

VR/AR Application in Engineering Research and Education

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Abstract

This keynote presentation consists of two parts: 1) Education efforts on the topic of virtual and augmented reality (VR and AR) by the College of Engineering at Seoul National University; and 2) Application efforts of VR technology to the training of specific construction procedures by the speaker's research team.

As the demand for eco-friendliness and economic feasibility increases, and as long-span and large-scale construction and civil engineering progress, the application of the post-tensioning (PT) method to residential and office buildings is increasing. If uneven tensile force is generated in the post-tensioned member during the construction process, it may fall short of the expected strength or lead to concrete failure due to excessive stress. It requires high accuracy. Currently, in most PT construction sites, the tension is measured by an analog method in which the operator measures the pressure gauge of the hydraulic pump and the moving distance of the piston of the hydraulic jack during tensioning work. The accuracy of the measured tension force is greatly affected by the operator's skill. In addition, the use of hydraulic equipment by workers with insufficient skills may lead to safety accidents. From 2012 to 2022, 36 hydraulic jack accidents occurred in the United States, resulting in a fatality rate of 47%. Work training for most PT methods is conducted in the field as an apprenticeship, and it takes a long time for workers to become proficient. Given the limitations and need for extensive training, we propose a VR-based post-tensioning training program. Training using VR can expect improved educational effects through cost reduction and increased immersion. The development of the program is currently conducted using the VR/AR Studios I & II and equipment at the Innovation Center for Engineering Education (ICEE) of Seoul National University. The studios have been built in the facility of Global Education Center for Engineers (GECE) in 2022 and their building process will be introduced in detail in this presentation, along with team-teaching on a new course of the College of Engineering regarding the VR/AR theory and practice.