Medical camera sees through the body

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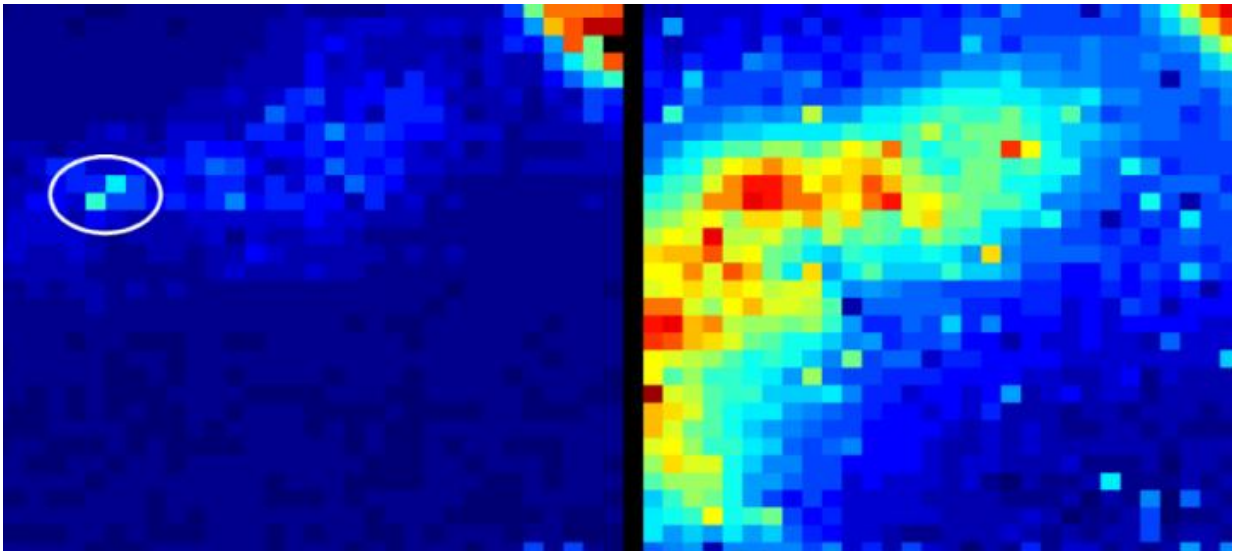

Images from a new camera that can detect tiny traces of light through the body's tissues. Here, the camera is detecting light emitted from a medical device known as an optical endomicroscope whilst in use in sheep lungs. Image on left shows light emitted from the tip of the endomicroscope, revealing its precise location in the lungs. Right image shows the picture that would be obtained using a conventional camera, with light scattered through the structures of the lung. Credit: University of Edinburgh

Scientists have developed a camera that can see through the human body. The camera is designed to help doctors track medical tools known as endoscopes that are used to investigate a range of internal conditions.

The new device is able to detect sources of light inside the body, such as

the illuminated tip of the endoscope's long flexible tube.

Light detection

Until now, it has not been possible to track where an endoscope is located in the body in order to guide it to the right place without using X-rays or other expensive methods

Light from the endoscope can pass through the body, but it usually scatters or bounces off tissues and organs rather than travelling straight through.

This makes it nearly impossible to get a clear picture of where the endoscope is.

The new camera takes advantage of advanced technology that can detect individual particles of light, called photons.

Experts have integrated thousands of single photon detectors onto a silicon chip, similar to that found in a digital camera.

The technology is so sensitive that it can detect the tiny traces of light that pass through the body's tissue from the light of the endoscope.

It can also record the time taken for light to pass through the body, allowing the device to also detect the scattered light.

By taking into account both the scattered light and the light that travels straight to the camera, the device is able to work out exactly where the endoscope is located in the body.

Researchers have developed the new camera so that it can be used at the patient's bedside.

"The ability to see a device's location is crucial for many applications in healthcare, as we move forwards with minimally invasive approaches to treating disease," says Kev Dhaliwal.

Early tests have demonstrated that the prototype device can track the location of a point light source through 20 centimetres of tissue under normal light conditions.

The project – led by the University of Edinburgh and Heriot-Watt University – is part of the Proteus Interdisciplinary Research Collaboration, which is developing a range of revolutionary new technologies for diagnosing and treating lung diseases.

Proteus is funded by the Engineering and Physical Sciences Research Council.

The research is published in the journal *Biomedical Optics Express*.

"My favourite element of this work was the ability to work with clinicians to understand a practical healthcare challenge, then tailor advanced technologies and principles that would not normally make it out of a physics lab to solve real problems. I hope we can continue this interdisciplinary approach to make a real difference in healthcare technology," says Dr Michael Tanner.

More information: M. G. Tanner et al. Ballistic and snake photon imaging for locating optical endomicroscopy fibres, *Biomedical Optics Express* (2017). DOI: 10.1364/BOE.8.004077

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