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A new multi-objective Jaya algorithm for optimization of modern machining processes

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ABSTRACT

In this work, the multi-objective optimization aspects of plasma arc machining (PAM), electro-discharge machining (EDM), and micro electro-discharge machining (μ-EDM) processes are considered. Experiments are performed and actual experimental data is used to develop regression models for the considered machining processes. A posteriori version of Jaya algorithm (MO-Jaya algorithm) is proposed to solve the multi-objective optimization models in a single simulation run. The PAM, EDM and μ-EDM processes are optimized using MO-Jaya algorithm and a set of Pareto-efficient solutions is obtained for each of the considered machining processes and the same is reported in this work. This Pareto optimal set of solutions will provide flexibility to the process planner to choose the best setting of parameters depending on the application. The aim of this work is to demonstrate the performance of MO-Jaya algorithm and to show its effectiveness in solving the multi-objective optimization problems of machining processes.

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Izvirni znanstveni članek

Nov večkriterijski Jaya algoritem za optimizacijo sodobnih obdelovalnih postopkov

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POVZETEK

V tem delu smo izvedli večkriterijsko optimizacijo obdelave s plazmo (angl. PAM), elektroerozijske obdelave (angl. EDM) in mikroelektroerozijske obdelave (angl. μ-EDM). Izvedli smo niz eksperimentov, dobljene podatke pa uporabili za razvoj regresijskih modelov za proučevane obdelovalne postopke. Za večkriterijko optimizacijo zgoraj omenjenih obdelovalnih postopkov smo predlagali posteriorno različico algoritma Jaya (MO-Jaya algoritem). Za vsak obdelovalni postopek smo dobili niz Pareto optimalnih rešitev, ki omogočajo veliko fleksibilnost, saj lahko načrtovalec proizvodnega postopka izbere najboljši niz obdelovalnih parametrov z ozirom na vrsto aplikacije (obdelave), ki jo mora izvesti. Namen te raziskave je bil prikazati zmogljivost algoritma MO-Jaya in njegovo učinkovitost pri reševanju večkriterijskih optimizacijskih problemov pri sodobnih obdelovalnih postopkih.

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PODATKI O ČLANKU

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