


Chapter 13

Virtual Reality in Engineering: Innovations and Applications

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ABSTRACT

Virtual reality (VR) has transitioned from a futuristic concept to a practical tool with wide-ranging applications in engineering. By immersing users in interactive digital environments, VR enhances spatial understanding, improves design accuracy, and facilitates comprehensive testing. This chapter explores the transformative potential of VR across various engineering fields, emphasizing its impact on design, simulation, training, and maintenance processes. This chapter covers the integration of VR in mechanical, civil, and biomedical engineering, highlighting its benefits in prototyping, fluid dynamics, architectural visualization, safety training, surgical simulation, and more. The future of VR in engineering looks promising, with advancements in AI and sensor technology poised to further revolutionize the field. Through detailed exploration, this chapter provides insights into the multifaceted applications of VR, showcasing its ability to drive innovation and improve outcomes across the engineering industry.

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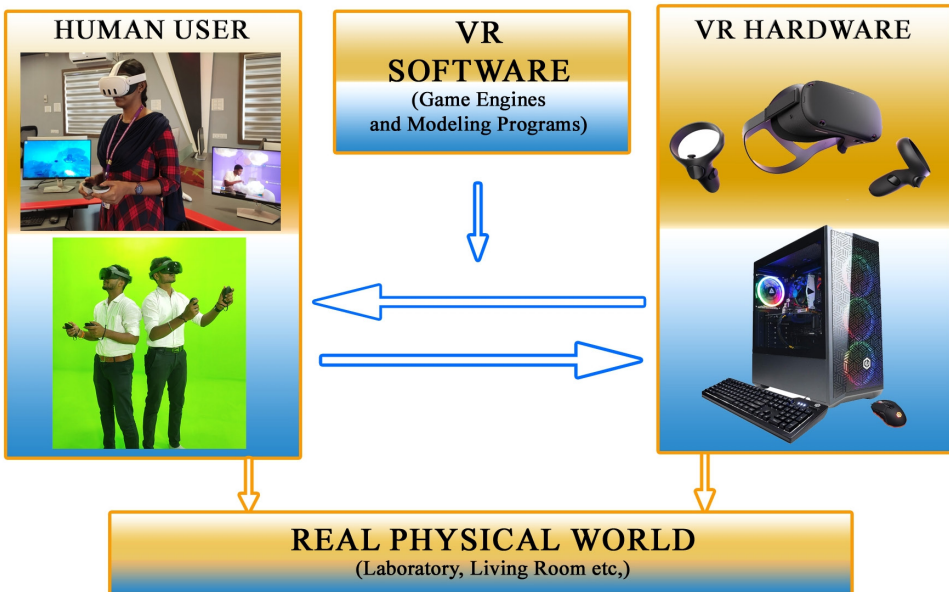
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1. INTRODUCTION

Virtual Reality (VR) is a simulated experience that can be similar to or completely different from the real world. It immerses users in computer-generated virtual surroundings, allowing them to interact in a seemingly real or physical way through the use of specialized equipment, such as headsets and motion controllers. VR is used in various fields, including gaming, education, healthcare, engineering, and entertainment, to provide immersive experiences that engage the user's senses and allow for interactive exploration.

The various compounds include VR headsets, Motion Controllers, Tracking Systems, Computing Devices, and Software. The interlinking of VR compounds is represented in Figure 1. The most critical component, the VR headset, is worn over the eyes and provides a stereoscopic display. It often includes sensors for tracking head movements, allowing the virtual surroundings to adjust as the user. These handheld devices enable users to engage with the virtual surroundings (Anthes et al., 2016). They typically include buttons, joysticks, and motion sensors to detect hand and arm movements.

Figure 1. Overview of all components included in a VR system



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