A Modular Approach to Emotional State Analysis in Minimal Spaces Utilizing Multimodal Systems

Paolo Gemelli, Mario Ivan Zignego, Alessandro Bertirotti, Laura Pagani (Università degli Studi di Genova, ITALY)*

Abstract:

In the architectural and interior design of confined or minimal spaces, the accurate assessment of user perception is critical for ensuring optimal user experience and well-being. This paper addresses the necessity of incorporating objective parameters to measure user perception, particularly focusing on emotional states, within such spatial contexts.

Drawing from previous research, this study highlights the effectiveness of artificial intelligence (AI)-based systems in gauging individuals' emotional states through Facial Emotion Recognition (FER) and Speech Emotion Recognition (SER) technologies. These systems leverage sophisticated algorithms to analyze facial expressions and vocal cues, providing valuable insights into users' emotional experiences within confined environments.

Furthermore, the integration of signals from an Electroencephalogram (EEG) offers additional layers of understanding regarding users' emotional states. However, it is noted that EEG utilization is more applicable in scenarios where users are professionals, as seen in specialized contexts like underwater or space habitats.

To address the complexities of emotional state analysis in minimal spaces, this paper proposes a modular approach. By combining FER, SER, and EEG data, a comprehensive understanding of users' emotional states can be achieved. This multimodal system offers flexibility and adaptability, catering to diverse user needs and environmental constraints within confined spaces, such as underwater research stations and space habitats.

The proposed approach holds significant implications for the design and implementation of emotional state analysis systems in constrained environments. By leveraging advanced technologies and integrating multiple modalities of data collection, designers and architects can enhance user experience and well-being in minimal spaces, ultimately contributing to the optimization of human-environment interactions in confined contexts.