UNIVERSITI TEKNOLOGI MARA

HYBRID CONJUGATE GRADIENT METHOD WITH EXACT LINE SEARCH FOR GREY WOLF OPTIMIZATION ALGORITHM

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ABSTRACT

Optimization is obtaining optimal solution in solving objective function. Conjugate gradient (CG) method is known for solving unconstrained optimization problems due to its simplicity, low memory storage and global convergence properties. CG method has been implemented in various application such as data fitting, robotic motion control and Grey Wolf Optimization (GWO) algorithm. GWO is a metaheuristic optimization algorithm that has credibility in solving multiple optimization problems. However, GWO is said to have poor population diversity, slow convergence in later stages and prone to get stuck in local optimums where it proves the imbalance of exploration and exploitation search. Thus, this research aims to find the best hybrid CG (HCG) under exact line search and implement it in GWO to improve search process through the hybrid GWO-CG algorithm. The performance of five HCG methods, LAMR-KMAR, LAMR-NRMI, LAMR-HS, LAMR-PRP and LAMR-LS coefficients are tested using 15 standard test functions with different initial points and variables ranging from 2 to 10,000. The numerical results are computed based on number of iteration (NOI) and CPU time. The results are plotted using performance profile to evaluate its efficiency and robustness. Numerically, LAMR-PRP outperforms other methods by solving all test functions with least NOI and CPU time. Lastly, LAMR-PRP is implemented in GWO and resulting effective implementation as it performs better that original GWO.

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