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Exploring Human Behavior and Performance in Virtual Environments Through Engineering Analytics and EEG

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Abstract

Engineering Analytics (EA) is a multidisciplinary approach that incorporates tools and techniques from fields such as Big Data, Machine Learning (ML), operations research, and statistics to analyze data and extract meaningful insights. Within the field of Industrial Engineering, EA is widely utilized to design, improve, and optimize integrated systems. This study focuses on the application of EA in combination with Virtual Reality (VR) and Electroencephalography (EEG) to explore various aspects of human cognitive performance, including attention, simulation sickness, and verbal-visual ability. By employing EA, VR, and EEG together, this research aims to provide a deeper understanding of how individuals interact within virtual environments and respond to cognitive and physiological challenges. Participants in the study were placed in immersive 3D virtual environments, where both subjective feedback and objective brainwave data were collected to measure their responses. The analysis involved identifying relationships between cognitive performance metrics and physiological signals to gain insights into human behavior and decision-making processes. The integration of EA techniques allowed for the exploration of complex patterns and relationships within the data, offering a comprehensive view of participants' mental states and performance. The study highlights the potential of combining EA, VR, and EEG to advance our understanding of human cognition and behavior in virtual environments. These insights can be applied to improve the design of virtual systems, enhance user experiences, and optimize applications in various fields, such as training, simulation, and education. By bridging cutting-edge technological tools with physiological data, this research demonstrates the value of a multidisciplinary approach to addressing challenges in human-computer interaction and cognitive performance.

Keywords

Human behavior, cognitive performance, virtual environment, Engineering Analytics and EEG.