Multimodal Spatial Awareness Assist Device for Patients With Single-Sided Deafness

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Patients with single-sided deafness (SSD) often struggle to determine sound direction due to the head shadow effect, limiting sound localization and potentially missing critical auditory warnings in noisy or open environments. Building on the author's 2025 study, this research introduces systematic improvements and a more intelligent, user-friendly design. Key enhancements include an upgraded voice recognition module with specific word detection for identifying nearby human voices and providing real-time verbal alerts, integration of millimeter-wave radar to extend detection range to 40 meters, and an optimized alert mechanism using a pressure sensor to detect frowning responses, replacing continuous vibration to reduce sensory fatigue. By combining acoustic, radar, and speech-recognition technologies, this system offers comprehensive environmental awareness and timely, user-friendly safety assistance for SSD patients.

Awards Won: