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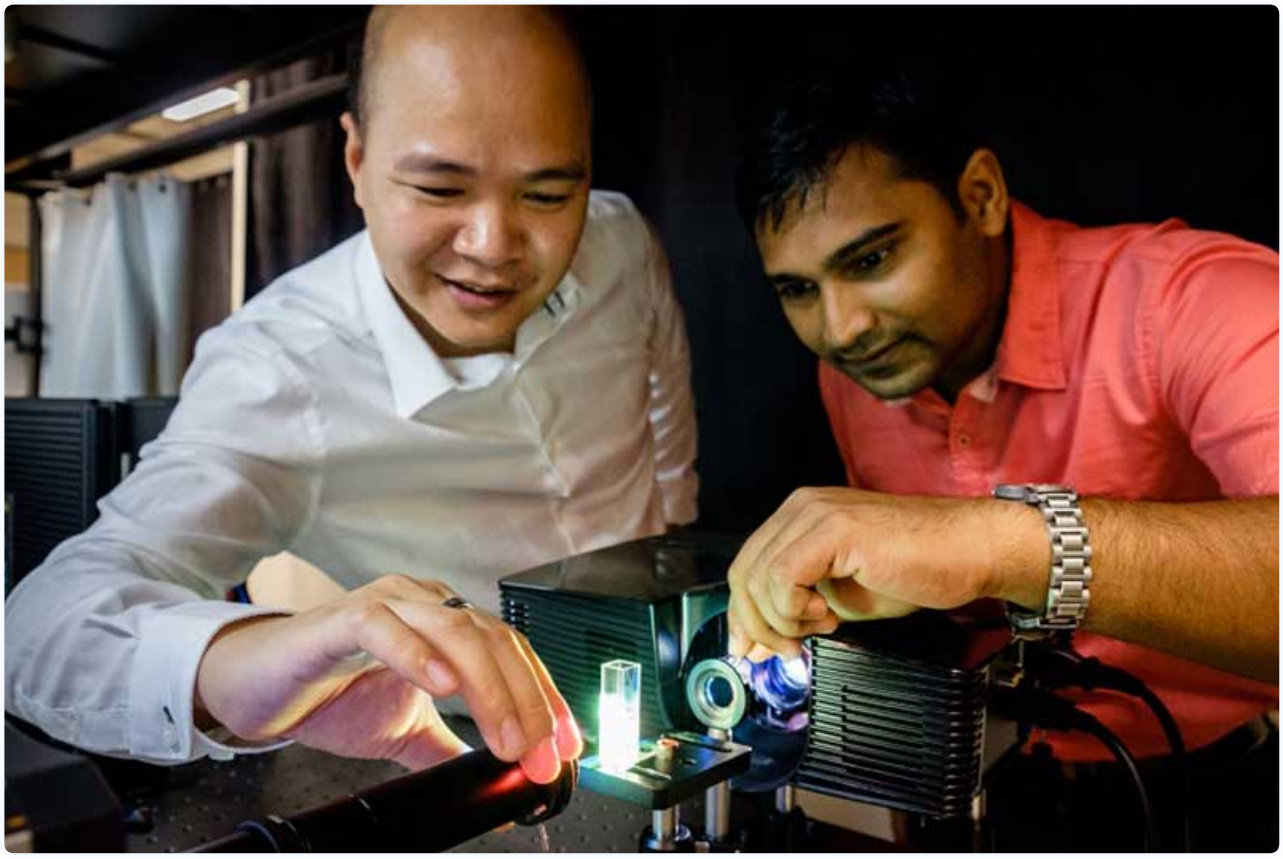

Credit: Nanyang Technological University, Singapore

Scientists at NTU Singapore develop lensless imaging technology

BY: **PRIYANKAR BHUNIA**

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in imaging purposes for medicine, surveillance and astrophysics.

Scientists at Nanyang Technological University, Singapore (NTU) hav new camera technology that can take sharp, colour images without colour filters.

A conventional camera utilises optics made from glass or plastic len and guide it onto colour filters and camera sensor in order to c ur images. These lenses are usually bulky in size and expensive precision manufacturing required.

