

Advances in Bone Conduction Audio Technology: A Review of Crosstalk Cancellation, Vibration Sensing, and Speech Intelligibility

Abstract---Bone conduction (BC) audio technology offers a compelling alternative to traditional air conduction, particularly for individuals with conductive hearing loss and for use in noisy environments. However, its practical implementation faces several challenges, including signal crosstalk between ears, reduced speech intelligibility, and limited sensor performance in compact devices. This review synthesizes recent advances in BC audio systems across five key studies, focusing on crosstalk cancellation techniques, high-performance MEMS-based vibration sensors, and methods to enhance speech intelligibility. We examine adaptive real-time filtering platforms, accelerometer-based cancellation zones, and active control using otoacoustic emission measurements, along with novel filter designs and sensor architectures. Strengths, limitations, and performance metrics of each approach are analyzed. The review highlights the growing potential of integrated BC solutions while identifying key areas for future development, such as higher-frequency cancellation, miniaturization, and user-specific adaptation.

Index Terms—Bone conduction, crosstalk cancellation, MEMS vibration sensor, speech intelligibility, FxLMS, real-time audio processing.