Erik Leitinger

Curriculum Vitae

Contact Information

Graz University of Technology
Signal Processing and Speech Communication Laboratory
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Personal Data

Date of birth	27. March, 1985
Citizenship	Austria
Languages	German (Nativ), English (Professional)
ORCID	0000-0003-1048-4849

Education

2012–2016 **Dr.techn. (Ph.D.)**, *TU*, Graz, *Passed with Highest Honors*.
PhD Programme - Information and Computer Engineering

2009–2012 **Dipl.-Ing.**, *TU*, Graz, *Passed with Highest Honors*.
Master Programme - Electrical Engineering with a focus on Wireless Communications

2005–2009 **BSc**, *TU*, Graz, *Passed with Highest Honors*.
Bachelor Programme - Electrical Engineering

1999–2004 **Matura**, *HTLuVA*, Graz, *Passed with Highest Honors*.
Branch Electrical Engineering

PhD thesis

title	*Cognitive Indoor Positioning and Tracking using Multipath Channel Information*
supervisor	Klaus Witrisal, Graz University of Technology
second examiner	Fredrik Tufvesson, Lund University

Master thesis

title	*Capacity and Capacity-Achieving Input-Distribution of an Energy Detector*
supervisor	Klaus Witrisal, Graz University of Technology

Professional Experience

11/2018 – present **Postdoctoral researcher (Schrödinger Fellow: Return Phase)**, *Signal Processing and Speech Communication Laboratory*, Graz University of Technology, Austria.

05/2017 – 10/2018 **Postdoctoral researcher (Schrödinger Fellow)**, *Department of Electrical and Information Technology*, Lund University, Sweden.

01/2017 – 04/2017 **Postdoctoral researcher**, *Signal Processing and Speech Communication Laboratory*, Graz University of Technology, Austria.

10/2016 – 01/2017 **Postdoctoral researcher**, *Department of Electrical and Information Technology*, Lund University, Sweden.

02/2016 – 09/2016 **Postdoctoral researcher**, *Signal Processing and Speech Communication Laboratory*, Graz University of Technology, Austria.

2012–2016 **Research Associate**, *Signal Processing and Speech Communication Laboratory*, Graz University of Technology, Austria.

2009–2012 **Study Assistant**, *Graz University of Technology*, Austria.
Courses: Fundamentals of Communications, Signal-Transformations, Communication Systems Laboratory, Advanced Telecommunications Laboratory and High-Frequency Laboratory

2008 **Programmer**, *Department of Broadband Communications*, Graz University of Technology, Austria.
Programming for the software WIIS (Weather Image Information System)

2007 **Internships**, *Siemens Austria AG*, Graz.
Programmer for automation of test-protocols

Professional Interests

Bayesian Inference; Variational Inference; MCMC Methods; Estimation/Detection Theory; Statistical Signal Processing; Array Signal Processing; Factor Graphs and Iterative Message Passing Algorithms; Localization and Navigation; Cooperative Localization; Cognitive Control; Stochastic Modeling and Estimation of Radio Channels.

Teaching

05/2019 – 06/2016 Array Signal Processing (problem class)

2013/2014 Fundamentals of Digital Communications (problem class)

2014/2015 Fundamentals of Digital Communications (problem class)

2009–2012 Study Assistant for Lectures: Signal Transformation and Fundamentals of Communications, and for Laboratories: Communication Systems Laboratory, Advanced Telecommunications Laboratory and High-Frequency Laboratory

Research Projects

03/2019 – 02/2022 **Dependable Internet of Things in Adverse Environments, Subproject: Dependable Wireless Communication and Localization**, *Funding institution: LEAD Project (excellence programm at TU Graz*, Involvement: Associate Researcher.

01/2018 – 02/2022 **Christian Doppler Laboratory for Location-Aware Electronic Systems**, *Funding institution: Christian Doppler Research Association, the Austrian Federal Ministry for Digital and Economics Affairs and the National Foundation for Research, Technology and Development*, Involvement: Contributions to the research programm proposal; associated PD Researcher .

11/2018 – present **Schrödinger Fellow: Cognitive Dynamic Systems for Location-Aware Radios**, *Funding institution: Austrian Science Fund (FWF)*, 122000 €, J 4027-N33, Involvement: Project Leader.

Awards

2017 **Erwin Schrödinger Fellowship**, *Fonds zur Förderung der wissenschaftlichen Forschung (FWF)*.