The scientists created multi-coloured images by using only a piece c and a monochrome (black and white) sensor and 'reverse engineeri is scattered by the translucent matt surface of the ground glass. Sin wavelengths of light are scattered differently by the ground glass, a created to reconstruct the original image that was projected on to the ground glass.

The scientists created a library of 'speckle patterns' linked to each wavelength of light, including those in the infrared and ultraviolet spectrums which are not visible to the naked eye.

Professor Yoon Soon Fatt, Chair of NTU's School of Electrical and Electronic Engineering, noted that the innovation was the result of interdisciplinary research involving both physics and photonics engineering.

"How light interacts with objects change with varying wavelengths, so our scientists had to think out of the box, in order to design a camera not limited by the typical red, green and blue spectrums. This research is an example of how advanced photonics research can lead to potential improvements to diagnostics, sensing and surveillance technologies," Prof Yoon said.

The project was led by Assistant Professor Steve Cuong Dang from the NTU School of Electrical and Electronic Engineeringand it took himand his researchers, Dr Sujit Kumar Sahoo, and Dr Tang Dongliang, over a year of research and development.

Applications

slimmer.

This is also much more cost-effective compared to existing multispectral cameras on the market.

In addition, this new imaging technique could also help to improve imaging applications in biomedical and scientific applications, as the technology can reconstruct images in other multiple wavelengths invisible to the naked eye, like infrared and ultraviolet. These are used for imaging purposes in medicine, surveillance and astrophysics. The technology can also reconstruct images taken at the microscopic scale.

Assistant Professor Dang said, “The unique feature of our camera is that it can capture any range of light spectrum, unlike existing cameras on the market which are pre-fixed. It is also less affected by optical alignment issues like conventional cameras, because there are no moving parts and no focusing optics.”

This camera could also be used in areas like 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.

For instance, the research team used their technique to distinguish between two different apple juices which look identical to the naked eye but have different colour spectrums signalling their difference in ingredient or freshness.

It could also be used in forensics, as the camera could be tuned to capture a wide spectrum, including near infrared and ultraviolet, to reveal clues or evidence invisible under normal circumstances.

A patent has been filed for this new technology by NTU’s innovation and enterprise arm, NTUitive.

Supported by NTUitive and the LUX Photonics Consortium, the team received keen interest from industry players and potential adopters to further develop this technology in the fields of vision correction and chemical sensing. The research team plans to engage industry partners to explore adaptation of their technology for real-world applications.

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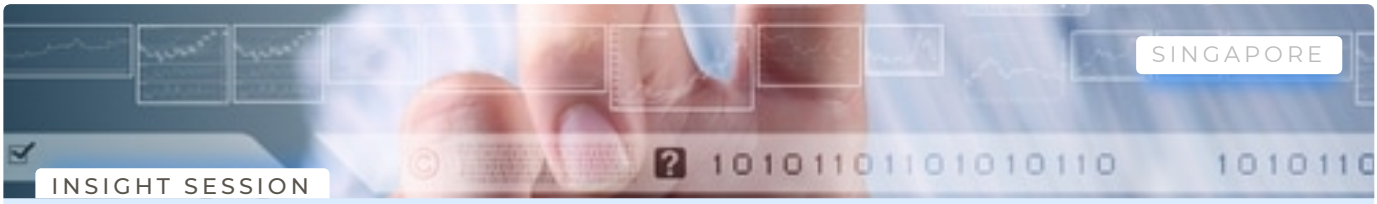

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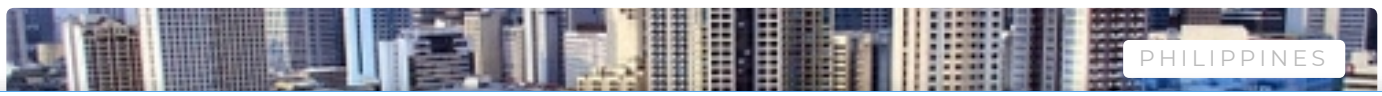

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