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Architecture for humans in space: design, engineering, concepts and mission planning (1)

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ESSENTIALITY OF HHMI (HARMONIZING HUMAN MATERIAL INTERACTION) IN SPACE HABITATS

Abstract

Human space explorers live and work under extreme environmental conditions, including temperature extremes, vacuum, and high radiation. Crew isolation is also impacted by up to 40 minutes round trip communication delays between Earth and Mars. Today's space habitat designs primarily focus on technological solutions, addressing physiological, psychological, safety, and functional needs of the crew. Higher level needs, related to wellbeing and comfort, are not yet incorporated into point designs. We believe that harmonizing Human Material Interaction (hHMI) within the interiors of a spacecraft is both necessary and essential. In this paper we outline a research effort to analyse, understand and enhance the quality of spatial and temporal Human-Material-Interaction in interiors of long-duration space habitation modules, while aiming to generate a rational understanding of aspects that contribute to the "wellbeing" for humans in shared spaces. In this context wellbeing is understood as balancing the physical, the psychological and the emotional states of the crew. This approach is expected to provide the astronauts a quality of life typically reserved for leisure. Any well-designed environment can become a strong influence on what people think and do. Interiors of transportation systems are intersection points for culture, society, technology and the environment. The consequence of harmonizing Human Material Interaction (hHMI) in these spaces has the potential to balance and de-stress the human component in it, thus transforming parts of the commutation time into a time of relaxation, contributing to the general upliftment of the travel experience during spaceflight. More than addressing the established issues of sustainability, this investigation is human centred. Grounded in a vision of ethical design, we are looking at the potential for design to enhance the qualities of shared realms in flow. An enclosed space in movement is a complex composition of proportions, materials, surfaces, colour, lighting, sounds and smells. How can these elements be arranged in sensitive ways to create a space which positively influences the state of being? The research is an in-depth study of their semantics – indicating symbolic functions and its connection to formal aesthetic aspects. The outcome will lead to guidelines, defining parameters to induce a "quality-of-life" experience in the system of human spaceflight, ranging from months-long cislunar space to years-long interplanetary travel. We are sharing our hHMI research (a work in progress) to advocate for the instrumental change it would make when both designers and users, following the hHMI criteria, humanise the interiors of space habitats.