Shoichi Koyama

Curriculum Vitae

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Personal profile

Shoichi Koyama received the B.E., M.S, and Ph.D. degrees from the University of Tokyo, Tokyo, Japan, in 2007, 2009, and 2014, respectively. He joined Nippon Telegraph and Telephone (NTT) Corporation as a Researcher in 2009. He moved to the University of Tokyo in 2014 and is currently Lecturer since 2018. From 2016 to 2018, he was also a visiting researcher at Paris Diderot University (Paris 7), Institut Langevin, Paris, France. His research interests include audio signal processing / machine learning, acoustic inverse problems, and spatial audio.

Research topics

Acoustic signal processing, machine learning for audio, microphone and loudspeaker array processing, spatial audio

Professional experience

2009 Apr. – 2014 Mar. **Researcher**, *Nippon Telegraph and Telephone Corp.*, Tokyo, Japan.
Worked at NTT Media Intelligence Laboratories

2014 Apr. – 2018 Mar. **Research Associate**, *The University of Tokyo*, Tokyo, Japan.
As a faculty staff of Graduate School of Information Science and Technology

2016 Apr. – 2018 Mar. **Visiting researcher**, *Paris Diderot University (Paris 7) / Institut Langevin*, Paris, France.
As a JSPS Overseas Research Fellow (Host researcher: Prof. Laurent Daudet)

2018 Apr. – present **Lecturer**, *The University of Tokyo*, Tokyo, Japan.
As a faculty staff of Graduate School of Information Science and Technology

2020 Apr. – present **Visiting Associate Professor**, *Tohoku University*, Miyagi, Japan.
As a lecturer at Research Institute of Electrical Communication

Education

2003 Apr. – 2007 Mar. **B.E. in Mathematical Engineering and Information Physics**, *The University of Tokyo*, Tokyo, Japan.
Signal processing using a new type of acoustic sensor (Supervisor: Prof. Shigeru Ando)

2007 Apr. – 2009 Mar. **M.S. in Information Physics and Computing**, *The University of Tokyo*, Tokyo, Japan.
Acoustic source localization based on the weighted integral method (Supervisor: Prof. Shigeru Ando)

2014 Jan. **Ph.D. (Information Science and Technology)**, *The University of Tokyo*, Tokyo, Japan.
Analytical approach to sound field recording and reproduction (Chief examiner: Prof. Shigeru Ando)

Honors and Awards

2022 **The Activity Contribution Award**, *The Acoustical Society of Japan (ASJ)*.

2021 **The Service Award (Operation of Technical Committee on Engineering Acoustics)**, *IEICE ESS*.

2018 **The Research Award**, *Funai Foundation for Information Technology*.

2015 **The Telecom System Technology Award**, *The Telecommunication Advancement Foundation*.

2015 **The Itakura Prize Innovative Young Researcher Award**, *The Acoustical Society of Japan (ASJ)*.

2011 **The Awaya Prize Young Researcher Award**, *The Acoustical Society of Japan (ASJ)*.

2010 **The Best Young Researcher Paper Award**, *IEEJ Sensors and Micromachines Society*.

2009 **The Young Researcher Award**, *SICE Measurement Division*.

Funding

Principal investigator

2022–2026 **JSPS KAKENHI Grant-in-Aid for Scientific Research (B)**, *Japan Society for Promotion of Science*, Japan.
Grant number: JPMJFR216M, Amount: n/a

2022–2025 **JST FOREST**, *Japan Science and Technology Agency*, Japan.
Grant number: 22H03608, Amount: 17,290,000

2018–2022 **JST PRESTO (Humans and Interactions)**, *Japan Science and Technology Agency*, Japan.
Grant number: JPMJPR184J, Amount: 40,100,000 JPY

2018–2020 **FY2018 Excellent Young Resarcher of the University of Tokyo**, *The University of Tokyo*, Japan.
Amount: 6,000,000 JPY

2016–2018 **JSPS Overseas Research Fellowships**, *Japan Society for the Promotion of Science*, Japan.

