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DESIGN OF MODULAR SMALL SATELLITE CONSTELLATIONS FOR SCIENCE MISSIONS

Abstract

Nanosatellites have gained increased interest as platforms for complex and challenging science missions in the recent years. The ability to piggyback these nanosatellites with larger spacecraft greatly reduces the overall cost of the mission. Designing a modular spacecraft bus with the ability to plug-in different payloads would significantly reduce the time duration for the design, testing and integration of the satellites as well as the overall cost of the mission. An interesting case study in this direction that I will be presenting is the design of a constellation of small satellites to enable simultaneous monitoring in different spectral bands (visible, UV, and near-IR). This could be achieved by designing a modular spacecraft bus, with visible, UV and near-IR payloads that can be plugged in to the same bus with minor modifications.

The science goal is to study accretion around stars that requires simultaneous monitoring in multiple spectral bands. The broadband photometric monitoring in these three bands could help discover the forces that drive evolution of protostellar disks, find how hot Jupiters and hot Neptunes are formed, and learn how gas reaches young stars to make them grow. This paper shall discuss the metrics involved in the design of the modular spacecraft constellation and the development of payloads to enable multi-spectral imaging.