APEM journal

Advances in Production Engineering & Management
Volume 12 | Number 4 | December 2017 | pp 363–374
https://doi.org/10.14743/apem2017.4.264

ISSN 1854-6250
Journal home: apem-journal.org
Original scientific paper

Container assignment optimization considering overlapping amount and operation distance in rail-road transshipment terminal

Wang, L.[a,*], **Zhu, X.**[a], **Xie, Z.**[a,b]

[a]School of Traffic and Transportation, Beijing Jiaotong University, Beijing, P.R. China
[b]State Key Laboratory of Rail Traffic Control and Safety, Beijing Jiaotong University, Beijing, P.R. China

ABSTRACT

Container assignment strategy is crucial to the operation efficiency of rail-road container transshipping system. An effective container assignment approach can markedly improve integral operation efficiency of rail-road container transshipping system. In this paper, the container assignment problem in rail-road transshipment terminal was described and formulated as a two-stage optimization model considering overlapping amount and operation distance of crane. The first stage optimization model was to optimize container assigning positions for minimizing the total overlapping amount caused by container assigned in the considered block at one planning period, and an iterative solution procedure was proposed to obtain container assignment sets. Based on the container assignment sets obtained by the first stage, the second stage optimization model was to optimize the container assigning sequence for decreasing the total operation distance of crane, and a genetic algorithm was designed to obtain the optimal container handling sequences in container assignment process. Computational experiments on the data from a rail-road transshipment terminal in China were implemented to test efficiency of the proposed approach. Computational results showed that the proposed approach was effective to reduce overlapping amount and operation distance in container assignment process. The proposed approach is significant for the production and management of rail-road container transshipping terminals.

ARTICLE INFO

Keywords:
Intermodal transportation
Container assignment
Terminal scheduling
Rail-road transshipment terminal
Optimization
Genetic algorithms

**Corresponding author:*
liwang@bjtu.edu.cn
(Wang, L.)

Article history:
Received 25 January 2017
Revised 21 October 2017
Accepted 26 October 2017

References

[1] Boysen, N., Fliedner, M. (2010). Determining crane areas in intermodal transshipment yards: The yard partition problem, *European Journal of Operational Research*, Vol. 204, No. 2, 336-342, doi: 10.1016/j.ejor.2009.10.031.
[2] Bazzazi, M., Safaei, N., Javadian, N. (2009). A genetic algorithm to solve the storage space allocation problem in a container terminal, *Computers & Industrial Engineering*, Vol. 56, No. 1, 44-52, doi: 10.1016/j.cie.2008.03.012.
[3] Kim, K.H., Park, K.T. (2003). A note on a dynamic space-allocation method for outbound containers, *European Journal of Operational Research*, Vol. 148, No. 1, 92-101, doi: 10.1016/S0377-2217(02)00333-8.
[4] Zhang, C., Wu, T., Zhong, M., Zheng, L., Miao, L. (2014). Location assignment for outbound containers with adjusted weight proportion, *Computers & Operations Research*, Vol. 52, 84-93, doi: 10.1016/j.cor.2014.06.012.
[5] Tang, L., Sun, D., Liu, J. (2016). Integrated storage space allocation and ship scheduling problem in bulk cargo terminals, *IIE Transactions*, Vol. 48, No. 5, 428-439, doi: 10.1080/0740817X.2015.1063791.
[6] Yu, M., Qi, X. (2013). Storage space allocation models for inbound containers in an automatic container terminal, *European Journal of Operational Research*, Vol. 226, No. 1, 32-45, doi: 10.1016/j.ejor.2012.10.045.
[7] Sharif, O., Huynh, N. (2013). Storage space allocation at marine container terminals using ant-based control, *Expert Systems with Applications*, Vol. 40, No. 6, 2323-2330, doi: 10.1016/j.eswa.2012.10.032.

[8] Hu, W., Wang, H., Min, Z. (2014), A storage allocation algorithm for outbound containers based on the outer–inner cellular automaton, *Information Sciences*, Vol. 281, 147-171, doi: 10.1016/j.ins.2014.05.022.
[9] Boysen, N., Fliedner, M., Jaehn, F., Pesch, E. (2013). A survey on container processing in railway yards, *Transportation Science*, Vol. 47, No. 3, 312-329, doi: 10.1287/trsc.1120.0415.
[10] Wang, L., Zhu, X., Xie, Z. (2014). Storage space allocation of inbound container in railway container terminal, *Mathematical Problems in Engineering*, Vol. 2014, 1-10, doi: 10.1155/2014/956536.
[11] Wang, L., Zhu, X.-N., Yan, W., Xie, Z.-Y., Li, Q.-B. (2013). Optimization Model of Mixed Storage in Railway Container Terminal Yard, *Journal of Transportation Systems Engineering and Information Technology*, Vol. 2, 172-178, doi: 10.3969/j.issn.1009-6744.2013.02.026.
[12] Guo, P., Cheng, W., Zhang, Z., Zhang, M., Liang, J. (2013). Gantry crane scheduling with interference constraints in railway container terminals, *International Journal of Computational Intelligence Systems*, Vol. 6, No. 2, 244-260, doi: 10.1080/18756891.2013.768444.
[13] Wang, L., Zhu, X., Xie, Z. (2016). Rail mounted gantry crane scheduling in rail-truck transshipment terminal, *Intelligent Automation & Soft Computing* Vol. 22, No. 1, 61-73, doi: 10.1080/10798587.2015.1041764.
[14] Tang, M., Gong, D., Liu, S., Zhang, H. (2016). Applying multi-phase particle swarm optimization to solve bulk cargo port scheduling problem, *Advances in Production Engineering & Management*, Vol. 11, No. 4, 299-310, doi: 10.14743/apem2016.4.228.
[15] Grubišić, N., Dundović, Č., Žuškin, S. (2016). A split task solution for quay crane scheduling problem in mid-size container terminals, *Tehnički vjesnik – Technical Gazette*, Vol. 23, No. 6, 1723-1730, doi: 10.17559/TV-20150914110215.
[16] Rajkovic, R., Zrnic, N. Stakic, D. (2016). Application of a mathematical model for container transport flow of goods: From the Far east to Serbia, *Tehnički vjesnik – Technical Gazette*, Vol. 23, No. 6, 1739-1746, doi: 10.17559/TV-20140629203730.