

List of Publications

Prof. Dr. Reinhold Häb-Umbach

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Books

- [1] J. Li, L. Deng, R. Haeb-Umbach and Y. Gong, *Robust Automatic Speech Recognition – a Bridge to Practical Applications*, Elsevier, Print Book ISBN 9780128023983, 2015. [Homepage of Book](#) , [Elsevier Webpage about book](#)
- [2] D. Kolossa and R. Haeb-Umbach (Editors.), *Robust Speech Recognition of Uncertain or Missing Data – Theory and Applications*, Springer, ISBN 978-3-642-21316-8, 2011. [Homepage of Book](#)

Journal Publications

- [3] T. Gburrek, J. Schmalenstroerer and R. Haeb-Umbach, "Geometry Calibration in Wireless Acoustic Sensor Networks Utilizing DoA and distance Information," in *Eurasip Journal on Audio, Speech, and Music Processing*, pp. 1-17, 2021, <https://doi.org/10.1186/s13636-021-00210-x>
- [4] K. J. Rohlfing *et al.*, "Explanation as a Social Practice: Toward a Conceptual Framework for the Social Design of AI Systems," in *IEEE Transactions on Cognitive and Developmental Systems*, vol. 13, no. 3, pp.717-728, Sept. 2021, [doi: 10.1109/TCDS.2020.3044366](https://doi.org/10.1109/TCDS.2020.3044366).
- [5] Haeb-Umbach R, Heymann, J. Drude, L., Watanabe, S., Delcroix M. and Nakatani, T.: Far-Field Automatic Speech Recognition," in *Proceedings of the IEEE*, vol. 109, no. 2, pp. 124-148, Feb. 2021, [doi: 10.1109/JPROC.2020.3018668](https://doi.org/10.1109/JPROC.2020.3018668)
- [6] Nakatani T, Boeddeker C. Kinoshita K., Ikeshita R., Delcroix, M. and Haeb-Umbach R, Jointly Optimal Denoising, Dereverberation , and Source Separation. *IEEE/ACM Transactions on Audio, Speech and Language Processing*, vol. 28, 2020; pp. 2267-2282. [doi: 10.1109/TASLP.2020.3013118](https://doi.org/10.1109/TASLP.2020.3013118)
- [7] Haeb-Umbach R, Watanabe S, Nakatani T, Bacchiani M., Hoffmeister B., Seltzer M., Zen H. and Souden M., Speech Processing for Digital Home Assistance: Combining Signal Processing With Deep-Learning Techniques. *IEEE Signal Processing Magazine*. 2019;36(6):111-124. [doi:10.1109/MSP.2019.2918706](https://doi.org/10.1109/MSP.2019.2918706)
- [8] Kurz G, Gilitschenski I, Pfaff F, et al. Directional Statistics and Filtering Using libDirectional. In: *Journal of Statistical Software* 89(4); 2019.
- [9] L.Drude, R. Haeb-Umbach, "Integration of Neural Networks and Probabilistic Spatial Models for Acoustic Blind Source Separation," *IEEE Journal of Selected Topics in Signal Processing*, Volume 13, no. 4, August 2019, Pages 815 – 826, <https://doi.org/10.1109/JSTSP.2019.2912565>
- [10] V. Despotovic, O. Walter, R. Haeb-Umbach, "Machine Learning Techniques for semantic analysis of dysarthric speech: An experimental study", *Speech Communication*, Volume 99, May 2018, Pages 242 – 251, <https://doi.org/10.1016/j.specom.2018.04.005>
- [11] J. Heymann, L. Drude, R. Haeb-Umbach, "A generic neural acoustic beamforming architecture for robust multi-channel speech processing", *Computer Speech & Language*, [Volume 46](#), November 2017, Pages 374-385 [http://dx.doi.org/10.1016/j.csl.2016.11.007](https://dx.doi.org/10.1016/j.csl.2016.11.007)
- [12] A. Plinge, F. Jacob, R. Haeb-Umbach, G.A. Fink, "Acoustic Microphone Geometry Calibration: An Overview and Experimental Evaluation of State-of-the-art Algorithms A Combined Hardware-Software Approach for Acoustic Sensor Network Synchronization", *IEEE Signal Processing Magazine*, vol. 33, no. 4, pp 14 – 29, July 2016
- [13] K. Kinoshita, M. Delcroix, S. Gannot, E. A. P. Habets, R. Haeb-Umbach, W. Kellermann, V. Leutnant, R. Maas, T. Nakatani, B. Raj, A. Sehr, T. Yoshioka, "A summary of the REVERB challenge: state-of-the-art and remaining challenges in reverberant speech processing research", *EURASIP Journal on Advances in Signal Processing*, 2016, <https://doi.org/10.1186/s13634-016-0306-6>

