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(57) Abstract :
An improved touchless gesture-controlled input device is disclosed, comprising a depth-sensing camera (101), infrared emitter (102), gesture processor (103), ultrasonic phased array (104), and haptic feedback controller (105). The device enables real-time gesture recognition and mid-air haptic feedback projection. Focused ultrasound generates perceivable tactile sensations without physical contact, improving user experience and accessibility. The system operates with low latency and high spatial precision, making it ideal for public terminals, medical devices, and smart environments.

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