



Fusion of Terahertz-Induced Ultrasound and Robotics for AI Tactile Perception

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Grand Challenge and Goal: We aim to integrate high-speed scanning of terahertz-induced ultrasound beams with robotic arm-based wide-area motion, thereby enabling active AI tactile perception and advancing non-contact ultrasound measurement for biomedical and nondestructive applications

Summary:

- Ultrasound applications require physical contact between the device and the target for acoustic impedance matching
→ This results in limited observability and risks of damage or infection. This study aims to overcome these issues by realizing non-contact ultrasound measurement through the integration of:
 - High-speed scanning of terahertz-induced ultrasound beams
 - Robotic arm control with AI-driven operation
- By collecting and analyzing diverse acoustic responses, we enable tactile perception for AI, thereby advancing recognition and causal understanding of hidden or internal structures

Social Impact:

Industry & Manufacturing: Nondestructive inspection

Bio-Medicine: Intraoperative diagnosis. Evaluation of organoid cultures

Sports & HCI: Non-contact, real-time assessment of physical condition

History & Cultural Heritage: Non-contact diagnosis of historical materials

