Curriculum Vitae

Wen Zhang
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Positions

- **ARC DECRA Fellow (Apr. 2015-present)**
  College of Engineering and Computer Science, The Australian National University, Canberra, Australia

- **Research Fellow (Apr. 2012-present)**
  College of Engineering and Computer Science, The Australian National University, Canberra, Australia

- **OCE Postdoctoral Fellowship (Feb. 2010-Mar. 2012)**
  CSIRO Process Science and Engineering Division, Lucas Heights Science and Technology Centre, NSW, Australia

Education

- **PhD in Electrical Engineering**, The Australian National University, Canberra, Australia.
  Thesis: *"Measurement and modelling of Head-Related Transfer Function for spatial audio synthesis"*, December 2010.
- **ME in Electrical Engineering**, First-Class Honours, The Australian National University, Canberra, Australia.
  Thesis: *"Space-frequency channel characterization of ultra-wideband wireless communications"*, December 2005.
- **BE in Telecommunication Engineering**, First-Class Honours, Xidian University, Xi'an, China, July 2003.

Research Interests

General: Audio and Acoustics Signal Processing, Array Signal Processing
Detailed: Active Noise Cancellation, Source Localization and Separation, HRTF (Head-Related Transfer Function) Measurement and Modelling, Virtual Acoustics and Surround Sound Systems

Awards, Grants and Scholarships

- **ANU Major Equipment Grant**, *"Dodecahedron speaker array for 3D sound field control and reproduction"*, First Chief Investigator with Prof. Thushara D. Abhayapala, A/Prof. Henry Gardner, and Dr. Samantha Bennett, $50,000, 2015.
- **ARC DECRA Fellowship DE150100363**, *"The cocktail party problem: Advancing binaural localisation techniques"*, Sole Chief Investigator, $330,000, 2015-2017.
- **ARC Discovery Project Grant DP140103412**, *"Active Sound Control and Noise Reduction over Space"*, 3rd Chief Investigator with Prof. Thushara D. Abhayapala and Prof. Walter Kellermann, $370,000, 2014-2016.
- **Travel Grant**, ANU Early Career Researcher Travel Grant to attend 2013 IEEE WASPAA (New Paltz, USA), Oct. 2013.
- **2008 IEEE ICASSP Student Travel Grant**, 2008 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), *"Iterative extrapolation algorithm for data reconstruction over sphere"*, awarded the student travel grant for the high quality of the paper.

- ◇ **Australian National University PhD Scholarship**, ANU, 2006-2009.
- ◇ **Australian National University-National ICT Australia Ltd Supplementary Scholarship**, ANU-NICTA, 2006-2009.
- ◇ **Travel Grant**, ANU Vice-Chancellor's Higher Degree Research Travel Grant (A$5500) + ACoRN International Attendance and Visit Grant (A$4000), to attend 2008 IEEE ICASSP (Las Vegas, USA) and visit A/Prof. Ramani Duraiswami at the Perceptual Interfaces and Reality Laboratory, UMIACS, University of Maryland (College Park, USA), Apr. 2008.
- ◇ **Travel Grant**, ANU Vice-Chancellor's Higher Degree Research Travel Grant (A$1000) + ACoRN International Attendance and Visit Grant (A$6000), to attend the 31 Audio Engineering Society conference (London, UK) and visit Dr. Mark Poletti at Gracefield Research Centre, Industrial Research Limited (Lower Hutt, New Zealand), June-July 2007.
- ◇ **Travel Grant**, ACoRN Domestic Attendance Grant (A$1500), to attend 2006 Australian Communication Theory Workshop (AusCTW), Adelaide, Jan. 2006.
- ◇ **Chancellor's letter of Commendation**, ANU, 2004-2005.
- ◇ **Third Prize in National Mathematical Contest**, China, 2002.

