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Ta-DAH: Task Driven Automated Hardware Design of Free-Flying Space Robots

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Abstract : Space robots will play an integral part in exploring the universe and beyond. A correctly designed space robot will facilitate OOA, satellite servicing and ADR. However, problems arise when trying to design such a system as it is a highly complex multidimensional problem into which there is little research. Current design techniques are slow and specific to terrestrial manipulators. This paper presents a solution to the slow speed of robotic hardware design, and generalizes the technique to free-flying space robots. It presents Ta-DAH Design, an automated design approach that utilises a multi-objective cost function in an iterative and automated pipeline. The design approach leverages prior knowledge and facilitates the faster output of optimal designs. The result is a system that can optimise the size of the base spacecraft, manipulator and some key subsystems for any given task. Presented in this work is the methodology behind Ta-DAH Design and a number optimal space robot designs.

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