

# Spiral Sine-Cosine Algorithm for Global Optimization

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## ABSTRACT

This paper presents a Hybrid Spiral and Sine-Cosine Algorithm (SSCA). Sine-Cosine algorithm (SCA) is a random-based optimization that utilizes an elitism approach and adaptive step size in its strategy. The step size is linearly varied and thus has caused the algorithm to produce steady convergence trend towards an optimal solution. It also has resulted the algorithm unable to achieve the true optimal solution. On the other hand, Spiral Dynamic Algorithm (SDA) is a deterministic-based algorithm that offers a nonlinear trend of agents step size in its operation. Therefore, an adoption of spiral equation from SDA into SCA is proposed as a solution to increase SCA convergence speed and its corresponding accuracy. The proposed algorithm is tested with a set of benchmark functions. Its accuracy and convergence trend performances are measured and recorded. A nonparametric Wilcoxon Sign Rank test is applied to statistically analyze the significance improvement of the SSCA accuracy in comparison to original SCA. Finding from the accuracy analysis indicates that the proposed SSCA algorithm significantly outperformed the original SCA. Moreover, from a graphical result, it shows that the SSCA has faster speed compared to another contestant algorithm.

## Keywords

*Sine-Cosine algorithm, spiral dynamic algorithm, global optimization algorithm*