Proceedings of the 2nd Annual World Conference
of the Society for Industrial And Systems Engineering
Las Vegas, NV, USA
November 5-7, 2013

Multi-Criteria Flow Shop Scheduling Using Hybrid GASA

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Abstract: Flow shop scheduling problems with sequence dependent set up times have been considered as one of the most complicated problems in the area of scheduling. In modern flow shop scheduling, industries have to achieve the various goals such as market competitiveness, manufacturing products economically, and increased productivity simultaneously. Hence, scheduling 'n' jobs on 'm' machines subject to multi-criteria decision making becomes essential for every managers and researchers which reflects all the criteria fixed by an industry. However, it is quite difficult to achieve an optimal solution to these problems with traditional optimization approaches owing to the high computational complexity. Amongst the metaheuristics, Genetic Algorithm (GA) and Simulated Annealing (SA) represent powerful combinatorial optimization methods with corresponding strengths and weaknesses. Hence, borrowing the respective advantages of the two paradigms, an efficient combination of GA and SA called hybrid GASA has been proposed for multi-criteria flow shop scheduling problems including sequence dependent set up time (SDST). The fitness function considered here is the minimizing weighted sum of total weighted tardiness, total weighted earliness and the makespan simultaneously. Computational experiments carried out with the Taillard (1993) benchmark problems upto 200 jobs and 20 machine shows that the proposed hybrid GASA provides better results when compared to those obtained with simple GA and SA alone. From the comparative analysis, it has been proved that GASA is viable and effective approach for the SDST flow shop scheduling, especially for larger sized problems.

Keywords: Flow Shop Scheduling, Genetic Algorithm, Simulated Annealing, Sequence Dependent set up time, Total weighted tardiness, Total weighted earliness, Makespan