Paper ID: 17818
oral
student

SPACE OPERATIONS SYMPOSIUM (B6)
Human Spaceflight Operations (1)

Author: Mr. Li Hailong
China Astronaut Research and Training Center, China

Prof. Liu Yuqing
Astronaut Center of China, China
Mr. Zhu Xiuqing
China

AUGMENTED REALITY STUDY FOR ASSISTING CREW OPERATION IN SPACE

Abstract

Many experimental equipments in spacecraft or space station have complex structure and need to be skillfully operated, the operators are therefore required higher level of operation skills. To improve the astronauts' performance of operating experimental devices and reduce the difficulty of the operation in space, studying on auxiliary operation training techniques and methods has important theoretical value and practical significance. Augmented Reality based on Optical See-Through Helmet Display (OSTHMD) can mix the augmented information generated by computer and the real-world around operators to one, through the combination of the virtual visual scene and real visual scene, guide astronauts to complete a specific equipment operation, and realize the guidance and training inside the spacecraft or space station. In this paper, the key technologies of auxiliary operation based on augmented reality are studied, which mainly include the natural man-computer interaction based on speech recognition that enable hands-free, and the registration of three-dimensional space based on the methods of Artificial Mark and calibration of Optical See-Through HMD. An operator-centered, intelligent auxiliary operating system is developed to provide astronauts with on-site guidance to reduce the difficulty of the operation and the probability of errors occurrence. In the end, an experiment of applying augmented reality to Body Mass Measuring Instrument is conducted, which demonstrates the effectiveness and practicability of the augmented reality system developed in this research to assist crew operation in space. We adopt speech recognition technology to realize natural man-computer interaction, such as recognizing several operational commands to switch display interface for different assistant operational information. In speech recognition the Speech SDK 5.0 of Microsoft is used as a speech recognition library. In the registration of tree-dimensional space, the method based on Artificial Mark is used and the technical parameters of two existing artificial mark systems (ARToolKit and ARTag) are compared and analyzed. Calibration of OSTHMD is a key issue in augmented reality, in this paper we discuss in detail about the advantages and disadvantages of commonly used OSTHMD calibration method SPAAM, develop a fast calibration method based on images and compare the two calibration method from the aspect of the algorithm complexity.