2015–2019 **JSPS KAKENHI Grant-in-Aid for Young Scientists (A)**, *Japan Society for the Promotion of Science*, Japan.
Grant number: 15H05312, Amount: 24,180,000 JPY

2015 **Research grant**, *Ono Acoustics Research Grant Foundation*, Japan.
Amount: 1,000,000 JPY

2014–2015 **JSPS KAKENHI Grant-in-Aid for Young Scientists (Start-up)**, *Japan Society for the Promotion of Science*, Japan.
Grant number: 26880003, Amount: 1,430,000 JPY

2014 **Overseas Travel Grant**, *The Telecommunications Advancement Foundation*, Japan.
For attending International Workshop on Acoustic Signal Enhancement (IWAENC) 2014, Amount: 290,000 JPY

Co-investigator

2019–2022 **JSPS KAKENHI Grant-in-Aid for Scientific Research (A)**, *Japan Society for Promotion of Science*, Japan.
Grant number: 19H01116, PI: Prof. Hiroshi Saruwatari

2016–2019 **JSPS KAKENHI Grant-in-Aid for Scientific Research (A)**, *Japan Society for the Promotion of Science*, Japan.
Grant number: 16H01735, PI: Prof. Nobutaka Ono (National Institute of Informatics, Japan)

2014 **JSPS KAKENHI Grant-in-Aid for Scientific Research (A)**, *Japan Society for the Promotion of Science*, Japan.
Grant number: 23240023, PI: Prof. Hiroshi Saruwatari (The University of Tokyo, Japan)

Teaching and mentoring experience

2010 Aug. **Supervision of research intern**, *Nippon Telegraph and Telephone Corp.*, Tokyo, Japan.
Supervised an undergraduate student from Keio University, Kanagawa, Japan

2012 Jan. – Aug. **Supervision of research intern**, *Nippon Telegraph and Telephone Corp.*, Tokyo, Japan.
Supervised an undergraduate student from University of British Columbia, Vancouver, Canada

2013 Aug. – Dec. **Supervision of research intern**, *Nippon Telegraph and Telephone Corp.*, Tokyo, Japan.
Supervised an undergraduate student from Georgia University of Technology, Atlanta, United States

2014 Apr. – 2016 Mar. **Student experiments**, *The University of Tokyo*, Tokyo, Japan.
Basic experiments of acoustic signal processing and sensor circuits for undergraduate students

2014 Apr. – present **Supervision/supervision aid of students**, *The University of Tokyo*, Tokyo, Japan.
Mentored undergraduate, master, and PhD students for their research

2018 Apr. – 2021 Mar. **Information Physics and Computing Exercises I**, *The University of Tokyo*, Tokyo, Japan.
Exercises of basic physics for undergraduate students

2018 Apr. – present **Information Physics and Computing Exercises III**, *The University of Tokyo*, Tokyo, Japan.
Exercises of basic signal processing and algorithm for undergraduate students

2019 Feb. **PhD thesis examiner**, *Australian National University*, Canberra, Australia.
Examined a PhD student of Australian National University

2019 Apr. – present **Applied Acoustics**, *The University of Tokyo*, Tokyo, Japan.
Physical acoustics and acoustic signal processing for undergraduate students.

2019 Oct. – 2022 Mar. **Basics of Modern Engineering I**, *The University of Tokyo*, Tokyo, Japan.
Introduction of signal processing and its applications for undergraduate students.

2019 Oct. – present **Advanced Topics of Acoustic Systems**, *The University of Tokyo*, Tokyo, Japan.
Recent advancement of acoustic signal processing and its applications for graduate students.

2020 Apr. – present **Signal Processing I**, *The University of Tokyo*, Tokyo, Japan.
Basics of signal processing for undergraduate students.

2021 Mar. **PhD thesis examiner**, *Australian National University*, Canberra, Australia.
Examined a PhD student of Australian National University

Publications

Journal papers

[1] Shoichi Koyama, Toru Kurihara, and Shigeru Ando. A theory and experiment of instantaneous wave source localization from a wave distribution on a small region. *IEEJ Transactions of Sensors and Micromachines*, 129-E(10):350–356, 2009. (in Japanese). **[The Best Young Researcher Paper Award, IEEJ Sensors and Micromachines Society]**.

[2] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Reproducing virtual sound sources in front of a loudspeaker array using inverse wave propagator. *IEEE Transactions on Audio, Speech, and Language Processing*, 20(6):1746–1758, 2012. **[The Telecom System Technology Award, the Telecommunication Advancement Foundation]**.

