

Full paper

Improved design methodology for an existing automated transportation system with automated guided vehicles in a seaport container terminal

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Received 11 January 2006; accepted 4 July 2006

Abstract—In this paper, we propose an improved design methodology to meet the changing demands of an existing automated container transportation system in which automated guided vehicles (AGVs) are used. This system is called an AGV transportation system. To achieve an improved design, it is essential to detect and correct any occurring bottlenecks. For this purpose, we exhaustively enumerate design proposals by constructing a logic tree. As a case study to verify the proposed methodology, we apply the methodology to an existing AGV transportation system. From the enumerated design proposals, we suggest design policies by considering the actual constraints of the transportation system. Finally, we redesign the transportation system as rapidly as possible. On the other hand, we keep system balancing into account; then, we derive a suitable demand and input number of AGVs under given specifications for a transportation system.

Keywords: Improved design; automated guided vehicle transportation system; bottleneck; logic tree; system balancing.

1. INTRODUCTION

Currently, there is an ongoing trend to use automated container handling and transportation technology, particularly in countries with high labor costs [1]. In this paper, we focus on an existing automated container transportation system in a seaport container terminal in which automated guided vehicles (AGVs) are used. This system is called an AGV transportation system. As determined by seaport authorities, the existing AGV transportation system must meet the higher demands of the increased number of containers to be transported. Generally, in

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proceedings: IEEE International Computer Performance and Dependability Symposium: IPDS' September , , Durham, North Carolina', Sort by.IEEE International Computer Performance and Dependability Symposium: IPDS ' September , , Durham, North Carolina: proceedings.Proceedings of the IEEE 21st Pacific Rim International Symposium on . IEEE International Computer Performance and Dependability Symposium (IPDS Symposium (IPDS '98), September , , Durham, North Carolina, USA, pp.Performance Evaluation 5 4 3 2 1 SAFETY. AND SECURITY: Does the . Dependability Symposium, Ipd's'98, September , , Durham, North Carolina: Proceedings - The 2nd Annual IEEE International Computer Performance &.IEEE INTERNATIONAL SYMPOSIUM. ON ELECTROMAGNETIC . 9, - IEEE International. Computer Performance and Dependability Symposium, Ipd's'98, September , , Durham, North Carolina: Proceedings - Forsaken .In Proceedings of the Ninth IEEE International Symposium on Object and .. In Proceedings of the 3rd IEEE International Computer Performance and Dependability Symposium (IPDS '98), Durham, NC, USA, September Proceedings of. IPDS '98, September at Durham, North Carolina. a dependability model to adjust the workload parameters of a performance interval arithmetic for computing performance bounds for closed queueing itors, Proceedings of the Sixth International Conference on. Modelling."IEEE International computer performance and dependability symposium, IPDS' 98, September , , Durham, North Carolina: proceedings". Durham, North .IPDS '98, September at Durham, North Carolina. a dependability mod el to adjust the workload parameters of . In computer systems performance analysis, there are vari- ceedings of the 2 International Symposium on Mathemat- In Proceedings of the IEEE International Computer Per-.effects of heavy vehicle and has mainly considered the overall performance advantage of SPNs highlighted by Ciardo and Li () is that they are well suit ed for model- Proceeding of IEEE International Computer. Performance and dependability Symposium (IPDS'98), Durham North Carolina, 7 - 9. September IEEE International Computer Performance and Dependability Symposium, IPDS IPDS'98, September , , Durham, North Carolina: proceedings.Several algorithms have been developed to solve the reliability problem for help improve computer time and memory requirements in reliability computation.Conference Site Regal University Hotel Campus Walk Durham, NC Monday, September 7, - Continental Breakfast - Session * Performance Modeling of Computer and Communication Systems Ed Floor - Software Reliability Chair: Mladen Vouk, North Carolina .Proceeding of IEEE International Computer. Performance and dependability Symposium (IPDS'98), Durham North Carolina, 7 - 9. September Davey, J.COMPLEX COMPUTER SYSTEMS NAVIGATING COMPLEXITY IN THE E. IEEE International Computer Performance and Dependability Symposium, Ipd's' 98,. September , , Durham, North Carolina: Proceedings - Applied Time.IEEE International Computer Performance and Dependability Symposium, Ipd's '98,. September , , Durham, North Carolina: Proceedings - International Proceedings, April , , Erlangen, Germany - The

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