

Applications of Hyperspectral Remote Sensing: A Commercial Perspective

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Abstract : Hyperspectral remote sensing refers to imaging of objects or materials in narrow conspicuous spectral bands. Hyperspectral images (HSI) enable the extraction of spectral signatures for objects or materials observed. These images contain information about the reflectance of each pixel across the electromagnetic spectrum. It enables the acquisition of data simultaneously in hundreds of spectral bands with narrow bandwidths and can provide detailed contiguous spectral curves that traditional multispectral sensors cannot offer. The contiguous, narrow bandwidth of hyperspectral data facilitates the detailed surveying of Earth's surface features. This would otherwise not be possible with the relatively coarse bandwidths acquired by other types of imaging sensors. Hyperspectral imaging provides significantly higher spectral and spatial resolution. There are several use cases that represent the commercial applications of hyperspectral remote sensing. Each use case represents just one of the ways that hyperspectral satellite imagery can support operational efficiency in the respective vertical. There are some use cases that are specific to VNIR bands, while others are specific to SWIR bands. This paper discusses the different commercially viable use cases that are significant for HSI application areas, such as agriculture, mining, oil and gas, defense, environment, and climate, to name a few. Theoretically, there is a number of use cases for each of the application areas, but an attempt has been made to streamline the use cases depending upon economic feasibility and commercial viability and present a review of literature from this perspective. Some of the specific use cases with respect to agriculture are crop species (sub variety) detection, soil health mapping, pre-symptomatic crop disease detection, invasive species detection, crop condition optimization, yield estimation, and supply chain monitoring at scale. Similarly, each of the industry verticals has a specific commercially viable use case that is discussed in the paper in detail.

Keywords : agriculture, mining, oil and gas, defense, environment and climate, hyperspectral, VNIR, SWIR

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