dispatch problems, Electric Power Systems Research **78**(8), 1322 (2008)
2. U.K. Chakraborty, *Advances in differential evolution*, vol. 143 (Springer, 2008)

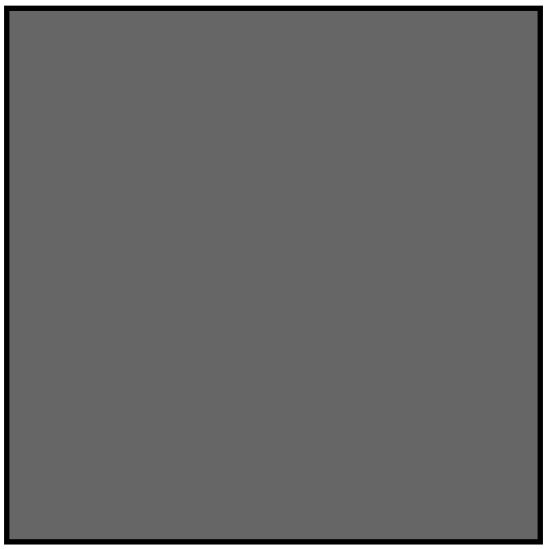

Fig. 1 Please write your figure caption here

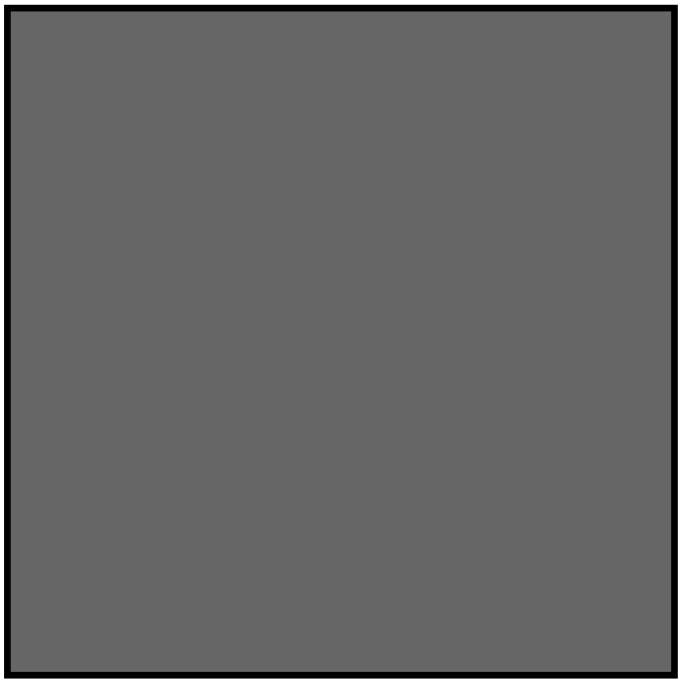

Fig. 2 Please write your figure caption here

Table 1 Please write your table caption here

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3. M. Srinivas, L.M. Patnaik, Genetic algorithms: A survey, computer **27**(6), 17 (1994)
4. H.P. Schwefel, Numerische optimierung von computer-modellen (phd thesis), Reprinted by Birkhuser (1977)
5. H. John. Holland, adaptation in natural and artificial systems: An introductory analysis with applications to biology, control and artificial intelligence (1992)
6. J.R. Koza, *Genetic Programming II, Automatic Discovery of Reusable Subprograms* (MIT Press, Cambridge, MA, 1992)
7. D.B. Fogel, L.J. Fogel, J.W. Atmar, in *Signals, systems and computers, 1991. 1991 Conference record of the twenty-fifth asilomar conference on* (IEEE, 1991), pp. 540–545
8. R. Storn, K. Price, Differential evolution–a simple and efficient heuristic for global optimization over continuous spaces, Journal of global optimization **11**(4), 341 (1997)
9. S. Das, P.N. Suganthan, Differential evolution: A survey of the state-of-the-art, IEEE transactions on evolutionary computation **15**(1), 4 (2011)
10. J.A. Nelder, R. Mead, A simplex method for function minimization, The computer journal **7**(4), 308 (1965)
11. W. Price, Global optimization by controlled random search, Journal of Optimization Theory and Applications **40**(3), 333 (1983)
12. R. Gämperle, S.D. Müller, P. Koumoutsakos, A parameter study for differential evolution, Advances in intelligent systems, fuzzy systems, evolutionary computation **10**(10), 293 (2002)