CURRICULUM VITAE

Enzo De Sena
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(a) Education

2013	Ph.D. Electr. Eng.	King's College London, UK
2009	M.Sc. Telecom. Eng., *cum laude*	Università degli Studi di Napoli "Federico II", Italy

(b) Research & Teaching Experience

2016/09 – present	Lecturer	University of Surrey, UK
2013/09 – 2016/08	Postdoctoral Fellow	KU Leuven, Belgium
2012/08 – 2013/08	Teaching Fellow	King's College London, UK

(c) Visiting positions

2018/08 – present	Visiting Researcher	King's College London, UK
2016/09 – 2017/09	Free Researcher	KU Leuven, Belgium
2016/02 – 2016/09	Visiting Researcher	Imperial College London, UK
2014/10 – 2015/01	Visiting Researcher	Aalborg University, Denmark
2013/08 – 2013/09	Visiting Researcher	Stanford University, USA

(d) Publications

Journal publications

1. E. De Sena, Z. Cvetković, H. Hacıhabiboğlu, M. Moonen, and T. van Waterschoot, "Localization uncertainty in time-amplitude stereophonic reproduction," *IEEE/ACM Trans. Audio, Speech, Language Proc.*, vol. 28, pp. 1000–1015, 2020.
2. N. Antonello, E. De Sena, M. Moonen, P. A. Naylor, and T. van Waterschoot, "Joint acoustic localization and dereverberation through plane wave decomposition and sparse regularization," *IEEE/ACM Trans. Audio, Speech, Language Proc.*, vol. 27, no. 12, pp. 1893–1905, 2019.
3. G. Vairetti, E. De Sena, M. Catrysse, S. H. Jensen, M. Moonen, and T. v. Waterschoot, "An automatic design procedure for low-order iir parametric equalizers," *J. Audio Eng. Soc.*, vol. 66, no. 11, pp. 935–952, 2018.
4. D. Pelegrín-García, E. De Sena, T. van Waterschoot, M. Rychtáriková, and C. Glorieux, "Localization of a virtual wall by means of active echolocation by untrained sighted persons," *Applied Acoustics*, vol. 139, pp. 82–92, 2018.
5. G. Vairetti, N. Kaplanis, E. De Sena, S. H. Jensen, S. Bech, M. Moonen, and T. Van Waterschoot, "The Subwoofer Room Impulse Response database (SUBRIR)," *J. Audio Eng. Soc.*, vol. 65, no. 5, pp. 389–401, 2017.
6. N. Antonello, E. De Sena, M. Moonen, P. A. Naylor, and T. van Waterschoot, "Room impulse response interpolation using a sparse spatio-temporal representation of the sound field," *IEEE/ACM Trans. Audio, Speech, Language Proc.*, vol. 25, no. 10, pp. 1929–1941, 2017.
7. G. Vairetti, E. De Sena, M. Catrysse, S. H. Jensen, M. Moonen, and T. van Waterschoot,

"A scalable algorithm for physically motivated and sparse approximation of room impulse responses with orthonormal basis functions," *IEEE/ACM Trans. Audio, Speech, Language Proc.*, vol. 25, no. 7, pp. 1547–1561, 2017.

