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Authors:

Atinesh Singh, Nanda Dulal Jana

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Abstract

In recent years, there has been a remarkable improvement in the computing power of computers. As a result, numerous realworld optimization problems in science and engineering, possessing very high dimensions, have appeared. In the research community, they are generally labeled as Large Scale Global Optimization (LSGO) problems. Several Metaheuristics has been proposed to tackle these problems. Broadly these algorithms can be categorized in 3 groups: Standard Evolutionary Algorithms, Cooperative Co-evolution (CC) based Evolutionary Algorithms and Memetic Algorithms. This paper gives a brief introduction of some state-of-the-art Metaheuristics used in the field of LSGO, discusses their performance in CEC Competition on LSGO and finally, future scope in this field is presented.

References

1. J. Brest, A. Zamuda, B. Boskovic, M. S. Maucec, and V. Zumer. High-dimensional real-parameter optimization using self-adaptive differential evolution algorithm with population

size reduction. In 2008 IEEE Congress on Evolutionary Computation (IEEE World Congress on Computational Intelligence), pages 2032–2039, June 2008.

2. Wenxiang Chen, Thomas Weise, Zhenyu Yang, and Ke Tang. Large-Scale Global Optimization Using Cooperative Coevolution with Variable Interaction Learning, pages 300–309. Springer Berlin Heidelberg, Berlin, Heidelberg, 2010.

3. Nikolaus Hansen and Andreas Ostermeier. Completely derandomized self-adaptation in evolution strategies. Evol. Comput., 9(2):159–195, June 2001.

4. J. Kennedy and R. Eberhart. Particle swarm optimization. In Neural Networks, 1995. Proceedings., IEEE International Conference on Neural Networks, volume 4, pages 1942–1948 vol.4, Nov 1995.

5. P. Korosec, K. Tashkova, and J. Silc. The differential antstigmergy algorithm for large-scale global optimization. In IEEE Congress on Evolutionary Computation, pages 1–8, July 2010.

6. A. LaTorre, S. Muelas, and J. M. Pea. Large scale global optimization: Experimental results with mos-based hybrid algorithms. In 2013 IEEE Congress on Evolutionary Computation, pages 2742–2749, June 2013.

7. J. J. Liang and P. N. Suganthan. Dynamic multi-swarm particle swarm optimizer. In Proceedings 2005 IEEE Swarm Intelligence Symposium, 2005. SIS 2005., pages 124–129, June 2005.

8. Jinpeng Liu and Ke Tang. Scaling up covariance matrix adaptation evolution strategy using cooperative coevolution. In Proceedings of the 14th International Conference on Intelligent Data Engineering and Automated Learning — IDEAL 2013 - Volume 8206, IDEAL 2013, pages 350–357, New York, NY, USA, 2013. Springer-Verlag New York, Inc.

9. Ilya Loshchilov. A computationally efficient limited memory cma-es for large scale optimization. In Proceedings of the 2014 Annual Conference on Genetic and Evolutionary Computation, GECCO '14, pages 397–404, New York, NY, USA, 2014. ACM.

10. Yi Mei, Mohammad Nabi Omidvar, Xiaodong Li, and Xin Yao. A competitive divide-and-conquer algorithm for unconstrained large-scale black-box optimization. ACM Trans. Math. Softw., 42(2):13:1–13:24, June 2016.

11. D. Molina and F. Herrera. Iterative hybridization of de with local search for the cec'2015 special session on large scale global optimization. In 2015 IEEE Congress on Evolutionary Computation (CEC), pages 1974–1978, May 2015.

12. D. Molina, M. Lozano, and F. Herrera. Ma-sw-chains: Memetic algorithm based on local search chains for large scale continuous global optimization. In IEEE Congress on Evolutionary Computation, pages 1–8, July 2010.

13. M. N. Omidvar, X. Li, Y. Mei, and X. Yao. Cooperative co-evolution with differential grouping for large scale optimization. IEEE Transactions on Evolutionary Computation, 18(3):378–393, June 2014.

14. M. N. Omidvar, X. Li, Z. Yang, and X. Yao. Cooperative coevolution for large scale optimization through more frequent random grouping. In IEEE Congress on Evolutionary Computation, pages 1–8, July 2010.

15. M. N. Omidvar, X. Li, and X. Yao. Cooperative co-evolution with delta grouping for large scale non-separable function optimization. In IEEE Congress on Evolutionary Computation, pages 1–8, July 2010.

16. Mitchell A. Potter. The Design and Analysis of a Computational Model of Cooperative Coevolution. PhD thesis, Fairfax, VA, USA, 1997. UMI Order No. GAX97-28573.

17. Mitchell A. Potter and Kenneth A. De Jong. A cooperative coevolutionary approach to function optimization, pages 249– 257. Springer Berlin Heidelberg, Berlin, Heidelberg, 1994.