[3] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Analytical approach to wave field reconstruction filtering in spatio-temporal frequency domain. *IEEE Transactions on Audio, Speech, and Language Processing*, 21(4):685–696, 2013.

[4] Yoichi Haneda, Ken'ichi Furuya, Shoichi Koyama, and Kenta Niwa. Close-talking microphone arrays based on spherical harmonic expansion. *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, J97-A(4):264–273, 2014. (in Japanese).

[5] Yoichi Haneda, Ken'ichi Furuya, Shoichi Koyama, Kenta Niwa, and Kazunori Kobayashi. Sound field simulation for circular array based on spatial circular convolution. *Acoustical Science and Technology*, 35(2):99–107, 2014.

[6] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, Yoichi Haneda, and Yôiti Suzuki. Wave field reconstruction filtering in cylindrical harmonic domain for with-height recording and reproduction. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 22(10):1546–1557, 2014.

[7] Shoichi Koyama, Ken'ichi Furuya, Hisashi Uematsu, Yusuke Hiwasaki, and Yoichi Haneda. Real-time sound field transmission system by using wave field reconstruction filter and its evaluation. *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, E97-A(9):1840–1848, 2014.

[8] Jorge Trevino, Shoichi Koyama, Shuichi Sakamoto, and Yôiti Suzuki. Mixed-order ambisonics encoding of cylindrical microphone array signals. *Acoustical Science and Technology, Acoustical Letters*, 35(3):174–177, 2014.

[9] Shoichi Koyama, Ken'ichi Furuya, Yoichi Haneda, and Hiroshi Saruwatari. Source-location-informed sound field recording and reproduction. *IEEE Journal of Selected Topics in Signal Processing*, 9(5):881–894, 2015.

[10] Shoichi Koyama, Ken'ichi Furuya, Keigo Wakayama, Suehiro Shimauchi, and Hiroshi Saruwatari. Analytical approach to transforming filter design for sound field recording and reproduction using circular arrays with a spherical baffle. *Journal of the Acoustical Society of America*, 139(3):1024–1036, 2016.

[11] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Sparse sound field decomposition for super-resolution in recording and reproduction. *Journal of the Acoustical Society of America*, 143(6):3780–3895, 2018.

[12] Naoki Murata, Shoichi Koyama, Norihiro Takamune, and Hiroshi Saruwatari. Sparse representation using multidimensional mixed-norm penalty with application to sound field decomposition. *IEEE Transactions on Signal Processing*, 66(12):3327–3338, 2018.

[13] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Sound field recording using distributed microphones based on harmonic analysis of infinite order. *IEEE Signal Processing Letters*, 25(1):135–139, 2018.

[14] Shoichi Koyama and Laurent Daudet. Sparse representation of a spatial sound field in a reverberant environment. *IEEE Journal of Selected Topics in Signal Processing*, 13(1):172–184, 2019.

[15] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Three-dimensional sound field reproduction based on weighted mode-matching method. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 27(12):1852–1867, 2019. **[IEEE SPS Japan Student Journal Paper Award]**.

[16] Yuki Mitsufuji, Stefan Uhlich, Norihiro Takamune, Daichi Kitamura, Shoichi Koyama, and Hiroshi Saruwatari. Multichannel non-negative matrix factorization using banded spatial covariance matrices in wavenumber domain. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 28:49–60, 2020.

[17] Yuhta Takida, Shoichi Koyama, Natsuki Ueno, and Hiroshi Saruwatari. Reciprocity gap functional in spherical harmonic domain for gridless sound field decomposition. *Signal Processing, Elsevier*, 169, 2020.

[18] Naoto Iijima, Shoichi Koyama, and Hiroshi Saruwatari. Binaural rendering from microphone array signals of arbitrary geometry. *Journal of the Acoustical Society of America*, 150(4):2479–2491, 2021.

[19] Shoichi Koyama, Jesper Brunnström, Hayato Ito, Natsuki Ueno, and Hiroshi Saruwatari. Spatial active noise control based on kernel interpolation of sound field. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 29:3052–3063, 2021.

[20] Yuki Mitsufuji, Norihiro Takamune, Shoichi Koyama, and Hiroshi Saruwatari. Multichannel blind source separation based on evanescent-region-aware non-negative tensor factorization in spherical harmonic domain. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 29:607–617, 2021.

[21] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Convex and differentiable formulation for inverse problems in hilbert spaces with nonlinear clipping effects. *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, E104-A(9):1293–1303, 2021.

[22] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Directionally weighted wave field estimation exploiting prior information on source direction. *IEEE Transactions on Signal Processing*, 69:2383–2395, 2021.

[23] Tomoya Nishida, Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Region-restricted sensor placement based on gaussian process for sound field estimation. *IEEE Transactions on Signal Processing*, 2022. (in press).

Overview / Tutorial papers

[1] Shoichi Koyama. Mathematical formulation of sound field reproduction – mathematics in wave field synthesis and higher order ambisonics–. *Journal of the Acoustical Society of Japan*, 68(11):584–589, 2012. (in Japanese).

[2] Ken'ichi Furuya and Shoichi Koyama. Wave field synthesis; principles and applications. *Journal of the Institute of Image Information and Television Engineers*, 68(8):621–624, 2014. (in Japanese).

[3] Shoichi Koyama. Sparse sound field representation for super-resolution in recording and reproduction. *Journal of the Acoustical Society of Japan*, 71(11):632–638, 2015. (in Japanese).

[4] Shoichi Koyama. The future of sound recording, reproduction, and editing. *Journal of IEICE*, 100(6):474–478, 2017. (in Japanese).

[5] Shoichi Koyama. Sparsity-based sound field reconstruction. *Acoustical Science and Technology*, 41(1):269–275, 2020.

[6] Shoichi Koyama, Gilles Chardon, and Laurent Daudet. Optimizing source and sensor placement for sound field control: An overview. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 28:686–714, 2020.

Conference papers

[1] Shigeru Ando, Shoichi Koyama, Nobutaka Ono, and Naoki Ikeuchi. Silicon cochlear microphone "fishbone" with complex filtering and hilbert transform capability for instantaneous signal detection and analysis. In *Proceedings of Transducers '07*, pages 1295–1298, Lyon, Jun. 2007.

[2] Shoichi Koyama, Toru Kurihara, and Shigeru Ando. A direct algebraic method of instantaneous wave source localization. In *Proceedings of SICE Annual Conference*, pages 532–537, Aug. 2008.

[3] Shoichi Koyama and Risa Suzuki. Scape synthesis: Generation of a novel acoustical space based on auditory perceptual features. In *Proceedings of the 2009 International Computer Music Conference (ICMC)*, pages 533–536, Montreal, Aug. 2009.

[4] Shoichi Koyama, Yusuke Hiwasaki, Ken'ichi Furuya, and Yoichi Haneda. Inverse wave propagation in wave field synthesis. In *Proceedings of 40th AES International Conference*, Tokyo, Oct. 2010.

[5] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Design of transform filter for sound field reproduction using microphone array and loudspeaker array. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, pages 5–8, New Paltz, Oct. 2011.

[6] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Sound field recording and reproduction using transform filter designed in spatio-temporal frequency domain. In *Proceedings of 131st AES Convention*, New York, Oct. 2011.

[7] Shoichi Koyama, Yusuke Hiwasaki, Ken'ichi Furuya, and Yoichi Haneda. Inverse wave propagation for reproducing virtual source in front of loudspeaker array. In *Proceedings of European Signal Processing Conference (EUSIPCO)*, pages 1322–1326, Barcelona, Sep. 2011.

[8] Satoru Emura, Shoichi Koyama, Ken'ichi Furuya, and Yoichi Haneda. Posterior residual echo canceling and its complexity reduction in the wave domain. In *Proceedings of International Workshop on Acoustic Signal Enhancement (IWAENC)*, Aachen, Sep. 2012.

[9] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Design of transform filter for reproducing arbitrary shifted sound field using phase-shift of spatio-temporal frequency. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 381–384, Kyoto, 2012.

[10] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Sound field reproduction method in spatio-temporal frequency domain considering directivity of loudspeakers. In *Proceedings of 132nd AES Convention*, Budapest, Apr. 2012.

[11] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. MAP estimation of driving signals of loudspeakers for sound field reproduction from pressure measurements. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, New Paltz, Oct. 2013.