8. H. Hacıhabiboglu, E. De Sena, Z. Cvetković, J. Johnston, and J. Smith, "Perceptual spatial audio recording, simulation, and rendering: An overview of spatial-audio techniques based on psychoacoustics," *IEEE Signal Processing Magazine*, vol. 34, no. 3, pp. 36–54, 2017.
9. E. D. Sena, M. Brookes, P. A. Naylor, and T. v. Waterschoot, "Localization experiments with reporting by head orientation: statistical framework and case study," *J. Audio Eng. Soc.*, vol. 65, no. 12, pp. 982–996, 2017.
10. E. De Sena, H. Hacıhabiboğlu, Z. Cvetković, and J. Smith, "Efficient synthesis of room acoustics via scattering delay networks," *IEEE/ACM Trans. Audio, Speech, Language Proc.*, vol. 23, pp. 1478–1492, Sep. 2015.
11. E. De Sena, N. Antonello, M. Moonen, and T. van Waterschoot, "On the modeling of rectangular geometries in room acoustic simulations," *IEEE/ACM Trans. Audio, Speech, Language Proc.*, vol. 23, pp. 774–786, Apr. 2015.
12. E. De Sena, H. Hacıhabiboğlu, and Z. Cvetković, "Analysis and design of multichannel systems for perceptual sound field reconstruction," *IEEE Trans. Audio, Speech, Language Proc.*, vol. 21, pp. 1653–1665, August 2013.
13. E. De Sena, H. Hacıhabiboğlu, and Z. Cvetković, "On the design and implementation of higher order differential microphones," *IEEE Trans. Audio, Speech, Language Proc.*, vol. 20, pp. 162–174, January 2012.

Conference papers

1. S. Djordjevic, H. Hacıhabiboğlu, Z. Cvetković, and E. De Sena, "Evaluation of the perceived naturalness of artificial reverberation algorithms," in *presented at the 148th Audio Eng. Soc. Conv., Preprint #10353, Vienna, Austria*, 2020.
2. E. Erdem, E. De Sena, H. Hacıhabiboğlu, and Z. Cvetković, "Perceptual soundfield reconstruction in three dimensions via sound field extrapolation," in *Proc. IEEE Int. Conf. on Acoust. Speech and Signal Process. (ICASSP-19)*, pp. 8023–8027, 2019.
3. J. Camilleri, N. Kaplanis, and E. De Sena, "Evaluation of car cabin acoustics using auralisation over headphones," in *Proc. Audio Eng. Soc. Int. Conf. on Immersive and Interactive Audio*, 2019.
4. P. Dawson, E. De Sena, and P. A. Naylor, "An acoustic image-source characterisation of surface profiles," in *Proc. Eur. Signal Process. Conf. (EUSIPCO-18)*, pp. 2130–2134, 2018.
5. L. Lightburn, E. De Sena, A. Moore, P. A. Naylor, and M. Brookes, "Improving the perceptual quality of ideal binary masked speech," in *Proc. IEEE Int. Conf. on Acoust. Speech and Signal Process. (ICASSP-17)*, pp. 661–665, 2017.
6. G. Vairetti, S. H. Jensen, E. De Sena, M. Moonen, M. Catrysse, and T. van Waterschoot, "Multichannel identification of room acoustic systems with adaptive filters based on orthonormal basis functions," in *Proc. IEEE Int. Conf. on Acoust. Speech and Signal Process. (ICASSP-16)*, pp. 16–20, 2016.
7. C. S. Doire, M. Brookes, P. A. Naylor, E. De Sena, T. van Waterschoot, and S. H. Jensen, "Acoustic environment control: Implementation of a reverberation enhancement system," in *Proc. 60th Audio Eng. Soc. Int. Conf.*, 2016.
8. N. Antonello, E. De Sena, M. Moonen, P. A. Naylor, and T. van Waterschoot, "Sound field

control in a reverberant room using the finite difference time domain method," in *Proc. 60th Audio Eng. Soc. Int. Conf.*, 2016.