Talks and Seminars

- ◇ **Paper Presentation**, *"Functional analysis guided approach for sound field reproduction with flexible loudspeaker layouts"*, at 2013 IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA), New Paltz, NY, USA, Oct. 2013.
- ◇ **Seminar**, *"Acoustics of Bubbles and Particles in Fluids"*, Research School of Engineering, ANU, Apr. 2012.
- ◇ **Paper Presentation**, *"On measurement of bubble solids mass loading: an acoustic technique"*, at Flotation'11, Cape Town, South Africa, Nov. 2011.
- ◇ **Paper Presentation**, *"Monitoring of Jameson Cell Flotation Performance by Passive Acoustic Emissions"*, at Flotation'11, Cape Town, South Africa, Nov. 2011.
- ◇ **Paper Presentation**, *"Modal expansion of HRTFs: Continuous representation in frequency-range-angle"*, at 2009 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, Apr. 2009.
- ◇ **Seminar**, *"Modal expansion of HRTFs: Continuous representation in frequency-range-angle"*, RSISE, ANU, Mar. 2009.
- ◇ **Seminar**, *"Modal analysis and synthesis of the Head-Related Transfer Function"*, Perceptual Interfaces and Reality Laboratory, University of Maryland, College Park, USA, Apr. 2008.
- ◇ **Paper Presentation**, *"Iterative extrapolation algorithm for data reconstruction over sphere"*, at 2008 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Las Vegas, USA, Apr. 2008.
- ◇ **Seminar**, *"Horizontal plane HRTF reproduction using continuous Fourier-Bessel functions"*, Gracefield Research Centre, Industrial Research Limited, Lower Hutt, New Zealand, July 2007.
- ◇ **Paper Presentation**, *"Horizontal plane HRTF reproduction using continuous Fourier-Bessel functions"*, at the 31st Audio Engineering Society (AES) international conference on "New directions in high resolution audio", London, UK, June 2007.
- ◇ **Seminar**, *"Continuous functional representation of Head-Related Transfer Function"*, Canberra Research Lab, National ICT Australia, Canberra, Australia, Dec. 2006.

Professional Activities

- ◇ **Editorial board member**, Advances in Signal Processing, Horizon Research Publishing (HRPUB), 2013-2016.
- ◇ **Editorial board member**, Science Journal of Circuits, Systems and Signal Processing, 2013-present.
- ◇ **Affiliate member**, IEEE Signal Processing Society Technical Committee on Audio and Acoustics Signal Processing, 2013-present.
- ◇ **Member**, Institute of Electrical & Electronics Engineers (IEEE), 2010-Present.
- ◇ **Member**, Journal of the Acoustical Society of America (JASA), 2010-Present.
- ◇ **TPC Member**, IEEE 4th Joint Workshop on Hands-free Speech Communication and Microphone Arrays (HSCMA), 2014.
- ◇ **TPC Member**, IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA), 2015.
- ◇ Reviewer of IEEE Journal of Selected Topics in Signal Processing.
- ◇ Reviewer of IEEE/ACM Transactions on Speech, Audio and Language Processing.
- ◇ Reviewer of EURASIP Journal on Advances in Signal Processing.
- ◇ Reviewer of IEEE Antennas and Wireless Propagation Letters.
- ◇ Reviewer of IEEE Transaction on Vehicular Technology.
- ◇ Reviewer of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2014-2015.
- ◇ Reviewer of European Signal Processing Conference (EUSIPCO), 2012-2014.
- ◇ Reviewer of Acoustics Australia, 2009.
- ◇ Reviewer of Australian Communications Theory Workshop (AusCTW), 2005,2009,2013.
- ◇ Visit to A/Prof. Ramani Duraiswami at Perceptual Interfaces and Reality Laboratory, UMIACS, University of Maryland, College Park, USA, Apr. 2008.
- ◇ Visit to Dr. Mark Poletti at Gracefield Research Centre, Industrial Research Limited, Lower Hutt, New Zealand, July 2007.

