

Integrating Virtual Reality and Augmented Reality for Synchronized Collaborations

Metaverse has emerged as a new technical trend that involves a network of 3D virtual and real worlds focused on social connection. In addition to NFT (Non-Fungible Token), another key element enabling metaverse is virtual reality and augmented reality (VR/AR) technologies. VR and AR has been developed independently, thus leading to different working principles, software, hardware, and applications. To seamlessly integrate both is critical to realizing fusion of virtual and real worlds, but in-depth research is still lacking in past studies. To overcome such a deficiency, this research aims to investigate synchronized collaborations via integration of VR and AR for human movement training. A novel systematic framework will be developed to combine VR and AR scenes from the aspects of information and communication technology (ICT), human computer interactions, and human factors. The framework will provide a calibration method for geometrically superimposing the heterogeneous VR and AR spaces using computer vision. Deep learning models will be applied to estimate the 6D posture of objects and human posture in an AR scene, which then allow automatic scene updates in VR. Moreover, we will propose a new user interface that offers multi-modal sensory feedback to effectively correct the trainee's posture in the VR through the guidance displaying in a virtual mirror. In the AR scene, a trainer observes the body movement of the VR user and gives corrective instructions via an input interface instantly prompted to the trainee. ICT elements such as 5G networking, sensors, cloud computing, and artificial intelligence will be introduced to realize a prototyping system based on the framework. Real use scenarios in sport and medical training will validate the proposed methods and demonstrate their practical values. This work is expected to open up original research topics in VR/AR integration and possible embodiments in the advancement of metaverse.

Keywords: Augmented Reality, Virtual Reality, Fusion of VR/AR, Movement Training, Human Posture, Synchronized Collaboration