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Guided Dynamic Particle Swarm Optimization for Optimizing Digital Image Watermarking in Industry Applications

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Abstract

Particle Swarm Optimization (PSO) algorithms often face premature convergence problem, specially in multimodal problems as it may get stuck in specific point. In this paper, we have enhanced Dynamic-PSO i.e. and an extension of our earlier research work. This newly proposed algorithm Guided Dynamic-PSO (GDPSO) also targets the particles whose personal best get stuck i.e. their personal best does not improve for fixed number of iterations similar to DPSO, however a new approach is proposed for replacing personal bests of such particles. The replacement of this new personal best is done on the basis of sharing fitness so that better diversity can be provided to avoid the problem. The performance of GDPSO has been compared with PSO and its variants including DPSO over 24 benchmark functions provided by Black-Box Optimization Benchmarking (BBOB 2015). Results show that the performance of GDPSO is better in comparison with other peer algorithms. Further effectiveness of GDPSO is demonstrated in digital image watermarking. Digital image watermarking schemes primarily focus on providing good tradeoff between imperceptibility and robustness along with reliability in watermarked images produced for wide variety of applications. To support watermarking scheme in achieving this tradeoff, suitable watermark strength is identified in the form of scaling factor using GDPSO for coloured images. Results achieved through GDPSO are compared with PSO

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