Teaching and Supervision Experience

- ◇ **Training**, Foundation of University Teaching and Learning, Centre for Higher Education, Learning and Teaching, ANU, Oct.-Nov. 2012.
- ◇ **Training**, The Graduate Teaching Programme, Research Student Development Centre, ANU, June-Oct. 2006.
- ◇ **Course Coordinator/Lecturer**, CECS, ANU, Advanced Topics in Telecommunications (ENGN 8637)—Audio and Speech Signal Processing, July-Oct. 2013.
- ◇ **Lecturer**, CECS, ANU, Discrete-time Signal Processing (ENGN 4537/6537), Feb-Jun. 2013-present.
- ◇ **HDR Student Supervision**, Mr. Dumidu Talagala, PhD (co-supervisor), Array Signal Processing Algorithms for Localization and Equalisation in Complex Acoustic Channels, ANU, 2012-2013.
- ◇ **HDR Student Supervision**, Mr. Hanchi Chen, PhD (co-supervisor), Active Noise Cancellation, ANU, 2013-present.
- ◇ **HDR Student Supervision**, Mr. Xiang Wu, PhD (co-supervisor), Binaural Source Separation and Localization, ANU, 2013-present.
- ◇ **HDR Student Supervision**, Mr. Fei Ma, PhD (main supervisor), TBA, ANU, 2015-present.

Journal Publications

[J1] W. Zhang, R.A. Kennedy, and T.D. Abhayapala, "Efficient continuous HRTF model using data independent basis functions: Experimentally guided approach", in *IEEE Trans. Audio, Speech, and Language Processing*, vol. 17, no. 4, pp. 819-829, May 2009.

[J2] W. Zhang, T.D. Abhayapala, R.A. Kennedy, and R. Duraiswami, "Insights into head-related transfer function: Spatial dimensionality and continuous representations", in *Journal of the Acoustical Society of America*, vol. 127, no. 4, pp. 2347-57, Apr. 2010.

[J3] W. Zhang, M. Zhang, R.A. Kennedy and T.D. Abhayapala, "On high resolution head-related transfer function measurements: An efficient sampling scheme", in *IEEE Trans. Audio, Speech, and Language Processing*, vol. 20, no. 2, pp. 575-584, Feb. 2012.

[J4] W. Zhang, S.J. Spencer, and P. Coghill, "An acoustic technique for measurement of bubble solids mass loading (a) Fundamental study of single bubble", in *Minerals Engineering*, vol. 36-38, pp. 45-52, Oct. 2012.

[J5] S.J. Spencer, R. Bruniges, G. Roberts1, V. Sharp, A. Catanzano, W.J. Bruckard, K.J. Davey and W. Zhang, "An acoustic technique for measurement of bubble solids mass loading (b) Monitoring of Jameson Cell flotation performance by passive acoustic emissions", in *Minerals Engineering*, vol. 36-38, pp. 21-30, Oct. 2012.

[J6] W. Zhang, S.J. Spencer, and P. Coghill, "Characterisation of acoustic emissions resulting from particle collision with a stationary bubble", in *Journal of the Acoustical Society of America*, vol. 133, no. 5, pp. 2523-2527, May 2013.

[J7] D. Talagala, W. Zhang, and T.D. Abhayapala, "Broadband DOA estimation using sensor arrays on complex-shaped rigid bodies", in *IEEE Trans. Audio, Speech, and Language Processing*, vol. 21, no. 8, pp. 1573-1585, Aug. 2013.

[J8] D. Talagala, W. Zhang, T.D. Abhayapala, and A. Kamineni, "Binaural sound source localization using the frequency diversity of the head-related transfer function", in *Journal of the Acoustical Society of America*, vol. 135, no. 3, pp. 1207-1217, March 2014.

[J9] W. Zhang, and T.D. Abhayapala, "Three dimensional sound field reproduction using multiple circular loudspeaker arrays: Functional analysis guided approach", in *IEEE/ACM Trans. Audio, Speech, and Language Processing*, vol. 22. no. 7, pp. 1184-1194, July 2014.

[J10] D. Talagala, W. Zhang, and T.D. Abhayapala, "Efficient multi-channel adaptive room compensation for spatial soundfield reproduction using a modal decomposition", in *IEEE/ACM Trans. Audio, Speech, and Language Processing*, vol, 22, no. 10, pp. 1522-1532, Oct. 2014.

