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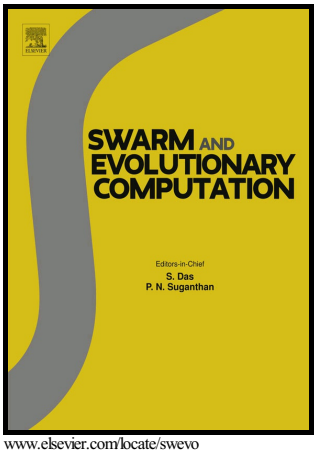

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Abstract

Grinding process is one of the most important machining processes in industry. The mathematical model of the optimization of the grinding process includes three objective functions and a weighted objective function with a set of operational constraints. Due to nonlinearity and complexity of the mathematical model, optimization of grinding process is a challenging task. This paper aims to optimize the surface grinding process parameters to increase final surface quality and production rate while minimizing total process costs. A novel Robust Stochastic Fractal Search is proposed to solve the problem efficiently. To increase the efficiency of the algorithm, a robust design methodology named Taguchi method is utilized to tune the parameters of the Stochastic Fractal Search. Since, the basic version of the Stochastic Fractal Search is proposed for unconstrained optimization, in this research, an efficient constraint handling method is implemented to handle complex nonlinear constraints of the problem. To Show the applicability and efficiency of the proposed Robust Stochastic Fractal Search, an experimental example is solved and compared to the results of the previous researches in the literature as well as two novel algorithm MPEDE and HCLPSO. The results revealed that the Robust Stochastic Fractal Search provides very competitive solutions and outperforms other solution methods.

Keywords: Robust Design; Grinding Process; Constrained Optimization; Stochastic Fractal Search; Taguchi Method

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