Computational Photograph Spectrometer with High Spectral Resolution: Photograph-to-Spectrometer Converter

Smartphone + color chart system that converts photos into full spectral data, replacing bulky spectrometers.

A spectrometer is a scientific instrument used to measure various aspects of light, such as wavelength and intensity. Spectrometers are used in materials analysis, environmental monitoring, and medical diagnostics, among other applications. However, conventional spectrometers are bulky and require high-quality optical components, limiting their portability and presenting high cost barriers. Researchers at Purdue University have developed an alternative to traditional spectrometry by designing a computational model to recover spectrometry data from simple photographs. Their computational photograph spectrometry design can recover spectral information with full resolution from any digital photograph. Unlike other methods of computational spectrometry, this novel design relies on only a single specially designed color chart, eliminating the need for individually tailored filters. With just a simple printed color chart and a smartphone, anyone can perform high-quality spectrometry analysis using this method. With such low barriers to use, this innovation offers a cost-effective, publicly accessible alternative to traditional spectrometry that does not compromise on precision or reliability. This invention has significant implications for various fields that utilize spectrometry data, such as lighting, paint, food analysis, and more.

Technology Validation:

The algorithm for spectral recovery was developed to accurately extract and recover the spectral information from photographs of a spectral color chart. The method was then evaluated for spectral recovery accuracy and resolution, and the adaptability of the algorithm was tested by a variety of different samples and applications, including LED, fluorescent lighting, food colorings, biological pigments, whiskey, and performed high accuracy.

Technology ID

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Category

Artificial Intelligence & Machine Learning/3D Optical Imaging & Industrial Metrology
Computing/Photonic & Optical Computing Technologies
Digital Health & Medtech/AI in Medical Imaging

Further information

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Advantages:

-High resolution and accuracy

-Smartphone compatibility

-Accessible to the public

-Inexpensive, portable alternative to traditional spectrometers

-Relies on a color chart instead of multiple tailored filters

Applications:

-Spectrometry and spectrum recovery research

-Medical diagnostics

-Whiskey forgery prevention

-LED and fluorescent light manufacturing

-Food analysis and colorants

-Biological pigment analysis

-Any need for portable, inexpensive, accurate spectrometry

TRL: 4

Intellectual Property:

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