[J11] T. Betlehem, W. Zhang, M. Poletti, and T.D. Abhayapala, "Personal sound zones: Delivering interface free audio to multiple listeners", in *IEEE Signal Processing Magazine*, vol, 32, no. 2, pp. 81-91, March 2015.

[J12] B. Bu, T. Abhayapala, C. Bao, and W. Zhang, "Parameterization of the three-dimensional room transfer function in horizontal plane", in *Journal of the Acoustical Society of America Express Letters* , vol. 138, no. 3, EL286, Sep. 2015.

[J13] H. Chen, T.D. Abhayapala, and W. Zhang, "Theory and design of compact hybrid microphone arrays on two-dimensional planes for three-dimensional soundfild analysis", vol. 138, no. 5, pp. 3081-3092, Nov. 2015.

Conference Publications

[C1] W. Zhang, T.D. Abhayapala, and J. Zhang, "Frequency dependency in UWB channel modelling", in *Proc. 8th International Symposium on DSP and Communication Systems (DSPCS'2005) & 4th Workshop on the Internet, Telecommunications and Signal Processing (WITSP'2005)*, Sunshine Coast, Australia, Dec. 2005, pp. 248-252.

[C2] W. Zhang, T.D. Abhayapala, and J. Zhang, "UWB Spatial-frequency channel characterization", in *Proc. 63rd IEEE Vehicular Technology Conference (VTC)*, vol. 6, Melbourne, Australia, May 2006, pp. 2732-2736.

[C3] W. Zhang, T.D. Abhayapala, and R.A. Kennedy, "Horizontal plane HRTF reproduction using continuous Fourier-Bessel functions", in *Proc. the 31st Audio Engineering Society (AES) international conference on "New directions in high resolution audio"*, London, UK, Jun. 2007, pp. 9 pages.

[C4] W. Zhang, R.A. Kennedy, and T.D. Abhayapala, "Signal estimation from incomplete data on the sphere", in *Proc. IEEE 9th Australian Communication Theory Workshop (AusCTW'07)*, Christchurch, New Zealand, Feb. 2008, pp. 39-44.

[**C5**] W. Zhang, R.A. Kennedy, and T.D. Abhayapala, "Iterative extrapolation algorithm for data reconstruction over sphere", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Las Vegas, USA, Apr. 2008, pp. 3733-3736.

[**C6**] R.A. Kennedy, W. Zhang, and T.D. Abhayapala, "Spherical harmonic analysis and model-limited extrapolation on the sphere: Integral equation formulation", in *Proc. the 2nd International Conference on Signal Processing and Communication Systems(ICSPCS'2008)*, Gold Coast, Australia, Dec. 2008, pp. 6 pages.

[**C7**] W. Zhang, T.D. Abhayapala, R.A. Kennedy, and R. Duraiswami, "Modal expansion of HRTFs: Continuous representation in frequency-range-angle", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Taipei, Taiwan, Apr. 2009, pp. 285-288.

[**C8**] M. Zhang, W. Zhang, R.A. Kennedy, and T.D. Abhayapala, "HRTF measurement on KEMAR manikin", in *Proc. ACOUSTICS 2009 (Australian Acoustical Society)*, Adelaide, Australia, Nov. 2009, pp. 8 pages.

[**C9**] M. Zhang, R.A. Kennedy, T.D. Abhayapala, and W. Zhang, "Internal structure identification of random process using principal component analysis", in *Proc. the 4th International Conference on Signal Processing and Communication Systems (ICSPCS'2010)*, Gold Coast, Australia, Dec. 2010, pp. 6 pages.

[**C10**] M. Zhang, R.A. Kennedy, T.D. Abhayapala, and W. Zhang, "Statistical method to identify key anthropometric parameters in HRTF individualization", in *Proc. the 3rd Joint Workshop on Hands-free Speech Communication and Microphone Arrays (HSCMA'11)*, Edinburgh, UK, May 2011, pp. 213-218.

[**C11**] D. Talagala, W. Zhang, and T.D. Abhayapala, "Active acoustic echo cancellation in spatial sound field reproduction", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Vacouver, Canada, May 2013, pp. 620-624.

