

# Binaural Hearing Aid System and the Intelligent Acoustic Signal Processing

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**Abstract** Nowadays, the hearing aid technology is facing a new horizon based on advanced digital signal processing, wireless communication and artificial intelligence. In this lecture, new methodology with a systematic solution covering both the auditory periphery and the cognitive system is given. The up to date and rapidly evolves technologies for the binaural hearing aid system are well addressed. The multi-channel wide dynamic range compression, active noise reduction, self-adaptable directivity, acoustic scene analysis, and the wireless linking with other audio or communication systems are presented. The key technologies including the ultra-low power chip design, the advanced digital signal processing (DSP), and the wireless system integration and connectivity are discussed. The micromechanics and high performance electro-acoustics, the miniaturized antenna, the user interface, and the fitting system development are also the important aspects for the hearing aid technologies are shown in this lecture. A smart binaural hearing aid technology, which simultaneously processes the acoustic signals from the four microphones in both ears are indicated which utilizing the computing power from the smart phone to finish the advanced binaural DSP algorithms.

**Biography** Zhihua Wang (M'99-SM'04-F'17) received the B.S., M.S., and Ph.D. degrees in Electronic Engineering in 1983, 1985 and 1990, respectively, from Tsinghua University, Beijing, China, where he has served as full professor and Deputy Director of the Institute of Microelectronics since 1997 and 2000. He was a visiting scholar at CMU (1992-1993) and KU Leuven (1993-1994), and was a visiting professor at HKUST (2014.9-2015.3). His current research mainly focuses on CMOS RFIC and biomedical applications, involving RFID, PLL, low-power wireless transceivers, and smart clinic equipment combined with leading edge RFIC and digital image processing techniques. He has co-authored 12 books/chapters, over 183 (480) papers in international journals (conferences), over 244 (29) papers in Chinese journals (conferences) and holds 123 Chinese and 8 US patents.

Prof. Wang has served as the chairman of IEEE SSCS Beijing Chapter (1999-2009), an AdCom Member of the IEEE SSCS (2016-2019), a technology program committee member of the IEEE ISSCC (2005-2011), a steering committee member of the IEEE A-SSCC (2005-), the technical program chair for A-SSCC 2013, a guest editor for IEEE JSSC Special Issues (2006.12, 2009.12 and 2014.11), an associate editor of IEEE Trans on CAS-I, CAS-II and IEEE Trans on BioCAS, and other administrative/expert committee positions in China's national science and technology projects.