

SPACE OPERATIONS SYMPOSIUM (B6)
Training Relevant for Operations, including Human Spaceflight (3)

Author: Dr. Bo Zhao

Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation
(CASC), China, zzzbbb163@163.com

AN IMMERSIVE VIRTUAL OPERATION AND VIRTUAL MAINTENANCE SYSTEM FOR
SPACECRAFT

Abstract

Because of complex structure of spacecraft, plenty of operation and maintenance should be practiced repeatedly on ground. As an emerging engineering science, virtual operation and virtual maintenance attract extensive attention from both industry and academia. For example, Lockheed Martin Corp. used sheer abundance of operation simulation on NASA's Orion crew exploration vehicle. So an immersive virtual operation and virtual maintenance system for spacecraft is proposed. Based on virtual reality, the system provides an immersive three-dimensional virtual environment, in which operation and maintenance can be accurately simulated. The system facilitates cutting training cost, rapidly establishing kinds of training scenes and exceeding the limits of space and time. The system consists of display module, sensor module, control module and graphic process module. In this system, spatial position of a person's eyes and head which is traced by optical cameras is transferred to graphic process module through a real-time process server. The graphic process module calculates the matching field of vision and transfer graphic to display module which consists of four channels and four corresponding projectors. The four projectors project images on four screens which make up a cave in which a virtual environment is composed. The sensor module can also trace the position and action of joints and fingers of people, so people can interactive with virtual objects of spacecraft in virtual environment. For establishing this system, key technologies such as virtual prototype modeling, stereo display, position and action tracing, interactive technology and collision detection have been studied. Then an application is introduced.