[**C12**] D. Talagala, W. Zhang, and T.D. Abhayapala, "Robustness analysis of room equalization for soundfield reproduction within a region", *International Congress on Acoustics (ICA)*, Montreal, Canada, June 2013. (invited paper)

[**C13**] W. Zhang, T.D. Abhayapala, R.A. Kennedy, and M. Zhang, "Towards optimal functional representation of head-related transfer functions in the horizontal plane", *International Congress on Acoustics (ICA)*, Montreal, Canada, June 2013. (invited paper)

[**C14**] W. Zhang, T.D. Abhayapala, and F.M. Fazi, "Functional analysis guided approach for sound field reproduction with flexible loudspeaker layouts", in *Proc. IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, New Paltz, NY, USA, Oct. 2013, pp. 1-4.

[**C15**] R.A. Kennedy, W. Zhang, and T.D. Abhayapala, "Comparison of spherical harmonics based 3D-HRTF functional models", in *Proc. International Conference on Signal Processing and Communication Systems (ICSPCS)*, Gold Coast, Australia, Dec. 2013, pp. 7 pages.

[**C16**] D. Talagala, X. Wu, W. Zhang, and T.D. Abhayapala, "Binaural localization of speech sources in the median plane using Cepstral HRTF extraction", in *Proc. European Signal Processing Conference (EUSIPCO)*, Lisbon, Portugal, Sep. 2014, pp. 2055-2059.

[**C17**] W. Zhang, and T.D. Abhayapala, "2.5D sound field reproduction in higher order Ambisonics", in *Proc. International Workshop on Acoustic Signal Processing (IWAENC)*, French Riviera, France, Sep. 2014, pp. 342-346.

[**C18**] H. Chen, T.D. Abhayapala, and W. Zhang, "Enhanced sound field reproduction within prioritized control region", in *Proc. INTER-NOISE and NOISE-CON Congress and Conference*, Melbourne, Australia, Oct. 2014, vol. 249, no. 3, pp. 4055-4064.

[**C19**] X. Wu, D. Talagala, W. Zhang, and T.D. Abhayapala, "Binaural localization of speech sources in 3D using a composite feature vector of the HRTF", in *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Brisbane, Australia, April 2015, pp. 2654-2658.

[**C20**] H. Chen, T.D. Abhayapala, and W. Zhang, "3D sound field analysis using circular higher-order microphone array", in *Proc. European Signal Processing Conference (EUSIPCO)*, Nice, France, Sep. 2015, pp. 1158-1162.

[**C21**] J. Zhang, W. Zhang and T.D. Abhayapala, "Noise Cancellation over Spatial Regions using Adaptive Wave Domain Processing", accepted for publication in *Proc. IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, New Paltz, NY, USA, Oct. 2015.

[**C22**] H.Chen, P. Samarasinghe, T.D. Abhayapala and W. Zhang, "Spatial Noise Cancellation Inside Cars: Performance Analysis and Experimental Results", accepted for publication in *Proc. IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, New Paltz, NY, USA, Oct. 2015.

[**C23**] H.Chen, P. Samarasinghe, T.D. Abhayapala and W. Zhang, "Estimation of the direct-to-reverberant energy ratio using a spherical microphone array", accepted for presentation at *The Acoustic Characterisation of Environments (ACE) Challenge workshop* during WASPAA, New Paltz, NY, USA, Oct. 2015.

Patent

[**P1**] H. Chen, T.D. Abhayapala, and W. Zhang, "Planar sensor array", Australian Provisional Patent Application No. 2014902837, 23 July 2014.

[**P2**] S. Spencer, P.J. Coghilll, and W. Zhang, "A method and a device for acoustic estimation of bubble properties", Australian Provisional Patent Application No. 2014903402, 27 August 2014.

[**P3**] S. Spencer, P.J. Coghilll, and W. Zhang, "Acoustic estimation of bubble properties and liquid like mediums", Australian Provisional Patent Application No. 2014905193, 22 December 2014.