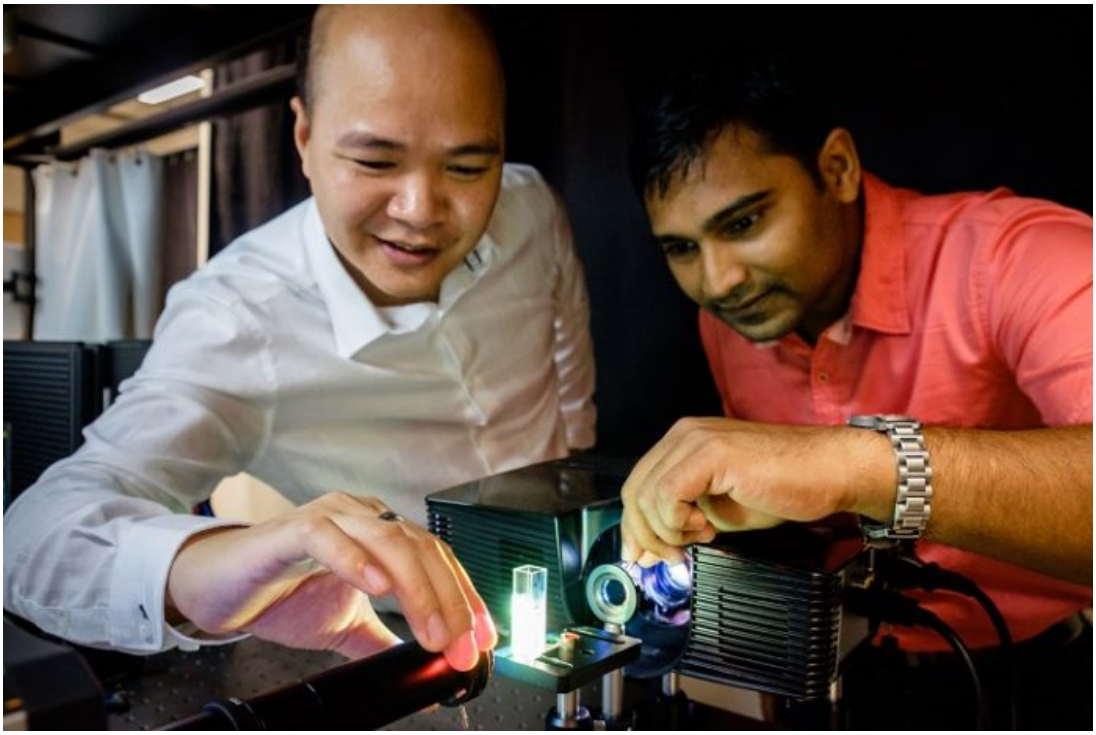
Scientists take multi-colored images with a lensless camera

Reverse engineering the light.

By **Amit Malewar** - March 13, 2018



Lensless camera technology Image: Nanyang Technological University

Scientists from Nanyang Technological University, Singapore have developed a new camera technology that can take sharp, multi-colored images without utilizing a focal point and shading channels.

Utilizing just a bit of ground glass and a monochrome sensor, the researchers made multi-shaded pictures by 'reverse engineering' the light that is scattered by the translucent matt surface of the ground glass, along these lines acquiring the first picture that was anticipated on to it.

Since various wavelengths of light are scattered distinctively by the ground glass, the NTU researchers made a calculation to remake the picture. To do this they made a library of 'spot examples' connected to every wavelength of light, incorporating those in the infrared and bright ranges which are not obvious to the exposed eye.

By removing the need for a lens and color filters and replacing them with ground glass, this innovation could potentially be applied to compact cameras and smartphones to make them slimmer.

Assistant Professor Steve Cuong Dang from the NTU School of Electrical and Electronic Engineering who led the research, said their new imaging technique could help to improve imaging applications in biomedical and scientific applications as well as opening new doors for other industries.

"Our technology can also reconstruct images in other multiple wavelengths invisible to the naked eye, like infrared and ultraviolet, which are used for imaging purposes for medicine, surveillance, and astrophysics. It can also reconstruct images taken at the microscopic scale," explained Prof Dang.

"Our multispectral imaging technique uses a monochromic (black and white) camera coupled with a simple piece of ground glass, making it very cost-effective compared to existing multispectral

cameras on the market.

"The unique feature of our camera is that it can capture any range of the 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."

Professor Yoon Soon Fatt, Chair of NTU's School of Electrical and Electronic Engineering said 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.

The examination group utilized their procedure to recognize two distinctive squeezed apple which seems to be indistinguishable to the exposed eye, however, have diverse shading ranges flagging their distinction in fixing or freshness, for example.

It could likewise be utilized for crime scene investigation, as the camera could be tuned to catch a wide range, including close infrared and bright, to uncover pieces of information or proof undetectable under typical conditions.

With just a preview picture and a computational calculation, this multispectral imaging system consolidates the qualities of visual innovation and spectroscopy to do different examination at high speeds.

This innovation was featured on the cover of the scientific journal Optica in Oct 2017.