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Hybrid Computational Intelligence for Optimization Based On PSO and DE

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ABSTRACT

Particle Swarm Optimization (PSO) is a stochastic global optimization method which is originated from the reproduction of the social performance of birds within a flock. Differential Evolution (DE)is a method that optimizes a problem by iteratively trying to improve an applicant solution with regard to a given determine or feature. The main purpose of this cram work is to nearby the major techniques for quickly verdict the global solution. In this paper combination of PSO and DE is proposed for quickly finding the global solutions. The multibenchmark, multimodal functions are used to test the performance of the proposed methods. The expected will be less time taken as compare to other algorithm.

Index Terms – Particle Swarm Optimization(PSO),Differential Evolution(DE),Global Solution(GS).

I. INTRODUCTION

The standard PSO has difficulty with every time converging to large-scale optima, especially for multi-modal, high-dimensional functions. The aim of optimization is to determine the best-suited solution to a problem under given set of constraints**.** The global optimization of multi-modal functions is an important topic in scientific and engineering investigates since many real situations can be modeled as nonlinear optimization problems. However, these PSO variants still have problems finding global solutions for some benchmark multi-modal, high-dimensional functions. The goal of this paper is to combine PSO techniques with differential evolution algorithm for finding globally optimal solutions of high-dimensional functions. We will focus on whether our proposed new approach can find the global solutions for these functions, and examine the performance of these approaches in converge to a worldwide solution.

In computer science, differential evolution (DE) is a method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality. Such methods are commonly known as metaheuristics as they make few or no assumptions about the problem being optimized and can search very large spaces of candidate solutions. However, metaheuristics such as DE do not guarantee an optimal solution is ever found.

II. LITERATURE SURVEY

In [1], two hybrid PSO algorithms: one uses a Differential Evolution (DE) operator to replace the standard PSO method for updating a particle's position. The goal of this was to investigate hybrid PSO approaches to optimize multi-modal functions. The goal was successfully achieved by using a DE operator and integrating a local search. In both hybrid algorithms, the convergence to local optima was successfully avoided; two hybrid PSO algorithms were developed in this.
HybridPSO1 replaces the method in standard PSO with one DE operator and uses it to update particles. HybridPSO2 integrates one local search operator based on HybridPSO1, explores the local optimal position in particles region. Both hybrid PSO algorithms are effective to find the global solutions of the seven benchmark multi-modal and high-dimensional functions. Global Search and optimization problems are ubiquitous through the various realms of science and engineering as in [2]. This has provided a comprehensive overview of two promising optimization algorithms, which are currently gaining popularity for their greater accuracy, faster convergence speed and simplicity. One of these algorithms, known as PSO mimics the behavior of a group of social insects in multi-agent cooperative search problems. The latter one called DE (DE) is a deviant variety of GA, which attempts to replace the crossover operator in GA by a special type of differential operator for reproducing offspring in the next generation. In [3], a competitive variant of Differential Evolution with Local Search algorithm is proposed to address real world optimization problems. These optimization problems are very hard to optimize due to large number of local minima. So, a distant search method is also included to farther ensure that any subpopulation does not get trapped in some local optima. We have also developed a hybrid mutation strategy to overcome the fast but less reliable convergence. [4], presents a hybrid particle swarm with differential evolution operator called DEPSO. The
Hybrid strategy provides the bell-shaped mutations with consensus on the population diversity by DE operator, while keeps the self-organized particle swarm dynamics, in order to make the performance is not very sensitive to the choice of the strategy parameters. It is shown to outperform the PSO and DE for a set of benchmark functions. However, more comparative works with different parameter settings for more problems should be performed to provide a full view.
In [5], a new self-adaptive DE variant, SaNSDE, which is an improved version of our previous algorithm NSDE. The SaNSDE can be viewed as a hybridization of SaDE [2] and NSDE [1]. In SaNSDE: 1) It utilized the

self-adaptation strategy of SaDE to adapt between candidate mutations; 2) It applied a self-adaptation to adjust parameter F; 3) Then it illustrated the ill-condition of original CR self-adaptation in SaDE, and proposed an enhanced version with weighting

III. PROPOSED METHODOLOGY

In this paper, we use combining of different two algorithms to create a hybrid. In this two algorithms are used for hybridization, and they are: PSO (Particle Swarm Optimization) Differential evolutionary. The aim of optimization is to establish the best-suited elucidation to a problem under given set of constraints**.** Particle Swarm Optimization (PSO) is a stochastic global optimization method which originated from the recreation of the social behavior of birds within a congregate, as developed by Kennedy and Eberhart in 1995. In computer science, differential evolution (DE) is a method that optimizes a problem by iteratively trying to improve a contestant solution with regard to a given measure of quality.

A .Particle Swarm Optimization

PSO is a robust stochastic optimization technique based on the movement and intelligence of swarms. PSO maintains a population of candidate solutions (called *particles*) and moves these particles around the search space. Each particle "flies" in a *D*-dimensional space according to the historical experiences of its own and its colleagues. Particle *i* has both a position, x_i , and a velocity v_i , which in "standard" PSO (SPSO), are updated as follows:

- Each particle tries to modify its position using the following information:
  - the current positions,
  - the current velocities,
  - the distance between the current position and pbest,
  - the distance between the current position and the gbest.
- The modification of the particle's position can be mathematically

modeled according the following equation :

$$\mathbf{V_i^{k+1} = c_0 V_i^k + c_1\, rand_1(\ldots) \times (pbest_i - s_i^k) + c_2\, rand_2(\ldots) \times (gbest - s_i^k)} \quad (1)$$

Where, v_i^k: velocity of agent i at iteration k,
c_j : weighting factor,
rand : uniformly distributed random number between 0 and 1,
s_i^k : current position of agent i at iteration k,
$pbest_i$: pbest of agent i,
gbest: gbest of the group.