- [14] O. Walter, R. Haeb-Umbach, B. Mokbel, B. Paassen u. B. Hammer, “Autonomous Learning of Representations”, *KI – Künstliche Intelligenz*, DOI 10.1007/s13218-015-0372-1, 2015, <https://doi.org/10.1007/s13218-015-0372-1>
- [15] J. Schmalenstroerer, P. Jebramzik and R. Haeb-Umbach, “A Combined Hardware-Software Approach for Acoustic Sensor Network Synchronization”, *Elsevier Signal Processing*, vol. 107, Special issue on ad hoc microphone arrays and wireless acoustic sensor networks, pp 171 – 184, Feb. 2015, <https://doi.org/10.1016/j.sigpro.2014.06.030>
- [16] J. Li, L. Deng, Y. Gong and R. Haeb-Umbach, “An Overview of Noise-Robust Automatic Speech Recognition”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 22, no. 4, pp. 745 - 777, April 2014
- [17] V. Leutnant, A. Krueger and R. Haeb-Umbach, “A New Observation Model in the Logarithmic Mel Power Spectral Domain for the Automatic Recognition of Noisy Reverberant Speech”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 22, no. 1, pp. 95 - 109, Jan. 2014
- [18] V. Leutnant, A. Krueger and R. Haeb-Umbach, “Bayesian Feature Enhancement for Reverberation and Noise Robust Speech Recognition”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 21, no. 8, pp. 1640 - 1652, Aug. 2013
- [19] T. Herbig, F. Gerl, W. Minker and R. Haeb-Umbach, “Adaptive Systems for Unsupervised Speaker Tracking and Recognition”, *Springer Journal on Evolving Systems*, vol. 2, no. 3 pp. 199-214, 2011
- [20] A. Krueger, E. Warsitz and R. Haeb-Umbach, “Speech Enhancement with a GSC-like Structure Employing Eigenvector-Based Transfer Function Ratios Estimation”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 19, no. 1, pp. 206- 219, Jan. 2011
- [21] A. Krueger and R. Haeb-Umbach, “Model Based Feature Enhancement for Reverberant Speech Recognition”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 18, no. 7, pp. 1692-1707, Sept. 2010
- [22] J. Schmalenstroerer and R. Haeb-Umbach, “Online Diarization of Streaming Audio-Visual Data for Smart Environments”, *IEEE Trans. on Selected Topics in Signal Processing*, vol. 4, no. 5, pp 845-856, Oct. 2010
- [23] S. Windmann and R. Haeb-Umbach, “Parameter Estimation of a State Space Model of Noise for Robust Speech Recognition”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 17, no. 8, pp 1577-1590, Nov. 2009.
- [24] S. Windmann and R. Haeb-Umbach, “Approaches to Iterative Speech Feature Enhancement and Recognition”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 17, no. 5, pp. 974-984, July 2009.
- [25] V. Ion and R. Haeb-Umbach, “A Novel Uncertainty Decoding Rule with Applications to Transmission Error Robust Speech Recognition”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 16, no. 5, pp 1047-1060, July 2008.
- [26] E. Warsitz and R. Haeb-Umbach, “Blind Acoustic Beamforming based on Generalized Eigenvalue Decomposition”, *IEEE Trans. Audio, Speech and Language Processing*, vol. 15, no. 5, pp. 1529-1539, July 2007.
- [27] R. Haeb-Umbach and S. Peschke, “A Novel Similarity Measure for Positioning Cellular Phones by a Comparison with a Database of Signal Power Levels”, *IEEE Transactions on Vehicular Technology*, vol. 56, no. 1, pp. 368-372, Jan. 2007.
- [28] V. Ion and R. Haeb-Umbach, “Uncertainty decoding for distributed speech recognition over error-prone networks“, *Speech Communication*, vol. 48, no.11, pp. 1435-1446, 2006.
- [29] R. Bischoff, R. Häb-Umbach, N.S. Ramesh, „Multipath-Resistant Time-of-Arrival Estimation for Satellite Positioning“, *Int. J. on Electronics and Communications*, vol. 58, no. 1, pp. 3-12, Jan. 2004.
- [30] Th. Hesse, R. Bischoff, W. Schulz, R. Haeb-Umbach, „Estimation of Bias Location Error due to Absence of the LOS-Signal in a UMTS System“, *Ortung und Navigation*, S. 85-92, 1/2002.
- [31] P. Beyerlein, X. Aubert, R. Haeb-Umbach et al., „Large Vocabulary Continuous Speech Recognition of Broadcast News – The Philips/RWTH Approach“, *Speech Communication*, 37 (1-2), pp. 109-131, 2002.
- [32] M. Loog, R.P.W. Duin, R. Haeb-Umbach, „Multi-class Linear Dimension Reduction by Weighted Pairwise Fisher Criteria“, *IEEE Trans. on Pattern Analysis and Machine Intelligence*, vol. 23, no. 7, pp. 762-766, July 2001.
- [33] R. Haeb-Umbach, „Automatic Generation of Phonetic Regression Class Trees for MLLR Adaptation“, *IEEE Trans. on Speech and Audio Processing*, vol. 9, no. 3, pp. 299-302, Mar. 2001.

