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Spatially Encoded Hyperspectral Compressive Microscope for Broadband VIS/NIR Imaging

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Abstract : Hyperspectral imaging counts among the most frequently used multidimensional sensing methods. While there are many approaches to capturing a hyperspectral data cube, optical compression is emerging as a valuable tool to reduce the setup complexity and the amount of data storage needed. Hyperspectral compressive imagers have been created in the past; however, they have primarily focused on relatively narrow sections of the electromagnetic spectrum. A broader spectral study of samples can provide helpful information, especially for applications involving the harmonic generation and advanced material characterizations. We demonstrate a broadband hyperspectral microscope based on the single-pixel camera principle. Captured spatially encoded data are processed to reconstruct a hyperspectral cube in a combined visible and near-infrared spectrum (from 400 to 2500 nm). Hyperspectral cubes can be reconstructed with a spectral resolution of up to 3 nm and spatial resolution of up to 7 µm (subject to diffraction) with a high compressive ratio.

Keywords : compressive imaging, hyperspectral imaging, near-infrared spectrum, single-pixel camera, visible spectrum
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