

Title :

Effectiveness on Training Method Using Virtual Reality and Augmented Reality Applications in Automobile Engine Assembly

Journal :

ASEAN Engineering Journal, Volume 12, Issue 4, December 2022, Pages 83-88

Document Type :

Article

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Full Text Link:

Publisher : <https://journals.utm.my/aej/article/view/18009/8067>

Citation:

Win, L. L., Abdul Aziz, F., Hairuddin, A. A., Abdullah, . L. N., Yap, . H. J., Saito, H., & Seyajah, N. (2022). EFFECTIVENESS ON TRAINING METHOD USING VIRTUAL REALITY AND AUGMENTED REALITY APPLICATIONS IN AUTOMOBILE ENGINE ASSEMBLY. *ASEAN Engineering Journal*, 12(4), 83-88. <https://doi.org/10.11113/aej.v12.18009>

Abstract:

Training and education have become increasingly crucial in obtaining new skills in a variety of fields, especially in assembly and disassembly operations. The main issue in mechanical engineering, particularly in the assembly department, was that automobile engine components assembly was found to be complicated and challenging to assemble using an existing method, where they only rely on a video-based method. The purpose of this paper is to create interactive Virtual Reality (VR) and Augmented Reality (AR) applications that allow users to efficiently assist and complete the assembly tasks. In this work, the authors designed and developed a fully immersive VR application using an HTC Vive headset and two AR applications (marker-less AR application and marker-based AR application) using EPSON MOVERIO BT-300 (AR Smart Glasses). Fourteen engineering students from Universiti Putra Malaysia were selected for the experiment. They were divided into four groups: video-based group, VR-based group, marker-less AR group, and marker-based AR group. They are required to complete all four experiments (video-based experiment, VR-based experiment, marker-less AR experiment, and marker-based AR experiment). The results showed that the marker-less AR application is the best impressive method (37% better), the VR application is the second impressive method (23% better) followed by the marker-based AR application is the third impressive method (3% better) compared to the existing video-based guideline. Therefore, the students favored AR and VR applications rather than the existing method to be used in automobile engine assembly tasks.