

経営情報学部・情報マネジメント専攻  
主催学術講演会  
日時：7月12日（木）、16:20～17:50  
場所：1号棟1512教室

Program in Information and Management Systems  
Graduate School of Comprehensive Scientific Research  
Prefectural University of Hiroshima, Hiroshima, Japan



## INVITED SEMINAR

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### Active noise reduction headset and removing frequency mismatch of narrowband ANC system with FLANN

**Abstract:** As one of the four major environmental problems in the world, noise pollution affects people's normal life and work in varying degrees. For noise pollution, the soundproof earmuffs are generally used to block the sound wave path to achieve noise reduction in the small space between the human ear and the earmuff cavity, which can be called small space noise reduction. The traditional physical noise reduction method has a good noise reduction effect on high-frequency noise but not good for the low-frequency band typically below 700 Hz. Active Noise Control (ANC) achieves a good noise reduction effect on low-frequency noise by sending out an anti-noise to interference with original noise.

In this talk, we provide a summary of schemes of the analog active noise reduction headset with AS3415 chip and the digital active noise reduction headset with STM32. The analog noise reduction scheme has a certain noise reduction effect to the frequency noise below 700 Hz and the noise reduction effect near 100Hz reaches 10dB. Comparing with the passive noise reduction platform, the common music headphones with digital noise reduction algorithm can reduce the noise reduction of 200Hz by 24dB and the pink noise of 100-1000Hz by 12.2dB. When the passive noise reduction platform is changed to be a professional noise headset, the single-frequency noise for 100Hz noise reduction increased by 27dB, 100-1000Hz pink noise reduction noise increased by 8dB. Furtherly, through introducing the passive noise reduction model, it can improve the broadband pink noise reduction to 12dB.

In a narrowband ANC system, frequency mismatch (FM), i.e. the difference between identified synchronization frequency and true frequency of primary noise, may exist for the sensor aging effects, fatigue accumulation, etc. A conventional narrowband ANC system will suffer severe performance degradation even for an FM as small as 1% and several structures have been developed for removing FM. In this talk, we also present a new narrowband ANC structure coupled with adaptive functional link artificial neural network (FLANN) for mitigating FM.

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**Biography:** Jian Liu received the B.S., M.S., and Ph.D. degrees in instrumentation science and technology from Harbin Institute of Technology (HIT), Harbin, China, in 2005, 2007, and 2011 respectively. He was a joint cultivated Ph.D. Candidate in Prefectural University of Hiroshima, Hiroshima, Japan, from Oct. 2008 to Sep. 2009. He is now a lecturer of Nanjing University of Aeronautics and Astronautics, Nanjing, China. His main areas of research interests are in active noise control, adaptive signal processing, and sensor signal processing. He is a member of the Acoustical Society of China (ASC), the Institute of Electronics, Information, and Communications Engineers (IEICE) of Japan, and IEEE.

**16:20 – 17:50, Thursday, July 12, 2018, Meeting Room 1512**

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