



NTU Assistant Professor Steve Cuong Dang (left), who led the research, and Dr Sujit Kumar Sahoo doing an experiment with the lensless camera that uses only a piece of ground glass and a monochrome sensor. Unlike existing technology, the new one can detect infinite spectra within a single image. PHOTO: NTU

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DR SUJIT KUMAR SAHOO, one of the researchers behind the project, on the potential uses of the multispectral camera.

instance, it could be used in food safety, where one can take a photo of fruits or meat in particular spectra to look for spots that are associated with chemicals or bacterial activity leading to spoilage,” he added.

It could also be used to verify the authenticity of artworks by capturing the different layers of paint not visible to the naked eye, or in the pharmaceutical industry as a cheaper and more flexible option to hyperspectral cameras, currently used for quality control of drugs.

Now, a spectrometre, an apparatus that can split light into separate colours, is used to detect different spectra within an image. But it is expensive. The cost of a commercial spectrometre can range from \$3,000 to over \$40,000, said Assistant Professor Steve Cuong Dang, who led the research. In contrast to spectrometers, this new technology is far simpler, more flexible and more cost-effective, he explained.

“We replace all the expensive parts of the spectrometer like the lens and the grating inside,” he said. “Here, we just have a piece of frosted glass at the front of the camera. We don’t have anything else.”

The researchers did not elaborate on how much cheaper it will be but Prof Dang said the new technology could also potentially be used in smartphones and even DSLR cameras, to help make them slimmer by reducing the need for bulky and expensive lens and colour filters.

“It would also allow people to have access to a range of colours that ordinary cameras may not be able to capture,” he added.

A patent for the new technology is currently pending.

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Sharp, multicoloured images

The new lensless camera makes use of speckle technology to capture images containing enough data to be separated into various photos, with each one appearing as if they were taken using different types of light, such as digital infrared (IR), reflected UV light (UVR), fluorescent UV (UVF) and visible light (VIS).

This can be used for a variety of different purposes, such as checking the authenticity of paintings, and detecting contamination in food.



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NTU researchers develop multispectral lensless camera

Ilyda Chua

A lensless camera that can capture sharp, multicoloured images without lens or colour filters has been developed by scientists from Nanyang Technological University (NTU).

In contrast to existing camera technology, which can capture up to 36 colour channels, this new technology – which uses only a piece of ground glass and a monochrome sensor – can detect infinite spectra within a single image.

The camera uses speckle patterns instead of conventional colour filters to detect and display the different spectra within an image that are not visible to the naked eye.

As a result, infinite spectra – including reflected ultraviolet (UVR), fluorescent ultraviolet (UVF), digital infrared (IR), and visible (VIS) – can be captured at once.

Due to this ability, the new camera could potentially be used in forensics or food safety, said Dr Sujit Kumar Sahoo, one of the researchers behind the project. “For