2016 **Award of Excellence for PhD Thesis**, *Federal Ministry of Science, Research and Economy (BMWFW)*.

2015 **Award for Patent**, *Graz University of Technology*.
Method, device and system for indoor localization and tracking using ultrawideband radio signals

2014 **Best student paper competition finalist**, *IEEE Radar Conference 2014*.

2010 **Excellence Scholarship**, *Styrian Government*.

2005 **Excellence Scholarship**, *Graz University of Technology*, Faculty of Electrical Engineering.

Reviewing Activities

Journals IEEE Transactions on Signal Processing, IEEE Transactions on Signal and Information Processing over Networks, IEEE Transactions on Wireless Communications, IEEE Signal Processing Letters, IEEE Communication Letters

Conferences IEEE PIMRC 2019, IEEE ICC 2019, IEEE PIMRC 2018, IEEE WCNC 2018, IEEE ITSC 2017, IEEE SPAWC 2017, IEEE ICC 2017, IEEE WCNC 2017, IEEE GLOBECOM 2016, EUSIPCO 2016, IEEE WCNC 2016, IEEE GC 2015, IEEE ICC 2015, IEEE ICC 2014, IEEE ICUWB 2013, IEEE ICC 2013

Professional Activities and Memberships

2019 Technical Programm Committee Member (TPC) for the Advances in Network Localization and Navigation (ANLN) Workshop at IEEE ICC

2019 Technical Programm Committee Member (TPC) for the IEEE PIMRC

2018 Technical Programm Committee Member (TPC) for the IEEE PIMRC

2016 Technical Programm Committee Member (TPC) LION Workshop IEEE GLOBECOM

Academic Cooperation Partners (Selected)

- Bernard Fleury, Department of Electronic Systems Wireless Communication Networks, Aalborg University, Aalborg, Denmark
- Franz Hlawatsch, Institute of Telecommunications, TU Wien, 1040 Vienna, Austria
- Florian Meyer, Wireless Information and Network Sciences Laboratory, Massachusetts Institute of Technology, Cambridge, USA
- Fredrik Tufvesson, Department of Electrical and Information Technology, Lund University, Sweden

Supervised PhD Students

running, co-advisor Xuhong Li, Radio-based Positioning exploiting massive MIMO antenna arrays

running, co-advisor Lukas Wielandner, Narrowband Positioning exploiting massive cooperation and mapping

running, co-advisor Thomas Wilding, Reliable Positioning in Directional Off-Body Channels

running, co-advisor Alexander Venus, Reliable and Secure Ranging and Positioning

Supervised Master Students

2014 Christoph Rüdisser, The Impact of Clock Offset on Multipath-assisted Indoor Localizations

2014 Gregor Dumphart, Performance Bounds for Anchorless Cooperative Indoor Localization Exploiting Multipath

2014 Manuel Lafer, Real-time Multipath-assisted IndoorTracking and Feature Detection

2014 Rudolfs Liepins, Acoustic Source Localization with a Single Microphone using Reflected Signals

Publications

Patents

[1] P. Meissner, E. Leitinger, M. Lafer, and K. Witrisal, "Method, device and system for indoor localization and tracking using ultrawideband radio signals," Patent 14 171 612.6, Jun. 6., 2014, patent filed.

Incollections

[1] K. Witrisal, P. Meissner, E. Leitinger, and P. Kulakowski, "Techniques and models for localization," in *Cooperative Radio Communications for Smart Green Environments (COST Action IC1004)*, 2015, section 3.3.

Peer-Reviewed Journal Papers

[1] S. Grebien, E. Leitinger, B. H. Fleury, X. Li, D. Shutin, and K. Witrisal, "Super-resolution channel estimation including the dense multipath component — A sparse variational Bayesian approach," in preperation.

[2] X. Li, E. Leitinger, M. Oskarsson, K. Åström, and F. Tufvesson, "Massive MIMO-based localization and mapping exploiting phase information of multipath components," *IEEE Trans. Wireless Commun.*, vol. 18, no. 9, pp. 4254–4267, Sep. 2019.

[3] E. Leitinger, F. Meyer, F. Hlawatsch, K. Witrisal, F. Tufvesson, and M. Z. Win, "A belief propagation algorithm for multipath-based SLAM," *IEEE Trans. Wireless Commun.*, vol. 18, no. 11, pp. 1–17, Nov. 2019.