[12] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, Yoichi Haneda, and Yôiti Suzuki. Sound field reproduction using multiple linear arrays based on wave field reconstruction filtering in helical wave spectrum domain. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 271–275, Vancouver, Mar. 2013.

[13] Shoichi Koyama, Ken'ichi Furuya, Hisashi Uematsu, Yusuke Hiwasaki, and Yoichi Haneda. Real-time sound field transmission system by using wave field reconstruction filter and its subjective listening test. In *Proceedings of 52nd AES International Conference*, Guildford, Sep. 2013.

[14] Shoichi Koyama, Timothy Lee, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Improvement using circular harmonics beamforming on reverberation problem of wave field reconstruction filtering. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 276–280, Vancouver, Mar. 2013.

[15] Hideaki Takada, Munekazu Date, Shoichi Koyama, Shiro Ozawa, Satoshi Mieda, and Akira Kojima. High-reality space composition using stably-positioned imaging and acoustic wave field synthesis. In *Proceedings of 36th European Conference on Visual Perception (ECVP)*, page 224, Bremen, Aug. 2013.

[16] Yoichi Haneda, Ken'ichi Furuya, Shoichi Koyama, and Kenta Niwa. Close-talking spherical microphone array using sound pressure interpolation based on spherical harmonic expansion. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 604–608, Florence, May 2014.

[17] Shoichi Koyama, Suehiro Shimauchi, and Hitoshi Ohmuro. Sparse sound field representation in recording and reproduction for reducing spatial aliasing artifacts. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 4443–4447, Florence, May 2014.

[18] Shoichi Koyama, Prakhar Srivastava, Ken'ichi Furuya, Suehiro Shimauchi, and Hitoshi Ohmuro. STSP: Space-time stretched pulse for measuring spatio-temporal impulse response. In *Proceedings of International Workshop on Acoustic Signal Enhancement (IWAENC)*, pages 309–313, Antibes, Sep. 2014.

[19] Shoichi Koyama, Koichiro Ito, and Hiroshi Saruwatari. Source-location-informed sound field recording and reproduction with spherical arrays. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, New Paltz, Oct. 2015.

[20] Shoichi Koyama, Atsushi Matsubayashi, Naoki Murata, and Hiroshi Saruwatari. Sparse sound field decomposition using group sparse bayesian learning. In *Proceedings of Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC)*, pages 850–855, Hong Kong, Dec. 2015. **[Invited]**.

[21] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Structured sparse signal models and decomposition algorithm for super-resolution in sound field recording and reproduction. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 619–623, Brisbane, Apr. 2015.

[22] Naoki Murata, Shoichi Koyama, Norihiro Takamune, and Hiroshi Saruwatari. Sparse sound field decomposition with parametric dictionary learning for super-resolution recording and reproduction. In *Proceedings of IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, pages 69–72, Cancun, Dec. 2015.

[23] Yuki Murota, Daichi Kitamura, Shoichi Koyama, Hiroshi Saruwatari, and Satoshi Nakamura. Statistical modeling of binaural signal and its application to binaural source separation. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 494–498, Brisbane, Apr. 2015.

[24] Shoichi Koyama. Source-location-informed sound field recording and reproduction: A generalization to arrays of arbitrary geometry. In *Proceedings of 2016 AES International Conference on Sound Field Control*, Guildford, Jul. 2016. **[Invited]**.

[25] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Super-resolution in sound field recording and reproduction based on sparse representation. In *5th Joint Meeting of the Acoustical Society of America and Acoustical Society of Japan*, Honolulu, Nov. 2016. **[Invited]**.

[26] Shoichi Koyama and Hiroshi Saruwatari. Sound field decomposition in reverberant environment using sparse and low-rank signal models. In *Proceedings of*

IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), pages 345–349, Shanghai, Mar. 2016.

[27] Yuki Mitsufuji, Shoichi Koyama, and Hiroshi Saruwatari. Multichannel blind source separation based on non-negative tensor factorization in wavenumber domain. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 56–60, Shanghai, Mar. 2016.

[28] Naoki Murata, Hirokazu Kameoka, Keisuke Kinoshita, Shoko Araki, Tomohiro Nakatani, Shoichi Koyama, and Hiroshi Saruwatari. Reverberation-robust underdetermined source separation with non-negative tensor double deconvolution. In *Proceedings of European Signal Processing Conference (EUSIPCO)*, pages 1648–1652, Budapest, Aug. 2016.

