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A comparative study of preference dominance-based approaches for selection of industrial robots

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ABSTRACT

In the modern era of highly mechanized technologies, manufacturing organizations are now extensively using different kinds of industrial robots for performing complicated and perilous tasks with superior levels of accuracy. The major role of robotic technology within manufacturing organizations is to amalgamate design, manufacturing and management planning activities into a flexible system for improving production lines with minimum manufacturing cost involvement. However, the pre-implementation, implementation, and post-implementation phases of robotic technologies are the foremost issues associated with the selection and rationalization of robotic investments, which is based on a thorough review and exploration of various alternative robots and their mutually conflicting performance measures. Evaluating alternative robots in the presence of multiple conflicting attributes often makes the selection task very complex. This paper focuses on the application feasibilities of two preference dominance-based multi-attribute decision-making (MADM) approaches, namely evaluation of mixed data (EVAMIX) and extended preference ranking organization method for enrichment evaluation II (EXPROM2) whilst selecting the best alternative robots within given manufacturing environments. Using these two methods, a list of all the feasible alternatives from the best to the worst suitable robot is obtained by taking into account different robot selection attributes. The ranking performances of these methods are also compared with those of the past researchers, using four performance tests.

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Izvirni znanstveni članek

Primerjalna študija za izbiro industrijskih robotov, ki temelji na pristopih z izbiro prednostnih zmogljivosti

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POVZETEK

V dobi visoko mehaniziranih tehnologij, proizvodno naravnana podjetja čedalje pogosteje uporabljajo različne vrste industrijskih robotov za izvedbo zapletenih in nevarnih nalog, ki zahtevajo vrhunsko raven natančnosti. Glavna naloga robotske tehnologije v proizvodnih organizacijah je združiti načrtovanje, proizvodnjo in menedžment v prilagodljiv sistem, ki izboljšuje proizvodna postrojenja in minimizira proizvodne stroške. Vendar pa so faze uvajanja robotske tehnologije pred njeno izvedbo, v času izvedbe in po njej, v prvi vrsti povezane z izbiro in racionalizacijo investicije v robotizacijo, ki temelji na temeljitem pregledu in raziskavi različnih alternativnih robotov in njihovih medsebojno nasprotujočih si kriterijev zmogljivosti. Vrednotenje različnih robotov z več nasprotujočimi si kriteriji zmogljivosti bistveno otežuje izbor. Članek se osredotoča na dva pristopa, ki omogočata v danem proizvodnem okolju izbiro najboljše alternative robotov. Oba postopka temeljita na prednostnem večparameterskem odločitvenem pristopu (MADM): prvi postopek vrednoti mešane podatke (EVAMIX), drugi pa vključuje razširjeno prednostno rangiranje za obogateno vrednotenje II (EXPROM2). Z uporabo teh dveh postopkov je bil dobljen seznam vseh možnih alternativ, od najbolj primernega robota do najmanj primernega, ob upoštevanju različnih parametrov. Rangirane zmogljivosti s pomočjo opisanih metod smo primerjali tudi s preteklimi izsledki drugih avtorjev, kjer so bili uporabljeni štirje preizkusi zmogljivosti.

PODATKI O ČLANKU

Ključne besede:
Izbira industrijskega robota
Večparametrsko odločanje
EVAMIX
EXPROM2
Primerjava zmogljivosti

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