18. Mitchell A. Potter and Kenneth A. De Jong. Cooperative coevolution: An architecture for evolving coadapted subcomponents. Evol. Comput., 8(1):1–29, March 2000.

19. A. K. Qin and P. N. Suganthan. Self-adaptive differential evolution algorithm for numerical optimization. In 2005 IEEE Congress on Evolutionary Computation, volume 2, pages 1785–1791 Vol. 2, Sept 2005.

20. E. Sayed, D. Essam, and R. Sarker. Dependency identification technique for large scale optimization problems. In 2012 IEEE Congress on Evolutionary Computation, pages 1–8, June 2012.

21. Eman Sayed, Daryl Essam, and Ruhul Sarker. Using Hybrid Dependency Identification with a Memetic Algorithm for Large Scale Optimization Problems, pages 168–177. Springer Berlin Heidelberg, Berlin, Heidelberg, 2012.

22. R. Storn. On the usage of differential evolution for function optimization. In Proceedings of North American Fuzzy Information Processing, pages 519–523, Jun 1996.

23. J. Sun and H. Dong. Cooperative co-evolution with correlation identification grouping for large scale function optimization. In 2013 IEEE Third International Conference on Information Science and Technology (ICIST), pages 889–893, March 2013.

24. Yuan Sun, Michael Kirley, and Saman Kumara Halgamuge. Extended differential grouping for large scale global optimization with direct and indirect variable interactions. In Proceedings of the 2015 Annual Conference on Genetic and Evolutionary Computation, GECCO '15, pages 313–320, New York, NY, USA, 2015. ACM.

25. Lin-Yu Tseng and Chun Chen. Multiple trajectory search for large scale global optimization. In 2008 IEEE Congress on Evolutionary Computation (IEEE World Congress on Computational Intelligence), pages 3052–3059, June 2008.

26. Y. Wang and B. Li. Two-stage based ensemble optimization for large-scale global optimization. In IEEE Congress on Evolutionary Computation, pages 1–8, July 2010.

27. Yu Wang and Bin Li. A Self-adaptive Mixed Distribution Based Uni-variate Estimation of Distribution Algorithm for Large Scale Global Optimization, pages 171–198. Springer Berlin Heidelberg, Berlin, Heidelberg, 2009.

28. F. Wei, Y. Wang, and T. Zong. A novel cooperative coevolution for large scale global optimization. In 2014 IEEE International Conference on Systems, Man, and Cybernetics (SMC), pages 738–741, Oct 2014.

29. F. Wei, Y. Wang, and T. Zong. Variable grouping based differential evolution using an auxiliary function for large scale global optimization. In 2014 IEEE Congress on Evolutionary Computation (CEC), pages 1293–1298, July 2014.

30. K. Weicker and N. Weicker. On the improvement of coevolutionary optimizers by learning variable interdependencies. In Proceedings of the 1999 Congress on Evolutionary Computation-CEC99 (Cat. No. 99TH8406), volume 3, page 1632 Vol. 3, 1999.

31. Zhenyu Yang, Ke Tang, and Xin Yao. Large scale evolutionary optimization using cooperative coevolution. Information Sciences, 178(15):2985 – 2999, 2008. Nature Inspired Problem-Solving.

32. Zhenyu Yang, Ke Tang, and Xin Yao. Multilevel cooperative coevolution for large scale optimization. In 2008 IEEE Congress on Evolutionary Computation (IEEE World Congress on Computational Intelligence), pages 1663–1670, June 2008.

33. Zhenyu Yang, Ke Tang, and Xin Yao. Self-adaptive differential evolution with

neighborhood search. In 2008 IEEE Congress on Evolutionary Computation (IEEE World Congress on Computational Intelligence), pages 1110–1116, June 2008.

34. Zhenyu Yang, Ke Tang, and Xin Yao. Scalability of generalized adaptive differential evolution for large-scale continuous optimization. Soft Computing, 15(11):2141–2155, 2011.

35. Zhenyu Yang, Xin Yao, and Jingsong He. Making a Difference to Differential Evolution, pages 397–414. Springer Berlin Heidelberg, Berlin, Heidelberg, 2008.

36. J. Zhang and A. C. Sanderson. Jade: Adaptive differential evolution with optional external archive. IEEE Transactions on Evolutionary Computation, 13(5):945–958, Oct 2009.

37. S. Z. Zhao, J. J. Liang, P. N. Suganthan, and M. F. Tasgetiren. Dynamic multi-swarm particle swarm optimizer with local search for large scale global optimization. In 2008 IEEE Congress on Evolutionary Computation (IEEE World Congress on Computational Intelligence), pages 3845–3852, June 2008.

38. S. Z. Zhao, P. N. Suganthan, and S. Das. Dynamic multiswarm particle swarm optimizer with sub-regional harmony search. In IEEE Congress on Evolutionary Computation, pages 1–8, July 2010.

Index Terms

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Keywords

Evolutionary Computation, Large Scale Optimization, Black-Box Optimization, Computational Intelligence