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Digital Human Modeling (DHM) to Overcome Ergonomic Challenges at Warehouses in Kuwait

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Abstract

Ergonomics is an applied scientific discipline that aims to understand the interactions between humans and other elements of the system to improve the well-being and efficiency of individuals, safety, and productivity of the system in general. Ergonomics helps to create a job that suits the worker so that the work becomes safer and more efficient. For this senior design project, we, applied Digital Human Modelling (DHM) simulation to overcome ergonomic challenges at warehouses in Kuwait. Warehouses are work environments where manual material handling duties are performed, which can result in various effects on the human body, including the development of Musculoskeletal Disorders (MSDs). MSDs are medical problems that impact the muscles, joints, tendons, nerves, and ligaments. Furthermore, the occurrence and severity of MSDs might increase if the problem is not addressed swiftly or proactively. Several ailments, including tennis elbow, plantar fasciitis, gout, rotator cuff injuries, and tendonitis, are classified as MSDs. This project presents a DHM simulation study and its results conducted in various warehouses in Kuwait, including products-COOP, a factory that produces refrigerators and water coolers, and a worldwide logistics shipping company. The aim of the project is to address and find solutions for workplace MSDs. The Nordic Musculoskeletal Questionnaire (NMQ) was employed to assess the physical well-being of the warehouse employees. The JACK software was employed to analyze the workers' postures in order to identify and rectify the primary issue to be avoided.

Keywords

Digital Human Modelling, Musculoskeletal Disorders, Warehouse Ergonomics, Nordic Musculoskeletal Questionnaire.

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Suat Kasap is an Associate Professor and Coordinator of Industrial Engineering Graduation Projects in the Industrial Engineering Department of the American University of Middle East-AUM, Kuwait. He earned degrees in electrical-electronics engineering and industrial engineering. He received his Ph.D. in Industrial Engineering from the University of Oklahoma. His research interests are in human factors and ergonomics, occupational safety and health, work and process analysis, technology and innovation management, multi-criteria decision making, financial engineering, data mining, and modeling, analysis, and optimization of complex engineering problems. He worked in different Industrial Engineering Departments University of Turkish Aeronautics Association, Hacettepe University, and Çankaya University as an assistant professor. He has taught courses on Work Analysis and Design, Ergonomic Work Analysis, Cognitive Ergonomics Work Analysis, Safety Engineering, Technology and Innovation Management, Management of Information Systems, Introduction to Optimization and Modeling, Deterministic Models of Operation Research, Project Management, Multi-criteria Decision Making.

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