[4] S. Grebien, J. Kulmer, F. Galler, M. Goller, E. Leitinger, H. Arthaber, and K. Witrisal, "Range estimation and performance limits for UHF-RFID backscatter channels," *IEEE Journal of Radio Frequency Identification*, 2017.

[5] J. Kulmer, E. Leitinger, S. Grebien, and K. Witrisal, "Anchorless cooperative tracking using multipath channel information," *IEEE Trans. Wireless Commun.*, vol. 17, no. 4, pp. 2262–2275, Apr. 2018.

[6] E. Leitinger, P. Meissner, C. Rudisser, G. Dumphart, and K. Witrisal, "Evaluation of position-related information in multipath components for indoor positioning," *IEEE J. Sel. Areas Commun.*, vol. 33, no. 11, pp. 2313–2328, Nov. 2015.

[7] K. Witrisal, P. Meissner, E. Leitinger, Y. Shen, C. Gustafson, F. Tufvesson, K. Haneda, D. Dardari, A. F. Molisch, A. Conti, and M. Z. Win, "High-accuracy localization for assisted living: 5G systems will turn multipath channels from foe to friend," *IEEE Signal Process. Mag.*, vol. 33, no. 2, pp. 59–70, Mar. 2016.

[8] K. Witrisal, E. Leitinger, S. Hinteregger, and P. Meissner, "Bandwidth scaling and diversity gain for ranging and positioning in dense multipath channels," *IEEE Wireless Commun. Lett.*, 2016.

[9] G. Steinböck, M. Gan, P. Meissner, E. Leitinger, K. Witrisal, T. Zemen, and T. Pedersen, "Hybrid model for reverberant indoor radio channels using rays and graphs," *IEEE Trans. Antennas Propag.*, vol. 64, no. 9, pp. 4036–4048, Sept. 2016.

[10] P. Meissner, E. Leitinger, and K. Witrisal, "UWB for robust indoor tracking: Weighting of multipath components for efficient estimation," *IEEE Wireless Comm. Lett.*, vol. 3, no. 5, pp. 501–504, Oct. 2014.

Peer-Reviewed Conference Papers

[1] E. Leitinger, S. Grebien, and K. Witrisal, "Multipath-based SLAM exploiting AoA and amplitude information," in *Proc. IEEE ICCW-19*, Shanghai, China, May 2019, pp. 1–7.

[2] S. Hu and E. Leitinger, "Joint modulus Zero-Forcing MIMO detector," in *Proc. IEEE WCNC-19*, Marrakech, Morocco, Apr. 2019.

[3] T. Wilding, S. Grebien, E. Leitinger, U. Mühlmann, and K. Witrisal, "Single-anchor, multipath-assisted indoor positioning with aliased antenna arrays," in *Proc. Asilomar-18*, Pacifc Grove, CA, USA, Oct. 2018, pp. 525–531.

[4] E. Leitinger, F. Meyer, F. Tufvesson, and K. Witrisal, "Factor graph based simultaneous localization and mapping using multipath channel information," in *Proc. IEEE ICCW-17*, Paris, France, May 2017, pp. 652–658.

[5] J. Vieira, E. Leitinger, M. Sarajlic, X. Li, and F. Tufvesson, "Deep convoluational neural network for massive MIMO fringerprint-based positioning," in *Proc. IEEE PIMRIC-17*, Montreal, QC, Canada, Oct. 2017, pp. 1–6.

[6] J. Kulmer, S. Hinteregger, B. Großwindhager, M. Rath, M. S. Bakr, E. Leitinger, and K. Witrisal, "Using DecaWave UWB transceivers for high-accuracy multipath-assisted indoor positioning," in *Proc. IEEE ICCW-17*, Paris, France, May 2017, pp. 1239–1245.

[7] E. Leitinger, F. Meyer, P. Meissner, K. Witrisal, and F. Hlawatsch, "Belief propagation based joint probabilistic data association for multipath-assisted indoor navigation and tracking," in *Proc. ICL-GNSS-16*, Barcelona, Spain, Jun. 2016, pp. 1–6.

[8] J. Kulmer, E. Leitinger, P. Meissner, S. Hinteregger, and K. Witrisal, "Cooperative localization and tracking using multipath channel information," in *Proc. ICL-GNSS-16*, Barcelona, Spain, Jun. 2016, pp. 1–6.

