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Pearl-inspired Disordered Multispectral Filter Array

Low-cost disordered filters enabling portable hyperspectral and quantum-grade imaging.

Researchers at Purdue University have developed a new disordered multispectral filter array disordered that's design was inspired by pearls. Purdue researchers have studied the effect of strong light localization at the site of Anderson transition phenomena in a disordered medium, where outgoing light waves are characterized by unique on/off binary modes, to create a sensing matrix that exhibits spatial and spectral incoherence, unlike traditional compressive sampling techniques. In addition, current multispectral filter array technologies are often expensive. The lustrous, highly reflective, cost-effective hyperspectral filter array fine-tuned by Purdue researchers includes numerous open channels exhibiting high resolution eigenvalues resulting in excellent resonant tunneling. The new imaging system can be implemented in portable, low dimensional, compressive spectrometers and existing cameras and sensors such as in laboratory, hospital, and military and defense settings for food science, environmental, pharmaceutical, polymeric, gas sensing, and thermal sensing applications.

Advantages:

-Low-Cost

-Adaptive

-Portable

-Compressible

-Highly Sensitive

Potential Applications:

-Spectrometry

-Multispectral Imaging

Technology ID

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Category

Artificial Intelligence & Machine Learning/3D Optical Imaging & Industrial Metrology
Computing/Photonic & Optical Computing Technologies

Authors

Young L Kim

Yunsang Kwak

Further information

Patrick Finnerty

pwfinnerty@prf.org

View online

-Quantum Computing

Technology Validation:

In laboratory testing in vitro, a sample of polystyrene microparticles and of human blood hemoglobin were prepared in various concentrations and hyperspectral line-scanning was achieved with a resolution of 2.1 nm, small divergence angle of 0.045 degrees (with traverse coherence length (angle/wavelength of 0.75 mm at 575 nm from a white LED illuminator), and an acceptance angle of the telecentric lens of 2.15 degrees.

Recent Publication:

"A Pearl Spectrometer"

Journal of Nano Letters

National Library of Medicine, National Center for Biotechnology Information

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TRL: 4

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