- [34] S. Gamm, R. Haeb-Umbach, D. Langmann, „The Development of a Command-Based Speech Interface for a Telephone Answering Machine“, *Speech Communication*, 23, pp. 161-171, 1997.
- [35] S. Gamm, R. Haeb-Umbach, „User Interface Design of Voice Controlled Consumer Electronics“, *Philips Journal of Research*, vol. 49, no. 4, pp. 439-454, Dec. 1995.
- [36] R. Haeb-Umbach, P. Beyerlein, D. Geller, „Speech Recognition Algorithms for Voice Control Interfaces“, *Philips Journal of Research*, vol. 49, no. 4, pp. 381-397, Dec. 1995.
- [37] V. Steinbiß, H. Ney, X. Aubert, S. Besling, C. Dugast, U. Essen, D. Geller, R. Haeb-Umbach, R. Kneser, H.-G. Meier, M. Oerder, B.-H. Tran, „The Philips Research System for Continuous-Speech Dictation“, *Philips Journal of Research*, vol. 49, no. 4, pp. 317-352, Dec. 1995.
- [38] V. Steinbiß, H. Ney, U. Essen, B.-H. Tran, X. Aubert, C. Dugast, R. Kneser, H.-G. Meier, M. Oerder, R. Haeb-Umbach, D. Geller, W. Höllerbauer, H. Bartosik, „Continuous-Speech Dictation — From Theory to Practice“, *Speech Communication*, 17(1-2), pp. 19-38, Aug. 1995.
- [39] R. Haeb-Umbach, H. Ney, „Improvements in Beam Search for 10,000-Word Continuous-Speech Recognition“, *IEEE Trans. on Speech and Audio Processing*, vol. 2, no. 2, pp. 353-356, Apr. 1994.
- [40] H. Ney, V. Steinbiss, R. Haeb-Umbach, B.-H. Tran, U. Essen, „An Overview of the Philips Research System for Large Vocabulary Continuous Speech Recognition“, *International Journal on Pattern Recognition and Artificial Intelligence*, vol. 8, no. 1, pp. 33-70, Jan. 1994.
- [41] S. Dobler, D. Geller, R. Haeb-Umbach, P. Meyer, H. Ney, H.W. Ruehl, „Design and Use of Speech Recognition Algorithms for a Mobile Radio Telephone“, *Speech Communication*, 12(3), pp. 221-230, Jul. 1993.
- [42] R. Haeb, „A Modified Trellis Coding Technique for Partial Response Channels“, *IEEE Trans. on Communications*, vol. 40, no. 3, pp. 513-520, Mar. 1992.
- [43] R. Haeb, R. T. Lynch, „Trellis Codes for Partial-Response Magneto-optical Direct Overwrite Recording“, *IEEE Journal on Sel. Areas in Commun.*, vol. 10, no. 1, pp. 182-190, Jan. 1992.
- [44] R. Haeb, H. Meyr, „A Systematic Approach to Carrier Recovery and Detection of Digitally Phase Modulated Signals on Fading Channels“, *IEEE Trans. on Communications*, vol. 37, no. 7, pp. 748-754, July 1989.
- [45] M. Oerder, G. Ascheid, R. Haeb, H. Meyr, „An All Digital Implementation of a Receiver for Bandwidth-Efficient Communication“, *Signal Processing III: Theories and Applications*, Young et al. (ed), Elsevier Science Publ., 1986.