[9] S. Hinteregger, E. Leitinger, P. Meissner, and K. Witrisal, "MIMO Gain and Bandwidth Scaling for RFID Positioning in Dense Multipath Channels," in *Proc. IEEE RFID-16*, Orlando, FL, USA, May 2016, pp. 1–6.

[10] S. Hinteregger, E. Leitinger, P. Meissner, J. Kulmer, and K. Witrisal, "Bandwidth dependence of the ranging error variance in dense multipath," in *Proc. EUSIPCO-16*, Budapest, Hungary, Aug. 2016, pp. 733–737.

[11] S. Witrisal, K .Hintergger, J. Kulmer, E. Leitinger, and M. P., "High-accuracy Positioning for Indoor Applications: RFID, UWB, 5G, and beyond," in *Proc. IEEE RFID-16*, Orlando, FL, USA, May 2016, pp. 1–7.

[12] A. Nguyen Hong, M. Rath, E. Leitinger, S. Hinteregger, and K. Klaus, "Channel capacity analysis of indoor environments for location-aware communications," in *Proc. IEEE GLOBECOM-16*, Washington, USA, Dec. 2016, pp. 1–6.

[13] E. Leitinger, P. Meissner, M. Lafer, and K. Witrisal, "Simultaneous localization and mapping using multipath channel information," in *Proc. IEEE ICCW-15*, London, UK, Jun. 2015, pp. 754–760.

[14] G. Dumphart, E. Leitinger, P. Meissner, and K. Witrisal, "Monostatic indoor localization: Bounds and limits," in *Proc. IEEE ICCW-15*, London, UK, Jun. 2015, pp. 865–870.

[15] P. Meissner, E. Leitinger, M. Lafer, and K. Witrisal, "Real-time demonstration of multipath-assisted indoor navigation and tracking (MINT)," in *Proc. IEEE ICCW-14*, Sydney, NSW, Australia, Jun. 2014, pp. 144–149.

[16] E. Leitinger, M. Fröhle, P. Meissner, and K. Witrisal, "Multipath-assisted maximum-likelihood indoor positioning using UWB signals," in *Proc. IEEE ICCW-14*, Sydney, NSW, Australia, Jun. 2014, pp. 170–175.

[17] E. Leitinger, P. Meissner, M. Froehle, and K. Witrisal, "Performance bounds for multipath-assisted indoor localization on backscatter channels," in *Proc. IEEE RadarCon-14*, Cincinnati, OH, USA, May 2014, pp. 0070–0075.

[18] M. Gan, P. Meissner, F. Mani, E. Leitinger, M. Froehle, C. Oestges, K. Witrisal, and T. Zemen, "Low-complexity sub-band divided ray tracing for UWB indoor channels," in *Proc. IEEE WCNC-14*, Istanbul, Turkey, Apr. 2014, pp. 305–310.

[19] ——, "Calibration of indoor UWB sub-band divided ray tracing using multiobjective simulated annealing," in *Proc. IEEE ICC-14*, Sydney, NSW, Australia, Jun. 2014, pp. 4844–4849.

[20] K. Witrisal, E. Leitinger, P. Meissner, and D. Arnitz, "Cognitive radar for the localization of RFID transponders in dense multipath environments," in *Proc. IEEE RadarCon-13*, Ottawa, ON, Canada, Apr. 2013, pp. 1–6.

[21] P. Meissner, E. Leitinger, M. Froehle, and K. Witrisal, "Accurate and robust indoor localization systems using ultra-wideband signals," in *Proc. ENC-13*, Vienna, Austria, 2013. [Online]. Available: http://arxiv.org/abs/1304.7928

[22] P. Meissner, M. Gan, F. Mani, E. Leitinger, M. Froehle, C. Oestges, T. Zemen, and K. Witrisal, "On the use of ray tracing for performance prediction of UWB indoor localization systems," in *Proc. IEEE ICCW-13*, Budapest, Hungary, Jun. 2013, pp. 68–73.

[23] M. Fröhle, E. Leitinger, P. Meissner, and K. Witrisal, "Cooperative multipath-assisted indoor navigation and tracking (Co-MINT) using UWB signals," in *Proc. IEEE ICCW-13*, Budapest, Hungary, Jun. 2013, pp. 16–21.