[29] Naoki Murata, Shoichi Koyama, Hirokazu Kameoka, Norihiro Takamune, and Hiroshi Saruwatari. Sparse sound field decomposition with multichannel extension of complex NMF. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 395–399, Shanghai, Mar. 2016.

[30] Hiroaki Nakajima, Daichi Kitamura, Norihiro Takamune, Shoichi Koyama, Hiroshi Saruwatari, Nobutaka Ono, Yu Takahashi, and Kazunobu Kondo. Music signal separation using supervised NMF with all-polle-model-based discriminative basis deformation. In *Proceedings of European Signal Processing Conference (EUSIPCO)*, pages 1143–1147, Budapest, Aug. 2016.

[31] Hiroaki Nakajima, Daichi Kitamura, Norihiro Takamune, Shoichi Koyama, Hiroshi Saruwatari, Yu Takahashi, and Kazunobu Kondo. Audio signal separation using supervised NMF with time-variant all-pole-model-based basis deformation. In *Proceedings of Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC)*, Jeju, Dec. 2016. **[Invited]**.

[32] Shoichi Koyama and Laurent Daudet. Comparison of reverberation models for sparse sound field decomposition. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, pages 214–218, New Paltz, Oct. 2017.

[33] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Effect of multipole dictionary in sparse sound field decomposition for super-resolution in recording and reproduction. In *Proceedings of International Congress on Sound and Vibration (ICSV)*, London, Jul. 2017. **[Invited]**.

[34] Naoki Murata, Shoichi Koyama, Norihiro Takamune, and Hiroshi Saruwatari. Spatio-temporal sparse sound field decomposition considering acoustic source signal characteristics. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 441–445, New Orleans, Mar. 2017.

[35] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Listening-area-informed sound field reproduction based on circular harmonic expansion. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 111–115, New Orleans, Mar. 2017.

[36] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Listening-area-informed sound field reproduction with gaussian prior based on circular harmonic expan-

sion. In *Proceedings of Hands-free Speech Communication and Microphone Arrays (HSCMA)*, pages 196–200, San Francisco, Mar. 2017.

[37] Shoichi Koyama. Sparsity-based sound field reconstruction. In *Tohoku Universal Acoustical Communication Month, Seminar on the spatial aspects of hearing and their applications, keynote lecture*, Sendai, Oct. 2018. **[Invited]**.

[38] Shoichi Koyama, Gilles Chardon, and Laurent Daudet. Joint source and sensor placement for sound field control based on empirical interpolation method. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 501–505, Calgary, Apr. 2018.

[39] Yuhta Takida, Shoichi Koyama, and Hiroshi Saruwatari. Exterior and interior sound field separation using convex optimization: Comparison of signal models. In *Proceedings of European Signal Processing Conference (EUSIPCO)*, pages 2567–2571, Rome, Sep. 2018.

[40] Yuhta Takida, Shoichi Koyama, Natsuki Ueno, and Hiroshi Saruwatari. Gridless sound field decomposition based on reciprocity gap functional in spherical harmonic domain. In *Proceedings of IEEE Sensor Array and Multichannel Signal Processing Workshop (SAM)*, pages 627–631, Sheffield, Jul. 2018. **[Best Student Paper Award, ONRG sponsored student travel grants]**.

[41] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Kernel ridge regression with constraint of helmholtz equation for sound field interpolation. In *Proceedings of International Workshop on Acoustic Signal Enhancement (IWAENC)*, pages 436–440, Tokyo, Sep. 2018.

[42] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Sound field reproduction with exterior radiation cancellation using analytical weighting of harmonic coefficients. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 466–470, Calgary, Apr. 2018. **[IEEE SPS Japan Student Conference Paper Award]**.

[43] Hayato Ito, Shoichi Koyama, Natsuki Ueno, and Hiroshi Saruwatari. Feedforward spatial active noise control based on kernel interpolation of sound field. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 511–515, Brighton, May 2019. **[Best Student Paper Award, IEEE SPS Japan Student Conference Paper Award]**.

