

Scientific Objective and Infrastructure of Space Exploration (1)
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A VERSATILE APPROACH FOR ASSEMBLING LARGE APERTURE REFLECTORS IN SPACE

Abstract

With the development of space exploration, there are many science and commercial missions, such as astronomical observation, mobile communication, detection et al, which could benefit significantly from large (in the 30- 100 meter range for main aperture diameter) reflector. On-orbit assembly is likely to be one of the most feasible way to construct those big applications, but previous approaches for assembling large reflectors in space have been perceived as very costly because they require high precision and custom components, or inefficiently because they need to weld hundreds of components (struts and nodes) one by one assisted by two sets of Intelligent Precision Jigging Robots (IPJRs). In this paper, a new versatile and efficient reflector assembly approach is proposed incorporating: Mobile and Assembly Function Integrated Hybrid Robot (MAFIHR) that can assembly modules precisely and move to the next assembling position efficiently by itself, Versatile Deployable Module Sets (VDMS) that can be used to assembly reflectors of different apertures, Versatile Pose Adjustable Connection Components (VPACCs) that can be used to connect modules with different poses, Long Reach Manipulating Robot (LRMR) that can carry module stacks to assembling positions in a far distance, and High-Accuracy Global Measuring System (HAGMS) that can measure module's pose precisely by three predefined marks in the assembling process. Key advantages of the new approach, as well as concept descriptions and ongoing research and technology development efforts for each of the major elements are summarized.