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MetaH2: A Snapshot Metasurface HDR Hyperspectral Camera

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Category
All products
Artificial Intelligence & Machine Learning/Computer Vision & Image Recognition

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Researchers at Purdue University have developed a novel high-dynamic range (HDR) hyperspectral camera capable of producing an HDR image and full set of hyperspectral data from a single snapshot. Traditionally, HDR and hyperspectral imaging are performed separately, with either approach requiring multiple sequential measurements. This presents challenges for dynamic scenes. This innovative camera, dubbed MetaH2, combines both functions using a single snapshot while still providing a higher degree of reconstruction accuracy than conventional single snapshot alternatives. By leveraging a custom-engineered metasurface and deep neural network for image processing, MetaH2 unlocks groundbreaking possibilities in nanophotonics, computer vision, and beyond—paving the way for transformative advances across multiple industries.

Technology Validation

Simulation studies show that the proposed system achieves higher reconstruction accuracy than previous snapshot hyperspectral imaging methods on benchmark datasets. A working prototype demonstrates snapshot reconstruction of 60 dB dynamic range and 10 nm spectral resolution from 600 nm to 700 nm on real-world scenes from a monochrome photosensor.

Advantages

-Jointly performs high-dynamic range (HDR) and hyperspectral imaging

-Requires only a single snapshot

-Pairable with existing lenses

-Deep neural network image processing algorithm

-Higher reconstruction accuracy than other single-snapshot alternatives

Customizable based on application (e.g., imaging lenses, sensors, reconstruction algorithms, etc.)

Applications

-Nanophotonics

-Computer vision

Keywords: Computer Technology, HDR imaging, snapshot imaging, metasurface, Electrical Engineering, Imaging, Nanophotonics, Computer Vision