

Multi-objective automated guided vehicle scheduling based on MapReduce framework

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ABSTRACT

During material handling processes, automated guided vehicles (AGVs) pose a path conflict problem. To solve this problem, we proposed a multi-objective scheduling model based on total driving distance and waiting time, and used the A* path planning algorithm to search the shortest path of AGV. By using a speed control strategy, we were able to detect the overlap path and the conflict time. Additionally, we adopted an efficient MapReduce framework to improve the speed control strategy execution efficiency. At last, a material handling system of smart electrical connectors workshop was discussed to verify the scheduling model and the speed control strategy combined with the MapReduce framework is feasible and effective to reduce the AGV path conflict probability. The material handling system could be applied in workshop to replace manual handling and to improve production efficiency.

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Večkriterijsko terminiranje samodejno vodenih vozil, ki temelji na softverskem okolju MapReduce

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POVZETEK

Pri transportu materiala se ob uporabi samodejno vodenih vozil (AGV) pojavi težava nastanka spora na poti. Za rešitev te težave smo vzpostavili model večkriterijskega razporejanja, ki temelji na skupni vozni razdalji in čakalnem času, ter za iskanje najkrajše poti AGV uporabili algoritem A*. Z uporabo strategije nadzora hitrosti smo zaznali prekrivanje poti in časa. Za izboljšanje učinkovitosti izvajanja strategije nadzora hitrosti smo uporabili softversko okolje MapReduce. Model smo preizkusili na sistemu za transport materiala v delavnici pametnih električnih konektorjev. Cilj je bil preveriti, ali je model razporejanja s strategijo nadzora hitrosti v kombinaciji z okoljem MapReduce izvedljiv in učinkovit za zmanjšanje verjetnosti nastanka konfliktnih poti samodejno vodenih vozil. Sistem za transport materiala bi lahko uporabili v delavnici, da bi nadomestili ročni transport material in izboljšali učinkovitost proizvodnje.

PODATKI O ČLANKU

Ključne besede:

Samodejno vodeno vozilo (AGV);
Razporejanje;
Razporejanje AGV;
MapReduce;
Načrtovanje poti;
A* iskalni algoritem

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