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3D printing technology used to develop ultrasound device

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Technology allows complex lens shapes to focus ultrasound waves that could detect harmful cancer cells

Researchers from Nanyang Technological University in Singapore (NTU) have used 3D printed resin lenses to develop an ultrasound device that produces sharper images.

The device will allow for more accurate medical procedures that involve the use of ultrasound to kill tumours, loosen blood clots and deliver drugs into targeted cells. With clearer images, doctors and surgeons can have greater control and precision when performing non-invasive diagnostic procedures and medical surgeries.

In current ultrasound machines, the lens that focuses the ultrasound waves are limited to cylindrical or spherical shapes, restricting the clarity of the imaging.

With 3D printing, complex lens shapes can be made, which results in sharper images. The 3D printed lenses allow ultrasound waves to be focused at multiple sites or shape the focus specially to a target, which current ultrasound machines are unable to do.

Ultrasound waves are produced by firing sound waves at a glass surface, or 'lens', to create high-frequency vibrations. In conventional ultrasound machines, the resulting heat causes the lens to expand rapidly, generating high frequency vibrations that produce ultrasound waves.

With lenses that are 3D printed, the ultrasound device overcomes the limitations of glass. Customised and complex 3D printed lenses can be made for different targets that not only results in better imaging, but are cheaper and easier to produce.

This taps into an ultrasound market that is expected to grow to about £5.5 billion by 2020. It is also expected to promote medical techniques and research opportunities in health sciences, such as surgery and biotechnology.

For example, researchers could use the sound waves to measure elastic properties of cells in a petri dish, seeing how they respond to forces. This will be useful to distinguish between harmful and benign tumour cells.

Tan Cher Heng, an assistant professor, said: “This offers significant clinical benefits including to the field of cancer imaging. This technology has the potential to reduce image distortions and more accurately differentiate cancerous from non-cancerous soft tissue.”

The NTU team is in talks with various industry and healthcare partners who are looking at developing prototypes for medical and research applications.

The findings have been published in *Applied Physics Letters.*