

Space debris mitigation and strategy analysis

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Space exploration is a mechanism whereby with the use of astronomy and space technology man is able to explore outer space and the universe at large. Space exploration not only enables man to advance scientific research, it also unites nations across the globe, ensures the future survival of humanity and also enables the development of military and strategic advantages against other nations that are deemed to be a threat to humanity.

As advantageous as it may be, the remnants of space explorations is a menace and is thus considered as being a hazard to future explorations and the universe in entirety. Remnants termed as space debris, also often denoted as orbital debris and space waste, is the collection of objects in orbits around Earth. Space debris is a creation by man, which serves no useful purpose and is a potent threat ubiquitous in the universe. Space debris consists of everything from spent rocket stages and defunct satellites to explosion and collision fragments. Space debris also includes specks from spacecraft engines, surface degradation material such as paint flakes, coolant released by nuclear powered satellites and objects released due to the impact of micrometeoroids or fairly small debris onto spacecraft. As the orbits of these objects often overlap with the trajectories of spacecrafts, debris is a potential collision risk. Hence, the urgency and importance of perfecting a mechanism whereby space debris can be reduced or destroyed in an efficient and cost effective manner. No nation has yet taken any concrete measures to mitigate debris in the low earth orbits except tracking debris up to a certain extent. In this research we have tested two fundamental debris removal strategies using the debris data catalog and proposed a new hybrid strategy that needed a lower Delta-V. Elementary data filtering methodology is used along with basic calculations to simulate simple mission patterns that deduce the minimum Delta-V. Research is further oriented to develop a mathematical optimization algorithm leading to handling a larger search space to identify the class of debris to be removed and to select the optimal maneuver options.