

An Autonomous Space Debris-Removal System for Effective Space Missions

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Abstract : Space exploration has noted an exponential rise in the past two decades. The world has started probing the alternatives for efficient and resourceful sustenance along with utilization of advanced technology viz., satellites on earth. Space propulsion forms the core of space exploration. Of all the issues encountered, space debris has increasingly threatened the space exploration and propulsion. The efforts have resulted in the presence of disastrous space debris fragments orbiting the earth at speeds up to several kilometres per hour. Debris are well known as a potential damage to the future missions with immense loss of resources, mankind, and huge amount of money is invested in active research on them. Appreciable work had been done in the past relating to active space debris-removal technologies such as harpoon, net, drag sail. The primary emphasis is laid on confined removal. In recently, remove debris spacecraft was used for servicing and capturing cargo ships. Airbus designed and planned the debris-catching net experiment, aboard the spacecraft. The spacecraft represents largest payload deployed from the space station. However, the magnitude of the issue suggests that active space debris-removal technologies, such as harpoons and nets, still would not be enough. Thus, necessitating the need for better and operative space debris removal system. Techniques based on diverting the path of debris or the spacecraft to avert damage have turned out minimal usage owing to limited predictions. Present work focuses on an active hybrid space debris removal system. The work is motivated by the need to have safer and efficient space missions. The specific objectives of the work are 1) to thoroughly analyse the existing and conventional debris removal techniques, their working, effectiveness and limitations under varying conditions, 2) to understand the role of key controlling parameters in coupled operation of debris capturing and removal. The system represents the utilization of the latest autonomous technology available with an adaptable structural design for operations under varying conditions. The design covers advantages of most of the existing technologies while removing the disadvantages. The system is likely to enhance the probability of effective space debris removal. At present, systematic theoretical study is being carried out to thoroughly observe the effects of pseudo-random debris occurrences and to originate an optimal design with much better features and control.

Keywords : space exploration, debris removal, space crafts, space accidents

Conference Title : ICMAE 2019 : International Conference on Mechanical and Aerospace Engineering

Conference Location : New York, United States

Conference Dates : January 30-31, 2019