

Application of virtual reality technology in simulating metal cutting techniques using gas combustion.

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Abstract: This study explores the application of virtual reality (VR) technology to simulate gas cutting techniques in metal fabrication. Traditional training in oxy-fuel cutting requires significant material resources, poses safety risks, and limits hands-on practice due to equipment costs. To address these challenges, a VR-based simulation system was developed, integrating realistic physics models for flame dynamics, heat transfer, and material removal. The system allows users to interact with virtual cutting torches and metal workpieces in an immersive 3D environment, providing real-time visual and auditory feedback. A comparative evaluation was conducted between VR-trained participants and those using conventional methods. Results indicate that the VR simulation significantly reduces training time and material waste while improving procedural accuracy and safety awareness. Furthermore, user feedback highlights high levels of engagement and knowledge retention. This research demonstrates that VR technology offers a viable, cost-effective, and scalable solution for industrial training in gas cutting, with potential for broader application in manufacturing education.

Keywords: Virtual reality, metal cutting simulation, gas cutting, cutting techniques