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Tunneling Automated Guided Vehicle Mobility Optimization by using Taguchi Method

Amizi Noor, Sha'ri Mohd Yusof and Khairul Rijal Jamaludin
Razak Faculty of Technology and Informatics
Universiti Teknologi Malaysia (UTM)
Kuala Lumpur, Malaysia

Abstract

Automated Guided Vehicle (AGV) has reached its maturity and has been introduced in various fields of applications, especially in manufacturing and warehouse logistic activities. Hence, they are available in multiple types with different capacities, capabilities, functions and technologies. Determining the design parameters of an AGV require thorough understanding of influencing factors, such as the load and carrying methods, and the external noise factors. Common issues in poor design cause problems of slippages, capsizes and deviations from the original trajectory plan which eventually leads to high power consumption. Many literatures have come up with various optimizations strategies for more efficient AGV mobility, however very limited numbers include the noises and energy factors in a single study. This research paper studies the optimum design of a tunnelling-lurking, differential drive, magnetic tape guided type of AGV performing of carrying trollies in the repetitive part transfers in manufacturing activities. In this study, multiple factors are involved including parameters of AGV major components, the noises from the floor abnormal conditions such surface roughness and slope, and the amount of energy usage. In order to handle such a complex condition, Taguchi Robust Design Method is employed to determine the best AGV design parameters to achieve robust performance. This paper strategically identifies and develops the signals, noises and control levels which are the vital considerations to run the formulation according to the 8 steps of Taguchi method. Finally, experiment is conducted based on L18 orthogonal array to select the best AGV parameters to achieve optimality for robust performance.