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A case-based reasoning approach for non-traditional machining processes selection

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ABSTRACT

To sustain in the modern era of rapid manufacturing development, it becomes necessary to generate complex shapes on materials which are highly temperature and corrosion resistant, hard to machine, and have high strength-to-weight ratio. Generation of complex shapes on those materials using conventional machining processes ultimately affects surface finish, material removal rate, accuracy, cost, safety etc. Non-traditional machining (NTM) processes have the capability to machine those advanced engineering materials with satisfactory results. But, selection of the most appropriate NTM process for a particular machining application is often a complicated task. Case-based reasoning (CBR), a domain of artificial intelligence, is a paradigm for reasoning new problems from the past experience. In CBR, a memory model is assumed for representing, indexing and organizing past similar cases, and a process model is supposed for retrieving and modifying the past cases and assimilating the new ones. This paper primarily focuses on the application of CBR approach for NTM process selection. Based on different process characteristics and process parameter values, the past similar cases are retrieved and reused to solve a current NTM process selection problem. For this, a software prototype is developed and three real time examples are cited to illustrate the application potentiality of CBR system.

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Izvirni znanstveni članek

Pristop za izbiro netradicionalnih obdelovalnih postopkov z metodo sklepanja na osnovi primerov

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POVZETEK

Za obstanek v obdobju hitro razvijajoče se proizvodnje, je vse pogosteje potrebno izdelati kompliciranе oblike iz materialov, ki so visoko temperaturno in korozijsko obstojni, se težko obdelujejo ter imajo visoko razmerje trdnost – teža. S konvencionalnimi obdelovalnimi postopki ni vedno mogoče zagotoviti zahtevane kakovosti površine, stopnje odvzema materiala, natančnosti, cene izdelka, varnosti itd., medtem ko netradicionalni obdelovalni postopki potencial za obdelavo takih materialov z zadovoljivimi rezultati pogosto imajo. Izbira najprimernejše tehnologije za neko aplikacijo je zato zelo zahtevna. Z metodo sklepanja na osnovi primerov, ki sodi v domeno umetne inteligence, z znanjem pridobljenim iz preteklih izkušenj rešujemo nove probleme. Za prikaz, indeksiranje in organizacijo preteklih podobnih primerov je zadolžen spominski model, procesni model pa zbira pretekle ter prilagodi pretekle in nove primere. Ta prispevek se prednostno ukvarja z uporabo metode sklepanja na osnovi primerov za izbor netradicionalnih obdelovalnih postopkov. Na osnovi različnih procesnih karakteristik in vrednosti parametrov so izbrani pretekli podobni primeri, ki so ponovno uporabljeni za razrešitev trenutnega problema izbire ne tradicionalnega obdelovalnega postopka. Za ta namen je razvita prototipna programska oprema, za ilustracijo možnosti uporabe metode sklepanja na osnovi primerov pa so navedeni trije primeri.

PODATKI O ČLANKU

Ključne besede:
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