9. G. Vairetti, E. De Sena, M. Catrysse, S. H. Jensen, M. Moonen, and T. van Waterschoot, "Room acoustic system identification using orthonormal basis function models," in *Proc. 60th Audio Eng. Soc. Int. Conf.*, 2016.
10. E. De Sena, N. Kaplanis, P. A. Naylor, and T. van Waterschoot, "Large-scale auralised sound localisation experiment," in *Proc. 60th Audio Eng. Soc. Int. Conf.*, (Leuven, Belgium), 2016.
11. G. Vairetti, E. De Sena, T. van Waterschoot, M. Moonen, M. Catrysse, N. Kaplanis, and S. H. Jensen, "A physically motivated parametric model for compact representation of room impulse responses based on orthonormal basis functions," in *Proc. of the 10th Eur. Congr. and Expo. on Noise Control Eng.(EURONOISE 2015)*, pp. 149–154, 2015.
12. E. De Sena and Z. Cvetković, "A computational model for the estimation of localisation uncertainty," in *Proc. IEEE Int. Conf. on Acoust. Speech and Signal Process. (ICASSP-13)*, (Vancouver, Canada), pp. 388–392, May 2013.
13. E. De Sena, H. Hacıhabiboğlu, and Z. Cvetković, "A generalized design method for directivity patterns of spherical microphone arrays," in *Proc. IEEE Int. Conf. on Acoust. Speech and Signal Process. (ICASSP-11)*, (Prague, Czech Republic), May 2011.
14. E. De Sena, H. Hacıhabiboğlu, and Z. Cvetković, "Scattering delay network: an interactive reverberator for computer games," in *Proc. 41st Audio Eng. Soc. Int. Conf.: Audio for Games*, (London, UK), Feb. 2011.
15. H. Hacıhabiboğlu, E. De Sena, and Z. Cvetković, "Frequency-domain scattering delay networks for simulating room acoustics in virtual environments," in *Proc. Signal-Image Technology and Internet-Based Systems (SITIS)*, pp. 180–187, November/December 2011.
16. E. De Sena, H. Hacıhabiboğlu, and Z. Cvetković, "Perceptual evaluation of a circularly symmetric microphone array for panoramic recording of audio," in *Proc. 2nd Int. Symp. on Ambisonics, and Spherical Acoustics*, (Paris, France), May 2010.
17. E. De Sena, H. Hacıhabiboğlu, and Z. Cvetković, "Design of a circular microphone array for panoramic audio recording and reproduction: Array radius." Presented at the AES 128^{th} Conv., Preprint #8064, London, UK, May 2010.
18. E. Giordano, E. De Sena, G. Pau, and M. Gerla, "Vergilius: A scenario generator for VANET," in *2010 IEEE 71st Vehicular Technology Conference*, pp. 1–5, 2010.
19. H. Hacıhabiboğlu, E. De Sena, and Z. Cvetković, "Design of a circular microphone array for panoramic audio recording and reproduction: Microphone directivity." presented at the 128th Audio Eng. Soc. Conv., Preprint #8063, London, UK, May 2010.
20. G. Marfia, G. Pau, E. Giordano, E. De Sena, and M. Gerla, "VANET: On mobility scenarios and urban infrastructure. A case study," in *2007 Mobile Networking for Vehicular Environments*, pp. 31–36, 2007.
21. G. Marfia, G. Pau, E. De Sena, E. Giordano, and M. Gerla, "Evaluating vehicle network strategies for downtown Portland: opportunistic infrastructure and the importance of realistic mobility models," in *Proc. of the 1st Int. MobiSys Workshop on Mobile Opportunistic Networking*, pp. 47–51, 2007.

Patents

1. H. Hacıhabiboğlu, E. De Sena, Z. Cvetković, *et al.*, "Microphone array," Mar. 10 2015. US Patent 8,976,977.

2. E. De Sena, Z. Cvetković, and H. Hacıhabiboğlu, "Electronic device with digital reverberator and method," Dec. 9 2014. US Patent 8,908,875.

