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Anti-collision during truck crane lifting based on virtual wall (Article)

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Abstract

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To reduce collision accident occurred between the boom of truck crane and obstacles in work area during lifting operations. Based on obstacle classification model, the shape and location data of obstacles are collected accurately by adopting self-exploration way for boom head of crane. By establishing cylinder coordinate system of crane, the work area is divided into many sectors according to crane slewing angle, and then the sectors are divided into many fan grids based on the distance to the rotation center. Since obstacle data are stored precisely in the fan grids, the three-dimensional virtual walls of safe lifting operations are built by using these fan grids' data. The next boom's movement and position are predicted by the weighted linear regression model by using last 20 boom position data. Based on boom's movement trend and different distances to the virtual wall, the different boom control strategies of non-intervention, deceleration, micro-movement and prohibition are utilized. The function testing of actual operating environment demonstrate that the system could effectively prevent the collisions between the boom and obstacles of work area. ©, 2015, Editorial Office of Chinese Journal of Mechanical Engineering. All right reserved.

Author keywords

Anti-collision; Lifting operation; Safety; Truck crane

Indexed keywords

Engineering controlled terms: Accident prevention; Collision avoidance; Industrial trucks; Linear regression; Regression analysis; Trucks; Walls (structural partitions)

Anti collision; Co-ordinate system; Collision accidents; Lifting operation; Linear regression models; Obstacle classification; Operating environment; Truck crane

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References (17)

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 Yang, Q., Liu, Y.

1 (2011) *Mechanical Management and Development*, 27 (2), pp. 139-141.

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 Tam, V.W.Y., Fung, I.W.H.

2 **Tower crane safety in the construction industry: A Hong Kong study**

(2011) *Safety Science*, 49 (2), pp. 208-215. *Cited 30 times.*

doi: 10.1016/j.ssci.2010.08.001

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(2013) *Advances in Mechanical Engineering*

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- Shapira, A., Lyachin, B.
3 **Identification and Analysis of Factors Affecting Safety on Construction Sites with Tower Cranes**
(2009) *Journal of Construction Engineering and Management*, 135 (1), pp. 24-33. Cited 37 times.
doi: 10.1061/(ASCE)0733-9364(2009)135:1(24)
[Get it @ Carleton](#) [View at Publisher](#)
- Ray, A.K.
4
(2011)
Austin: The University of Texas
[Get it @ Carleton](#)
- Xu, G., Jiang, F.
5
(2010) *Journal Safe Environment*, 10 (2), pp. 196-200. Cited 4 times.
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- Zhang, Y.
6 **Connotation and development of mechanical reliability-based design**
(2010) *Jixie Gongcheng Xuebao/Journal of Mechanical Engineering*, 46 (14), pp. 167-188. Cited 26 times.
doi: 10.3901/JME.2010.14.167
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- 7 **Design and control on automobile crane torque limiter**
(2012) *Applied Mechanics and Materials*, 201-202, pp. 657-660.
<http://www.scientific.net/AMM.201-202.657.pdf>
ISBN: 978-303785482-2
doi: 10.4028/www.scientific.net/AMM.201-202.657
[Get it @ Carleton](#) [View at Publisher](#)
- Gao, F., Wang, G., Cui, Y., Yang, X.
8 **Dynamic modeling and analysis of 9-DOF omnidirectional legged vehicle**
(2011) *Chinese Journal of Mechanical Engineering (English Edition)*, 24 (4), pp. 515-521. Cited 4 times.
doi: 10.3901/CJME.2011.04.515
[Get it @ Carleton](#) [View at Publisher](#)
- Jia, Q., Chen, G., Sun, H., Zheng, S.
9 **Path planning for space manipulator to avoid obstacle based on A* algorithm**
(2010) *Jixie Gongcheng Xuebao/Journal of Mechanical Engineering*, 46 (13), pp. 109-115. Cited 20 times.
doi: 10.3901/JME.2010.13.109
[Get it @ Carleton](#) [View at Publisher](#)
- Zhang, C., Hammad, A., Zayed, T.M., Wainer, G., Pang, H.
10 **Cell-based representation and analysis of spatial resources in construction simulation**
(2007) *Automation in Construction*, 16 (4), pp. 436-448. Cited 16 times.
doi: 10.1016/j.autcon.2006.07.009
[Get it @ Carleton](#) [View at Publisher](#)
- Wu, H., Tao, J., Li, X., Chi, X., Li, H., Hua, X., Yang, R., (...), Chen, N.
11 **A location based service approach for collision warning systems in concrete dam construction**
(2013) *Safety Science*, 51 (1), pp. 338-346. Cited 7 times.
doi: 10.1016/j.ssci.2012.08.006
[Get it @ Carleton](#) [View at Publisher](#)

- Zhang, C., Hammad, A., Rodriguez, S.
12 **Crane pose estimation using UWB real-time location system**
(2012) *Journal of Computing in Civil Engineering*, 26 (5), pp. 625-637. Cited 10 times.
doi: 10.1061/(ASCE)CP.1943-5487.0000172
[Get it @ Carleton](#) [View at Publisher](#)
- Yang, J., Arif, O., Vela, P.A., Teizer, J., Shi, Z.
13 **Tracking multiple workers on construction sites using video cameras**
(2010) *Advanced Engineering Informatics*, 24 (4), pp. 428-434. Cited 34 times.
doi: 10.1016/j.aei.2010.06.008
[Get it @ Carleton](#) [View at Publisher](#)
- Ye, X.
14
(2010) *Hoisting and Conveying Machinery*, 2, pp. 23-25. Cited 2 times.
[Get it @ Carleton](#)
- Vaughan, J., Smith, A., Kang, S.
15
(2011) *IEEE Trans. Systems, Man, and Cybernetics, Part A: Systems and Humans*, 41 (2), pp. 323-330. Cited 10 times.
[Get it @ Carleton](#) [View at Publisher](#)
- Xie, J., Zhang, S.
16
(2009) *Special Purpose Vehicle*, 34 (4), pp. 14-19.
[Get it @ Carleton](#)
- Ludbrook, J.
17 **A primer for biomedical scientists on how to execute Model II linear regression analysis**
(2012) *Clinical and Experimental Pharmacology and Physiology*, 39 (4), pp. 329-335. Cited 12 times.
doi: 10.1111/j.1440-1681.2011.05643.x
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