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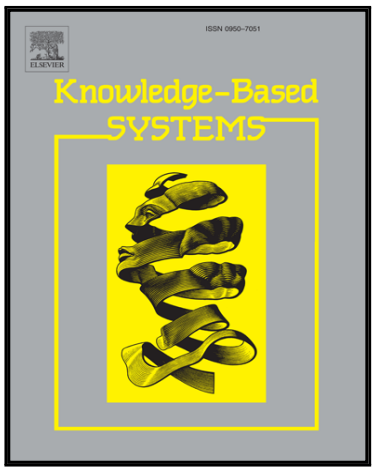

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A stability constrained adaptive alpha for gravitational search algorithm

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Abstract:

Gravitational search algorithm (GSA), a recent meta-heuristic algorithm inspired by Newton's law of gravity and mass interactions, shows good performance in various optimization problems. In GSA, the gravitational constant attenuation factor alpha (α) plays a vital role in convergence and the balance between exploration and exploitation. However, in GSA and most of its variants, all agents share the same α value without considering their evolutionary states, which has inevitably caused the premature convergence and imbalance of exploration and exploitation. In order to alleviate these drawbacks, in this paper, we propose a new variant of GSA, namely stability constrained adaptive alpha for GSA (SCAA). In SCAA, each agent's evolutionary state is estimated, which is then combined with the variation of the agent's position and fitness feedback to adaptively adjust the value of α. Moreover, to preserve agents' stable trajectories and improve convergence precision, a boundary constraint is derived from the stability conditions of GSA to restrict the value of α in each iteration. The performance of SCAA has been evaluated by comparing with the original GSA and four alpha adjusting algorithms on 13 conventional

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