(e) PhD Supervision and Examination

2021 – 2024	SCReAM Student	Supervisor	University of Surrey, UK
2021	Craig Cieciura	Internal Examiner	University of Surrey, UK
2020 – present	Leslie Gaston-Bird	Co-supervisor	University of Surrey, UK
2020	Marco A. Martinez	External Examiner	Queen Mary University, UK
2020	Benjamin R. Hammond	Internal Examiner	University of Surrey, UK
2019	Cian O' Brien	Internal Examiner	University of Surrey, UK
2019 – present	Juan C. F. Hernandez	Co-supervisor	University of Surrey, UK
2017 – present	Peter Dawson	Co-supervisor	Imperial College London, UK
2013 – 2019	Giacomo Vairetti	Daily supervision	KU Leuven, Belgium
2013 – 2019	Niccolò Antonello	Daily supervision	KU Leuven, Belgium

(f) Research Projects

As principal investigator, applicant or named researcher

2021/01 – 2023/12	SCalable Room Acoustic Modeling (SCReAM)	PI	£407k	EPSRC	University of Surrey, UK
2016/05 – 2016/08	Outgoing mobility grant of Flanders Research Foundation (FWO)	Applicant	€6.3k	FWO	Imperial College London, UK
2015/02 – 2016/02	F+ Fellowship	Named researcher	€34k	KU Leuven	KU Leuven, Belgium
As collaborator					
2018/07 – 2023/03	The Spatial Dynamics of Room Acoustics (SONORA)	Named collab. (PI: T. van Waterschoot)	€2m	H2020	KU Leuven, Belgium
2016/02 – 2016/08	Environment-aware Listener-Optimized Binaural Enhancement of Speech (E-LOBES)	Collaborator (PI: M. Brookes)	£984k	EPSRC	Imperial College London, UK
2013/09 – 2015/01 and 2016/02 – 2016/09	Dereverberation and Reverberation of Audio, Music and Speech (DREAMS) ITN	Marie Curie Postdoctoral Fellow (PI: T. van Waterschoot)	€4.1m	Marie Curie Actions (FP7)	KU Leuven, Belgium
2009/09 – 2013/08	Perceptual Soundfield Reconstruction (PSR)	PhD student (PI: Z. Cvetković)	£390k	EPSRC	King's College London, UK

(g) Administration

2016 – present	International Relations Officer of the Department of Music & Media	University of Surrey, UK
2013 – 2016	Coordinator of Work Package 1 in DREAMS ITN	KU Leuven, Belgium
2012 – 2013	Coordinator of M.Sc. final year projects of the Engineering Dept.	King's College London, UK

(h) Teaching (as module leader)

2018 – present	Audio Signal Analysis	TON1023	University of Surrey, UK
2018 – present	Computer Systems	TON1024	University of Surrey, UK
2019 – present	Audio Signal Proc. and Synth.	TON2022	University of Surrey, UK
2016 – 2018	Audio Signal Proc. A	TON1019	University of Surrey, UK
2016 – 2018	Audio Signal Proc. B	TON1020	University of Surrey, UK
2016 – 2019	Sound Synthesis	TON2020	University of Surrey, UK
2012 – 2013	Mult. Compr. Methods and Sys.	7CCSMMUL	King's College London, UK

(i) Professional associations and activities

Memberships

IEEE	Senior Member
IEEE Transactions on Signal Processing	Technical reviewer
IEEE Signal Processing Letters	Technical reviewer
IEEE Signal Processing Magazine	Technical reviewer
IEEE/ACM Transactions on Audio, Speech and Language Processing	Technical reviewer
European Association of Signal Processing (EURASIP)	Member
Journal of Electrical and Computer Engineering (Hindawi)	Technical reviewer
Journal of Engineering Applications of Artificial Intelligence (Elsevier)	Technical reviewer
Journal of the Audio Engineering Society	Technical reviewer

Conference activities

1. 60th Int. Conf. of the Audio Engineering Society (2016): member of organizing committee and co-chair of demonstrations.
2. 45th Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP-19): co-chair of special session "Perceptually Motivated Signal Processing: Data, Algorithms and Evaluation."

(j) Invited presentations and lectures

1. UoS FASS Research Festival 2021, invited talk, "Covid Listening Project," 19 Jan. 2021, Zoom.
2. UK Acoustics Network, invited talk, "Perception-Based Methods for Spatial Audio," 28 Oct. 2020, Zoom.
3. UoS FASS Research Festival 2020, invited talk, "Engaging with Digital Realities: Immersive Audio," 23 Jan. 2020, Guildford, UK.
4. Sonos R&D, invited talk, Perceptual Spatial Audio Simulation and Reproduction," 19 Aug. 2019, Santa Barbara, California.