Particle update position

$$\mathbf{s_i^{k+1} = s_i^k + V_i^{k+1}} \quad (2)$$

B. Differential Evolution

Differential Evolution (DE) is also a population-based optimization algorithm. It has been applied to classical optimization and multi-objective optimization .DE creates new candidate solutions by combining existing, ones, via three evolutionary operators: mutation crossover and selection. The classical DE (crossover) operator is given as:

$$v^i_j = x^t_{l1} + F(x^t_{l2} - x^t_{l3})$$

$$x^{t+1}_{i,j} = \begin{cases} v^t_{i,j} & rand() < pcr \\ x^t_{i,j} & \text{otherwise} \end{cases}$$

C .Hybrid PSO and DE

Hybridization has bowed out to be an effective and competent way to design high-performance optimizers, which is witnessed by the rapid evolution of diverse hybrid optimizers in the precedent decade. As a special and ambassador affiliate in the family of hybrid optimizers, DEPSO has received much consideration from researchers that are engrossed in optimization, problem solving, and algorithm design.

The optimization problem, now-a-days, is represented as an intellectual search problem, where one or more agents are employed to verify the optima on a search landscape, representing the constrained surface for the optimization problem.The algorithm which gives the hybrid of PSO and DE is:

for *i = 0 to the maximum bound of the number of function evaluation* ***do***
  for *s = 0 to the swarm size* ***do***
    for *d = 0 to the problem dimension* ***do***
      Update velocity by PSO method
      Update position by PSO method
    end for *d*
    Compute fitness of updated position If needed, update historical information for P_i *and* P_g
  end for *s*
  Select the best swarm as a elitism swarm
  If saturation factor critaria met
    Perform DE updation in the Elitism swarm
      Compute fitness *New solution generated from parents as a result ofDE. Replace the parent particle with the newoffspring*
  end if

end for *i*

IV. PROPOSED RESULT

From the discussion, it can be seen that Hybridization of any algorithms has many useful applications in soft computing and computer vision fields. Several researchers have explored and implemented different approaches for intelligence. The success of a particular approach depends largely on the problem domain The Expected outcome is to reduce the time complexity by reducing iteration of the solution. In this study, an attempt has been made by different approaches and to train the computational astuteness for different parameters such as based on benchmark function.

V. CONCLUSION

From the discussion, it can be seen that hybridization has many constructive applications in the Scheduling, wireless network and computer vision fields. Several researchers have explored and implemented dissimilar approaches for optimization. The success of a scrupulous approach depends largely on the problem domain. In other words, a method that is successful to obtain best suited solution to optimize the multimodal functions. For real time applications we may need fast high performance optimization techniques. It can also be seen from the diverse nature of the techniques used that the field has a lot of room for improvement

VI. SCOPE FOR FUTURE WORK

For future we will prepare artificial intelligence in such a way that it can optimize with great accuracy and deal with best suited solution as well also. In that system we will skilled computational intelligence work for every domain so that it can successfully optimized multiple functions for scheduling, wireless sensors etc.

REFERENCES

[1]. Hybrid Particle Swarm Optimisation Algorithms Based on Differential Evolution and Local Search Wenlong Fu1, Mark Johnston1, and Mengjie Zhang2 1 School of Mathematics, Statistics and Operations Research 2 School of Engineering and Computer ScienceVictoria University of Wellington, P.O. Box 600, Wellington, New Zealand

[2]Particle Swarm Optimization and Differential Evolution Algorithms: Technical Analysis, Applications and Hybridization Perspectives Swagatam Das1, Ajith Abraham2, and Amit Konar1Studies in Computational Intelligence (SCI) 116, 1–38 (2008) www.springerlink.com c_ Springer-Verlag Berlin Heidelberg 2008

[3] MODIFIED DIFFERENTIAL EVOLUTION WITH LOCAL SEARCH ALGORITHM FOR REAL WORLD OPTIMIZATION: ANKUSH MANDAL, AVEEK KUMAR DAS, AND PRITHWIJIT MUKHERJEE, SWAGATAM DAS, IEEE (2011.

[4] DEPSO: Hybrid Particle Swarm with Differential Evolution Operator Wen-Jun Zhang, Xiao-Feng Xie* Institute of Microelectronics,

.

[5] A. Bonnaccorsi, "On the Relationship between Firm Size and Export Intensity," Journal of International Business Studies, XXIII (4), pp. 605-635, 1992. (journal style)

[6]R.Caves, Multinational Enterprise and Economic Analysis, Cambridge University Press, Cambridge, 1982. (book style)

[7]M. Clerc, "The Swarm and the Queen: Towards a Deterministic and Adaptive Particle Swarm Optimization," In Proceedings of the IEEE Congress on Evolutionary Computation (CEC), pp. 1951-1957, 1999. (conference style)

[8] H.H. Crokell, "Specialization and International Competitiveness," in Managing the Multinational Subsidiary, H. Etemad and L. S, Sulude (eds.), Croom-Helm, London, 1986. (book chapter style)contour," IEEE Trans. Circuits and Systems for Video Technology,vol. 20, no. 4, April 2010.

[9] K. Deb, S. Agrawal, A. Pratab, T. Meyarivan, "A Fast Elitist Non-dominated Sorting Genetic Algorithms for Multiobjective Optimization: NSGA II," KanGAL report 200001, Indian Institute of Technology, Kanpur, India, 2000. (Technical report style)

[10] J. Geralds, "Sega Ends Production of Dreamcast," vnunet.com, para. 2, Jan. 31, 2001. [Online]. Available: http://nl1.vnunet.com/news/1116995. [Accessed: Sept. 12, 2004]. (General Internet site)

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