УНИВЕРЗИТЕТ У НОВОМ САДУ
UNIVERSITY OF NOVI SAD

TOP ACHIEVEMENTS 2021

"MIHAJLO PUPIN" TECHNICAL FACULTY

"A Hybrid Grey Wolf Optimizer for Process Planning Optimization with Precedence Constraints"

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Process planning optimization is a well-known NP-hard combinatorial problem extensively studied in the scientific community. Its main components include operation sequencing, selection of manufacturing resources and determination of appropriate setup plans. These problems require metaheuristic-based approaches in order to be effectively and efficiently solved. Therefore, to optimize the complex process planning problem, a novel hybrid grey wolf optimizer (HGWO) is proposed. The traditional grey wolf optimizer (GWO) is improved by employing genetic strategies such as selection, crossover and mutation which enhance global search abilities and convergence of the traditional GWO. Precedence relationships among machining operations are taken into account and precedence constraints are modeled using operation precedence graphs and adjacency matrices. Constraint handling heuristic procedure is adopted to move infeasible solutions to a feasible domain. Minimization of the total weighted machining cost of a process plan is adopted as the objective and three experimental studies that consider three different prismatic parts are conducted. Comparative analysis of the obtained cost values, as well as the convergence analysis, are performed and the HGWO approach demonstrated effectiveness and flexibility in finding optimal and near-optimal process plans. On the other side, comparative analysis of computational times and execution times of certain MATLAB functions showed that the HGWO have good time efficiency but limited since it requires more time compared to considered hybrid and traditional algorithms. Potential directions to improving efficiency and performances of the proposed approach are given in conclusions.