[24] E. Leitinger, B. Geiger, and K. Witrisal, "Capacity and capacity-achieving input distribution of the energy detector," in *Proc. IEEE ICUWB-12*, Syracuse, NY, USA, Sept. 2012, pp. 57–61.

Non Peer-Reviewed Papers

[1] E. Leitinger, P. Meissner, M. Lafer, and K. Witrisal, "Multipath-Assisted Indoor Simultaneous Localization and Mapping," in *COST Action IC1004 Scientific Meeting*, Dublin, Ireland, 2015.

[2] J. Kulmer, E. Leitinger, P. Meissner, and K. Witrisal, "Cooperative Multipath-Assisted Navigation and Tracking: A Low-Complexity Approach," in *1st EAI International Conference on Future access enablers of ubiquitous and intelligent infrastructures, 2015*. EAI, 2015.

[3] J. Kmiecik, P. Meissner, E. Leitinger, K. Witrisal, and P. Kulakowski, "Experimental validation of passive indoor localization and tracking using UWB systems," in *COST Action IC1004 Scientific Meeting*, Dublin, Ireland, 2015.

[4] P. Meissner, E. Leitinger, and K. Witrisal, "Robust and Accurate Indoor Localization using Channel Information," in *COST Action IC1004 Scientific Meeting*, Dublin, Ireland, 2015, tD(15)12067.

[5] E. Leitinger, M. Froehle, P. Meissner, and K. Witrisal, "Multipath-Assisted Maximum-Likelihood Indoor Positioning using UWB Signals," in *COST Action IC1004 Scientific Meeting*, Ferrara, Italy, Feb. 2014, tD(14)09054.

[6] P. Meissner, E. Leitinger, M. Lafer, and K. Witrisal, "Real-time demonstration of multipath-assisted indoor navigation and tracking (MINT)," in *COST Action IC1004 Scientific Meeting*, Aalborg, Denmark, May 2014, tD(14)10003.

[7] K. Witrisal, P. Meissner, E. Leitinger, T. Zemen, M. Gan, C. Oestges, B. Fleury, G. Steinboeck, T. Pedersen, and M. Jakobsen, "UWB channel modeling for indoor localization," in *COST Action IC1004 Scientific Meeting*, Ferrara, Italy, Feb 2014, tD(14)09053.

[8] G. Steinboeck, T. Pedersen, M. Gan, T. Zemen, P. Meissner, E. Leitinger, and K. Witrisal, "Preliminary hybrid model for reverberant indoor radio channels," in *COST Action IC1004 Scientific Meeting*, Aalborg, Denmark, May 2014, tD(14)10056.

[9] P. Meissner, E. Leitinger, M. Froehle, and K. Witrisal, "Accurate and robust indoor localization systems using ultra-wideband signals," in *COST Action IC1004 Scientific Meeting*, Ilmenau, Germany, 2013, tD(13)0711.

[10] P. Meissner, M. Gan, F. Mani, E. Leitinger, M. Froehle, C. Oestges, T. Zemen, and K. Witrisal, "On the use of ray tracing for performance prediction of UWB indoor localization systems," in *COST Action IC1004 Scientific Meeting*, Ilmenau, Germany, 2013, tD(13)07010.

[11] E. Leitinger, P. Meissner, M. Froehle, and K. Witrisal, "Performance Bounds for Multipath-assisted Indoor Localization on Backscatter Channels," in *COST Action IC1004 Scientific Meeting*, Ilmenau, Germany, 2013, tD(13)07012.

[12] K. Witrisal, E. Leitinger, M. P., and D. Arnitz, "Cognitive Radar for the Localization of RFID Transponders in Dense Multipath Environments," in *COST Action IC1004 Scientific Meeting*, Ghent, Belgium, Oct. 2013, tD(11)02001.

Supervised Masters' Thesis

[1] M. Lafer, "Real-Time Multipath-Assisted Indoor-Localization using a Channel Sounder," Master's thesis, Graz University of Technology, 2014.

[2] C. Rüdisser, "Synchronisation for Multipath-assisted Indoor Localization and Tracking," Master's thesis, Graz University of Technology, 2014.

[3] G. Dumphart, "Performance Bounds for Anchorless Cooperative Indoor Localization exploiting Multipath," Master's thesis, Graz University of Technology, 2014.

[4] R. Liepins, "Acoustic Source Localization using Reflected Signals," Master's thesis, Graz University of Technology, 2014.