The Use of Virtual Reality and Content Validation Methods Based on Text and Image Analysis for Assessing Information Comprehensibility: A Case Study of the Rescuer Application Design for Improving Mountain Tourism Safety

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Abstract:

This study presents a novel two-component validation method integrating text and image analysis within virtual reality (VR) environments to assess and enhance the comprehensibility of information for users with special needs. The research focuses on improving mountain tourism safety through the design and evaluation of the Rescuer application—an immersive VR training tool supporting inclusive education and risk prevention. The proposed methodology combines traditional text readability indices (Haming, Fog, Pisarek) with natural language processing (NLP) algorithms for semantic evaluation, alongside graphical analysis based on color interpretation and accessibility indicators derived from WCAG standards. Empirical research was conducted on a group of 130 participants representing various user profiles related to mountain tourism. The results indicate that over 98% of respondents found the application's content comprehensible and visually clear, confirming the effectiveness of the dual validation approach. Statistical analysis further revealed no significant differences across gender or age, suggesting the system's universal usability. The findings highlight that combining linguistic and perceptual validation significantly enhances information clarity in immersive environments, thereby reducing the risk of misinterpretation during decision-making. The study demonstrates that adaptive, AI-supported validation of content in VR applications can substantially improve user safety and educational outcomes. The proposed method contributes to the broader field of digital accessibility and inclusive design, offering practical applications in mountain rescue training, public safety communication, and virtual education systems.

Keywords:

Virtual Reality (VR), Content Validation, Readability Analysis, Accessibility, Mountain Tourism Safety.