

Predicting the availability of production lines by combining simulation and surrogate model

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ABSTRACT

The availability analysis plays a significant part in both the design and operations management of production lines. In this paper, a method combining discrete event simulation (DES) and surrogate model is presented to predict the availability of production lines with unreliable workstations and finite intermediate buffers. The DES can conduct computer experiments for production lines with the help of design of experiments (DOE) under the Matlab environment. The surrogate model is constructed by using Kriging model integrated with Latin hypercube sampling (LHS), which can predict the responses based on a limited set of simulation results. The major advantages of the proposed approach are its flexibility and convenience. Also, it is the first time to investigate Kriging opportunities in predicting the performance of production lines. Finally, an application in a crankshaft production line is presented, and the results indicate that the proposed approach can achieve higher prediction accuracy than the other methods.

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Napovedovanje razpoložljivosti proizvodnih linij z združitvijo simulacije in nadomestnega modela

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POVZETEK

Analiza razpoložljivosti igra pomembno vlogo pri načrtovanju in upravljanju proizvodnih linij. V tem prispevku je za predvidevanje razpoložljivosti proizvodnih linij z nezanesljivimi delovnimi postajami in končnim številom vmesnih skladišč predlagana metoda, ki združuje simulacijo diskretnega dogodka (DES) in nadomestni model. DES v programskem okolju Matlab omogoča izvedbo eksperimentov proizvodnih linij s pomočjo načrtovanja eksperimentov (DOE). Nadomestni model je zgrajen z uporabo Krigingovega modela z integracijo latinskega hiperkubičnega vzorčenja (LHS) in nudi rešitve na podlagi omejenega nabora simulacijskih rezultatov. Glavni prednosti predlaganega pristopa sta prilagodljivost in priročnost. Prav tako je prvič uporabljen Krigingov model pri napovedovanju uspešnosti proizvodnih linij. Nak koncu je predstavljena še aplikacija modela v proizvodni liniji za izdelavo ročnične gredi. Rezultati so kazali, da lahko s predlaganim pristopom dosežemo višjo natančnost napovedi kot z drugimi metodami.

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PODATKI O ČLANKU

Ključne besede:

Proizvodne linije

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Krigingov model

Latinsko hiperkubično vzorčenje (LHS)

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