[44] Hayato Ito, Shoichi Koyama, Natsuki Ueno, and Hiroshi Saruwatari. Three-dimensional spatial active noise control based on kernel-induced sound field interpolation. In *Proceedings of International Congress on Acoustics (ICA)*, pages 1101–1108, Aachen, Sep. 2019.

[45] Masahiro Nakanishi, Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Two-dimensional sound field recording with multiple circular microphone arrays considering multiple scattering. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, pages 363–367, New Paltz, Oct. 2019.

[46] Yuhta Takida, Shoichi Koyama, Natsuki Ueno, and Hiroshi Saruwatari. Comparison of interpolation methods for gridless sound field decomposition based on

reciprocity gap functional. In *Proceedings of International Congress on Sound and Vibration (ICSV)*, Montreal, Jul. 2019. **[Invited]**.

[47] Yuhta Takida, Shoichi Koyama, Natsuki Ueno, and Hiroshi Saruwatari. Robust gridless sound field decomposition based on structured reciprocity gap functional in spherical harmonic domain. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 581–585, Brighton, May 2019.

[48] Kentaro Ariga, Tomoya Nishida, Shoichi Koyama, Natsuki Ueno, and Hiroshi Saruwatari. Mutual-information-based sensor placement for spatial sound field recording. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 166–170, May 2020.

[49] Gilles Chardon, Shoichi Koyama, and Laurent Daudet. Numerical evaluation of source and sensor placement methods for sound field control. In *Proceedings of Forum Acusticum*, Lyon, Dec. 2020.

[50] Naoto Iijima, Shoichi Koyama, and Hiroshi Saruwatari. Binaural rendering from distributed microphone signals considering loudspeaker distance in measurements. In *Proceedings of IEEE International Workshop on Multimedia Signal Processing (MMSP)*, Tampere, Sep. 2020.

[51] Hayato Ito, Shoichi Koyama, Natsuki Ueno, and Hiroshi Saruwatari. Spatial active noise control based on kernel interpolation with directional weighting. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 8399–8403, May 2020. **[Invited]**.

[52] Tomoya Nishida, Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Sensor placement in arbitrarily restricted region for field estimation based on gaussian process. In *Proceedings of European Signal Processing Conference (EUSIPCO)*, pages 2289–2293, Amsterdam, Jan. 2020.

[53] Juliano G. C. Ribeiro, Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Kernel interpolation of acoustic transfer function between regions considering reciprocity. In *Proceedings of IEEE Sensor Array and Multichannel Signal Processing Workshop (SAM)*, Jun. 2020.

[54] Jesper Brunnström and Shoichi Koyama. Kernel-interpolation-based filtered-x least mean square for spatial active noise control in time domain. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 161–165, Jun. 2021.

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Other talks

[1] Shoichi Koyama. Sound field recording and reproduction and its extension to super-resolution. In *IEEE NZ North Section Technical seminar, University of Auckland*, Apr. 2015.

[2] Shoichi Koyama. Sound field recording and reproduction and its extension to super-resolution. In *IEEE NZ Central Section Invited Lecture, Victoria University of Wellington*, Apr. 2015.

[3] Shoichi Koyama. Sound field recording and reproduction using small number of microphones and loudspeakers. In *University of Southampton, Institute of Sound and Vibration Research (ISVR), seminar talk*, Jul. 2017.

[4] Shoichi Koyama. Sparsity-aware sound field recording / joint source and sensor placement for sound field control. In *Microsoft Research Lab, Redmond, seminar talk*, Apr. 2018.

[5] Shoichi Koyama. Sound field analysis and synthesis: Theoretical advances and applications to spatial audio reproduction. In *Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC), Overview Session*, Dec. 2021.

[6] Natsuki Ueno and Shoichi Koyama. Infinite-dimensional expansion for sound field estimation with application to spatial audio. In *IEEE Signal Processing Society Webinar*, Dec. 2021.

[7] Shoichi Koyama and Natsuki Ueno. Sound field estimation: Recent advances and applications. In *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Tutorial*, May 2022.

Professional memberships

IEEE, *Member*

Acoustical Society of America (ASA), *Member*

Audio Engineering Society (AES), *Member*

Acoustical Society of Japan (ASJ), *Member*

IEICE, *Member*

Technical skills

Programming Matlab, Python, C/C++, PHP, HTML, CSS

Languages

Japanese	Native speaker
English	Proficient
French	Basic