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ON-ORBIT VIDEO FROM CARBONITE-2: TOWARDS SOFTWARE-DEFINED EARTH OBSERVATION

Abstract

Carbonite-2 was launched in January 2018 to demonstrate high-resolution video imaging from a low-cost, small satellite platform. The applications of high resolution video from space are numerous, as this class of data provides the necessary spatial and temporal resolution to monitor human activity and pattern-of-life.

Conventional wisdom would suggest that small satellites are not well suited to this mission profile: the laws of diffraction dictate that to obtain a higher spatial resolution, a larger aperture is required, whereas small satellites are by definition limited in volume. This problem is exacerbated by video, where exposure time and therefore the signal-to-noise ratio of the resultant video are highly constrained.

The Carbonite-2 mission reconciles the laws of physics with the microspace philosophy by leveraging principles of computational photography and the latent richness in the data collected. The video collected by Carbonite-2 is enhanced in software by exploiting the high redundancy in this video data and the contextual information inherent in its high resolution. These technologies have enabled the Carbonite-2 mission to produce high quality data at a low cost. This paper will describe these technologies and the experiments carried out to demonstrate them during the on-orbit commissioning and early operations of Carbonite-2.