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Applying multi-phase particle swarm optimization to solve bulk cargo port scheduling problem

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ABSTRACT

Factors related to bulk cargo port scheduling are very complex and peculiar. Changes in the factors will affect the reusability of a model, so establishing a reliable scheduling model for bulk cargo ports is particularly important. This paper sorts the factors affecting bulk cargo port scheduling, such as the number of vessels, the number of berths, vessel-berthing constraints (basic factors), the service priority, and the makespan (special factors), and then establishes the non-deterministic polynomial (NP) model, which aims to minimize the total service time and makespan. Lastly, it solves the model based on the multi-phase particle swarm optimization (MPPSO) algorithm and Matlab. Some important conclusions are obtained. (1) For the model neglecting priority, the total service time is the smallest, whereas the maximum waiting time and maximum operating time are relatively large, and the makespan is the latest. (2) For the model considering priority, the total service time is relatively large, whereas the maximum waiting time and maximum operating time are relatively small, and the makespan is relatively early. (3) For the model considering the makespan, the total service time is the mostlargest, whereas the maximum waiting time and especially the maximum operating time are the smallest, and the makespan is the earliest. We can choose different models according to different situations in bulk cargo port scheduling.

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Izvirni znanstveni članek

Uporaba več stopenjske optimizacije z rojem delcev za rešitev problema razvrščanja razsutih ladijskih tovorov

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POVZETEK

Faktorji, ki vplivajo na razvrščanje razsutih tovorov v pristaniščih so zelo specifični in zapleteni. Ker spremembe faktorjev vplivajo na uporabnost modela, je vzpostavitev zanesljivega modela posebej pomembna. V prispevku so vplivni faktorji razvrščeni na število plovil, število privezov, omejitve priveza na plovilo (osnovni faktor), prednost raztovarjanja in pretočni čas (poseben faktor). Na podlagi faktorjev je zgrajen ne deterministični polinomski model, s katerim poiščemo najmanjši skupni čas priveza in najmanjši pretočni čas. Model rešimo z več stopenjskim algoritmom roja delcev v programu Matlab. Pomembnejši zaključki so: (1) Brez upoštevanja prednosti je skupni čas priveza najkrajši, najdaljši čas čakanja in najdaljši čas obratovanja pa sta razmeroma dolga. Pretočni čas je najdaljši. (2) Z upoštevanjem prednosti je skupni čas priveza razmeroma dolg, najdaljši čas čakanja in najdaljši čas obratovanja pa sta razmeroma kratka, enako kot pretočni čas. (3) Z upoštevanjem faktorja pretočnega časa je skupni čas priveza najdaljši. Najdaljši čas čakanja in posebej najdaljši čas obratovanja sta najkrajša. Pretočni čas je najkrajši. V različnih situacijah lahko izberemo različne modele razvrščanja tovorov v pristaniščih.

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Ključne besede:
Velik tovor
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