

Researchers demonstrate fundamentally new approach to ultrasound imaging

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North Carolina State University researchers have demonstrated a new technique for creating ultrasound images. The new approach is substantially simpler than existing techniques and could significantly

drive down technology costs.

"Conventional [ultrasound](#) devices have a receiver that detects [ultrasonic waves](#) and converts them into an electrical signal, which is then sent to a computer that processes the signal and converts it into an image," says Xiaoning Jiang, co-corresponding author of a paper on the work and a Duncan Distinguished Professor of Mechanical and Aerospace Engineering at NC State. "We've created a device that effectively eliminates the [electrical signal](#) processing altogether."

Specifically, the researchers have developed a receiver that incorporates a piezoelectric crystal and an organic light-emitting diode (OLED). When an ultrasonic wave hits the crystal, it produces voltage, which causes the OLED to light up. In other words, the image appears on the OLED screen, which is built into the receiver itself.

"Our prototype is a proof-of-concept, so we designed it with an OLED array that is 10 pixels by 10 pixels; the resolution isn't great," says Franky So, co-corresponding author of the study. "However, I can easily make it 500 pixels by 500 pixels, boosting the resolution substantially." So is the Walter and Ida Freeman Distinguished Professor of Materials Science and Engineering at NC State.

"Conventional ultrasound imaging probes can cost upward of \$100,000 because they contain thousands of transducer array elements, which drives up manufacturing costs," So says. "We can make ultrasound receiver-display units for \$100 or so."

"This is really a completely new field for ultrasound, so we're only beginning to explore the potential applications," Jiang says. "However, there are obvious near-term applications, such as non-destructive testing, evaluation and inspections in the context of structural health monitoring."

More information: Hyeonggeun Yu et al, Direct Acoustic Imaging Using a Piezoelectric Organic Light-Emitting Diode, *ACS Applied Materials & Interfaces* (2020). [DOI: 10.1021/acsami.0c05615](https://doi.org/10.1021/acsami.0c05615)

Provided by North Carolina State University

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