15th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Space Technology and System Management Practices and Tools (4)

Author: Mr. Loris Franchi
Politecnico di Torino, Italy, loris.franchi@polito.it

Mr. Andrea Emanuele Maria Casini
Politecnico di Torino, Italy, andrea.casini@polito.it
Mr. Daniele Calvi
Politecnico di Torino, Italy, daniele.calvi@polito.it
Dr. Sabrina Corpino
Politecnico di Torino, Italy, sabrina.corpino@polito.it
Prof. Paolo Maggiore
Politecnico di Torino, Italy, paolo.maggiore@polito.it
Dr. Nicole Viola
Politecnico di Torino, Italy, nicole.viola@polito.it

VIRTUAL REALITY TO ASSIST THE ENGINEERING DECISION-MAKING PROCESS: IMPROVING THE CONCURRENT DESIGN APPROACH

Abstract

Space mission design is becoming more complex, especially for managerial and technical aspects. During early design phases, alongside with the complexity related to the technical interfaces, the stakeholders must face the lack of knowledge related to the system. This entail that every decision is taken with uncertain outcomes, identifying a risky scenario in which each choice will drive all the design iterations and all the costs related to next design phases. In order to handle this scenario, several design approaches have been developed and applied in both academia and industrial environments, known as sequential, centralized or concurrent design. Concurrent Design (CD) is a systematic approach that involves several field of experts working together at the same time, in the same physical space, and sharing ideas and results. This approach maximize the efficiency of the design sessions and help to identify early mistakes that could hinder the feasibility of a project, or worsen its cost. Despite the CD benefits, engineers are still facing the problem of group decision-making: about 10 Among all the different methods to assist the decision-making process, this paper investigates the benefits related to the integration of a Virtual Reality (VR) environment within a Concurrent Design Facility (CDF). Immersive simulations combine 3D visualization and natural human sensory interactions. Being able to see and interact with virtual geometry enables designers to make collective critical design decisions earlier in the product design process, without the complication of manufacturing a physical prototype. The principal benefits of VR have been analysed thanks to the application of either open-source or commercial software. The actual effectiveness of this tool within the engineering design has also been quantified. The present work explores the advantages relative to the integration of a VR shared tool in a concurrent engineering environment. Data results to appear more understandable to all expert thanks to visual representation. The scenarios' generation process is then assisted by human interventions and is coupled with the product design life cycle management and risk assessment.