Book Chapters

- [46] R. Haeb-Umbach and A. Krueger, “Reverberant Speech Recognition”, in *Techniques for Noise Robustness in Automatic Speech Recognition*, T. Virtanen, B. Raj, R. Singh (Editors.), Wiley, 2012.
- [47] R. Haeb-Umbach, “Uncertainty Decoding and Conditional Bayesian estimation”, in *Robust Speech Recognition of Uncertain or Missing Data – Theory and Applications*, D. Kolossa and R. Haeb-Umbach (Editors.), Springer, 2011.
- [48] A. Krueger and R. Haeb-Umbach, “A Model-Based Approach to Joint Compensation of Noise and Reverberation for Speech Recognition”, in *Robust Speech Recognition of Uncertain or Missing Data – Theory and Applications*, D. Kolossa and R. Haeb-Umbach (Editors.), Springer, 2011.
- [49] V. Leutnant and R. Haeb-Umbach, “Conditional Bayesian Estimation Employing a Phase-Sensitive Observation Model for Noise Robust Speech Recognition”, in *Robust Speech Recognition of Uncertain or Missing Data – Theory and Applications*, D. Kolossa and R. Haeb-Umbach (Editors.), Springer, 2011.
- [50] R. Haeb-Umbach, “Können Computer sprechen und hören, sollen sie es überhaupt können? Sprachverarbeitung und ambiente Intelligenz”, in *Baustelle Informationsgesellschaft und Universität heute*, F. Göttmann, T. Reuther (Editors.), Ferdinand Schöningh Verlag, Paderborn, 2011.
- [51] R. Haeb-Umbach and V. Ion, “Error Concealment”, in *Automatic Speech Recognition on Mobile Devices and over Communication Networks*, Z.-H. Tan and B. Lindberg (Editors), Springer, 2008.