5. Apple R&D, invited talk, "Perceptual Spatial Audio Recording, Simulation, and Rendering," 13 Aug. 2019, Los Angeles, California.
6. Sony R&D, invited talk, "Low-Complexity Room Acoustics Modelling and Simulation," 22 Jan. 2018, Tokyo, Japan.
7. University of Electro-Communications, invited talk "Efficient modelling of room acoustics: parametric and perceptual methods," 23 Jan. 2018, Tokyo, Japan.
8. KU Leuven, invited lecture for the Signal Processing module of Prof. Marc Moonen, "Sound Field Recording and Reproduction: A Brief Overview," 2 Dec. 2015 and 2 Dec. 2016, Leuven, Belgium.
9. Southampton University, invited talk at Institute of Sound and Vibration Research, "Room acoustics simulation: perceptual approximation of physical models," 31 Jan. 2017, Southampton, UK.
10. Imperial College London, invited talk at Electrical & Electronic Engineering Department "Perception Based Methods for Spatial Audio," 11 Sept. 2015, London, UK.
11. Bang & Olufsen R&D, invited presentation, "On the Modeling of Rectangular Geometries in Room Acoustic Simulations," 23 Jan. 2015, Struer, Denmark.
12. Aarhus University, Danish Neuroscience Centre, invited seminar in the "Music in the brain" seminar series, "Sound Localisation: from Binaural Modelling to Multichannel Recording and Reproduction," 6 Nov. 2014, Aarhus, Denmark.
13. Stanford University, CCRMA, guest lecture, "Interactive Auralization for Virtual and Augmented Reality," 26 Sep. 2013, Stanford, USA.
14. BBC R&D, invited presentation with Z. Cvetković, "Perceptual Sound Field Reconstruction and Coherent Emulation," 22 Nov. 2011, London, UK.

(k) Tutorials

1. ICASSP 2021: "Acoustic Environment Synthesis for XR," with Z. Cvetković and H. Hacıhabiboğlu, 6-11 Jun. 2021, Toronto, Canada.
2. AES AVAR 2020: "Interactive Room Acoustics Synthesis for XR," with Z. Cvetković and H. Hacıhabiboğlu, 19 Aug. 2020, Altspace VR.
3. EUSIPCO 2017: "Dereverberation and Reverberation of Audio Music and Speech," with P. A. Naylor and T. van Waterschoot, 28 Aug. 2017, Kos, Greece.
4. ICASSP 2015: "Auralization for Architectural Acoustics, Virtual Reality and Computer Games: from Physical to Perceptual Rendering of Dynamic Sound Scenes," with Z. Cvetković, and J. O. Smith III, 19 Apr. 2015, Brisbane, Australia.

(l) Public Outreach

Public events and performances

Parts of my research and associated software have been used at a number of public events and performances, with varying degree of support from me or my colleagues, including:

1. National Gallery exhibition "Sensing the Unseen, Step into Gossaert's 'Adoration"': the exhibition (Room 1 in the Main Entrance Hall), features a number of acoustic pods with directional loudspeakers, used in conjunction with a surround sound system incorporating our immersive audio technology and software, 9 Dec. 2020 – 28 Feb. 2021, London, UK. [link][link]
2. WOMAD-at-home: a series of virtual concerts organised by Real World Studios, Oct. 2020. A

quote from one of the acts, Blue Lab, was "Outstanding plugin to make it even more of a live feel. [..] That was amazing to use, so that it feels like you are in the room with us when we are playing the live musing. [...]". [link] [link]

