

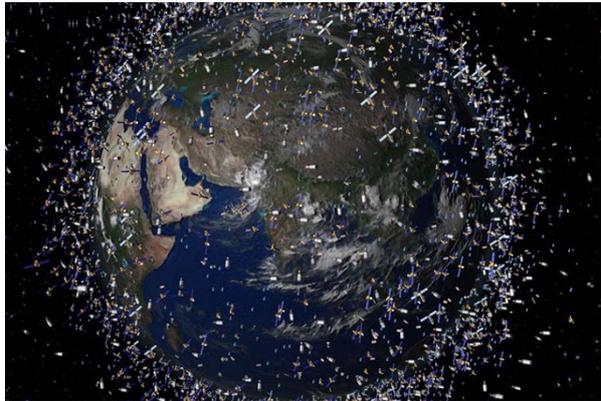


Concept Study on Satellite Swarms for Space Debris Removal

Bachelor-/Project-/Master Thesis

The collision between two satellites in 2009 caused the amount of space debris in orbit to rise drastically. Especially, the announced mega-constellations with thousands of satellites to be launched in the next few years will increase the amount of satellites in orbit even more which in turn will increase the risk of collisions.

In order to keep the access to space and the satellites in orbit safe and secure, the amount of debris orbiting Earth has to be reduced. Space agencies like ESA but also the private space industry is working on missions and technologies to de-orbit existing debris. Instead of using heavy missions in terms of spacecraft size, complexity and development cost, the possibility to use commercial satellites like off-the-shelf CubeSats and distribute the tasks between several small spacecraft working together in a swarm can be worth exploring.



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This thesis shall evaluate the possibility to de-orbit space debris with the use of a swarm of small spacecraft. The focus shall be in regard to the debris size, the amount of debris a swarm of satellites can remove, which removal method is most effective for such a concept and how a possible debris removal mission can look like for a formation of small satellites.

Objectives

- Familiarization with the topic Space Debris and Debris Removal
- Survey on active debris removal methods, systems and existing missions
- Study on usability and feasibility of small spacecraft for de-orbiting
- Study on satellite swarm formations and task distribution
- Documentation of results

Literature

1. H. Klinkrad: *Space Debris Model and Risk Analysis*, Springer, 2006.
2. D. Wang, B. Wu, E. K. Poh: *Satellite Formation Flying*, Springer, 2017.

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