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3D PRINTING APPLICATIONS FOR LARGE-SCALE CONSTRUCTION IN SPACE

Abstract

As one of the key technologies representing the country's aerospace strength, 3D printing is vital to the development of the space industry. It is a new opportunity for the matter of using 3D printing technology in the aerospace field to be able to diversify large structures by getting rid of the constraints and limitations imposed by ground-based manufacturing. In recent years, 3D printing technology has been used in space manufacturing due to its unique properties, providing new technical support for space technology applications. In addition to reducing uplink expenses and enhancing the overall efficiency of space station amenities, 3D printing on-orbit could also respond to the needs of specialized instruments, test apparatus, urgent on-orbit manufacturing, and more products. Furthermore, large-scale space construction and spacecraft manufacturing are among the space-related activities for which 3D printing technology is indispensable. However, 3D printing in space always faces technical challenges such as low gravity, reliability, and sustainable material supply, et al.. Especially for the construction and manufacture of space solar power plants and large-sized antennas in orbit, it is necessary to solve the problem of mutual constraints between size and printing accuracy. This paper highlights advances in 3D printing technology for large-scale space construction, including planetary base construction and on-orbit manufacturing, and looks at future scenarios for constructing large-scale antennas and space solar power satellites (SSPS). It presents the current status of 3D printing technology in the field of aerospace manufacturing both domestically and internationally, focusing on the 3D printing technology in the future construction of large-scale antennas in space and space solar power satellites to carry out the research concept, and looks forward to the future development trend and direction of the aerospace industry. Finally, the key technologies for developing space 3D print in China and the technological approaches for implementing large-scale infrastructures will be outlined and given, which presents potential applications in space industry in the approaching years.