3. National Gallery X: in collaboration with Z. Cvetkovic and A. Hossaini [link], the project's leader, I helped design the surround sound auralisation system within NGX–the new experimental space of the National Gallery. The opening event of NGX saw the participation of Sir Tim Berners-Lee, the inventor of the world wide web, and Gabriele Finaldi, the National Gallery's director, in Sep. 2019, London, UK. [link]
4. Immersive sound installations by Gestalt [link]:
   - "Cause & Effect" an interactive installation piece presented at the PRS stage for 'Your Stratford Stage' at Endeavour Square, Stratford on the 17th May 2019, London, UK. [link]
   - "Ghost in the Machine" performance at Underdog Gallery for London Architecture festival in partnership with Musicity Global, May 2019, London, UK. [link]
5. Transformations: a play theatre group New Public, with music composed by Keir Vine, shown as a part of RADA Festival in Jul. 2019, London, UK. [link]
6. The Philosophy Shop: a play by Ali Hossaini and composer Catherine Kontz, shown at RADA in Mar. 2019, London, UK. [link]
7. Pigment Channel: collaboration with Patrick Morgan [link], [link], Escape Studios [link], V&A Museum, Dec. 2018, London, UK. [link] [link]
8. Circular Breathing: collaboration with Reeps One, Get Involved, Ninja Tune, Somerset House, was presented at Somerset House in Sep. 2018, London, UK. [link] [link]
9. Ouroboros: a 3D piece by A. Hossaini, a "3-D visual collage of vibrating mandalas, exploding galaxies, astronauts and corporate logos", which was presented at
   - Click Festival 2017, 20-21 May 2017, Copenhagen, Denmark. [link]
   - Guildhall Art Gallery, Jun.-Jul. 2018, London, UK.
   - Bell Labs, part of Christie's NYC Master Class on Digital Art, May 2019, NYC, USA.
10. Royal Society Summer Science Exhibition (≈15k visitors): designed and presented part of the "Interaction with Sound in a 3D World" exhibit (one of twenty-two exhibits), Jun.-Jul. 2015, London, UK. [link]

Private events and workshops

Parts of my research and associated software have been used at a number of private events and workshops, including:

1. The Piano: organised by King's College London in partnership with superstar pianist, Yuja Wang, 59 Productions and Fidelio Arts, Sep. 2016, London UK. [link]
2. Connected Culture: organised by King's College London, in partnership with Mischa Dohler, Ali Hossaini, Battersea Arts Centre, Young Vic, RoomOne, Vodafone, Ericsson, Jul. 2018, London, UK. [link] [link] [link]
3. Networked Performance: organised by King's College London, in partnership with RADA, M. Dohler, A. Hossaini, Jan. 2017. [link]

(m) Open Source Resources

1. MCL: A C++ Library implementing various Matlab functions. [link]
2. Spatial Audio Library (SAL): A C++ Library for spatial audio. [link]
3. Audio Circular Statistics (ACS): Matlab library for statistical analysis of directional data. [link]

4. Randomized Image Method (RIM): Matlab implementation of the Image Method and Randomized Image Method. [link]
5. Scattering Delay Network (SDN): Matlab implementation of the room acoustic model. [link]
6. Perceptual Soundfield Reconstruction (PSR): Python module to generate PSR directivity patterns and its higher-order approximations. [link]
7. SUBRIR: The Subwoofer Room Impulse Response Database (SUBRIR) [link]

(n) In the Media

1. "Using Music to fight COVID-19," 13 Nov 2020, Metro London (≈1.3m circulation).
2. "Understanding coronavirus through musical transformations," 6 May 2020, Medical XPress.
3. "Come cambia il virus? Barbara Gallavotti ce lo spiega con la musica," 19 May 2020, diMartedì (Italian prime-time TV programme; ≈3m viewers) [link].
4. "National Gallery paints vision of technology in art," 20 Sep. 2019, Financial Times (≈1m circulation) [link].

(o) Pet Projects

1. Built an 8-bit Turing-complete programmable breadboard computer using Ben Eater's design, which I ended up using for the Computer Systems module. [link]