Publications on Conferences with Peer Review

- [52] T. Gburrek, J. Schmalenstroeer and R. Häb-Umbach, “On Synchronization of Wireless Acoustic Sensor Networks in the Presence of Time-Varying Sampling Rate Offsets and Speaker Changes,” in *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Singapore, 2022
- [53] J. Ebbers, R. Haeb-Umbach and R. Serizel, “Threshold-Independent Evaluation of Sound Event Detection Scores,” in *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Singapore, 2022
- [54] T. von Neumann, K. Kinoshita, C. Boeddeker, M. Delcroix and R. Häb-Umbach, “SA-SDR: A Novel Loss Function for Separation of Meeting Style Data,” in *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Singapore, 2022
- [55] T. Gburrek, J. Schmalenstroeer and R. Häb-Umbach, “Iterative Geometry Calibration from Distance Estimates for Wireless Acoustic Sensor Networks,” in *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Toronto, 2021
- [56] W. Zhang, C. Boeddeker, S. Watanabe, T. Nakatani, M. Delcroix, K. Kinoshita, T. Ochiai, N. Kamo, R. Haeb-Umbach and Y. Qian, “End-to-End Dereverberation, Beamforming, and Speech Recognition with Improved Numerical Stability and Advanced Frontend,” in *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Toronto, 2021
- [57] C. Boeddeker et al., “Convolutional Transfer Function Invariant SDR Training Criteria for Multi-Channel Reverberant Speech Separation,” in *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Toronto, 2021
- [58] J. Ebbers, M. Kuhlmann, T. Cord-Landwehr, and R. Haeb-Umbach, “Contrastive Predictive Coding Supported Factorized Variational Autoencoder for Unsupervised Learning of Disentangled Speech Representations,” in *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Toronto, 2021.
- [59] C. Boeddeker, F. Rautenberg, and R. Haeb-Umbach, “A Comparison and Combination of Unsupervised Blind Source Separation Techniques,” in *Proc. 14th ITG Conference on Speech Communication*, Kiel, Germany, 2021
- [60] J. Heitkaemper, J. Schmalenstroeer, J. Ullmann, V. Ion and R. Haeb-Umbach, “A Database for Research on Detection and Enhancement of Speech Transmitted over HF Links,” in *Proc. 14th ITG Conference on Speech Communication*, Kiel, Germany, 2021
- [61] T. von Neumann, C. Boeddeker, K. Kinoshita, M. Delcroix, and R. Haeb-Umbach, “Speeding Up Permutation Invariant Training for Source Separation,” in *Proc. 14th ITG Conference on Speech Communication*, Kiel, Germany, 2021
- [62] T. Gburrek, J. Schmalenstroeer and R. Haeb-Umbach, “On Source-Microphone Distance Estimation Using Convolutional Recurrent Neural Networks,” in *Proc. 14th ITG Conference on Speech Communication*, Kiel, Germany, 2021
- [63] T. von Neumann, K. Kinoshita, C. Boeddeker, M. Delcroix, and R. Haeb-Umbach, “Graph-PIT: Generalized Permutation Invariant Training for Continuous Separation of Arbitrary Numbers of Speakers,” in *Proc. Interspeech*, Brno, 2021
- [64] J. Ebbers and R. Haeb-Umbach, “Self-Trained Audio Tagging and Sound Event Detection in Domestic Environments,” in *Proceedings of the 6th Detection and Classification of Acoustic Scenes and Events 2021 Workshop (DCASE)*, 2021, pp. 226–230.
- [65] J. Ebbers, M. C. Keyser, and R. Haeb-Umbach, “Adapting Sound Recognition to A New Environment Via Self-Training,” in *Proceedings of the 29th European Signal Processing Conference (EUSIPCO)*, 2021, pp. 1135–1139.
- [66] J. Schmalenstroeer, J. Heitkaemper, J. Ullmann and R. Haeb-Umbach, “Open Range Pitch Tracking for Carrier Frequency Difference Estimation from HF Transmitted Speech,” in *Proceedings of the 29th European Signal Processing Conference (EUSIPCO)*, 2021, pp. 1135–1139.
- [67] J. Ebbers and R. Haeb-Umbach, “Forward-Backward Convolutional Recurrent Neural Networks and Tag-Conditioned Convolutional Neural Networks for Weakly Labeled Semi-Supervised Sound Event Detection,” In: *Proc.DCASE Workshop*, 2020.

- [68] T. Gburrek, J. Schmalenstroeer, A. Brendel, W. Kellermann and R. Haeb-Umbach, “Deep Neural Networks based Distance Estimation for Geometry Calibration in Acoustic Sensor Networks,” In: *Proc. EU-SIPCO*, Amsterdam, The Netherlands, 2020.
- [69] J. Heitkaemper, J. Schmalenstroeer and R. Haeb-Umbach, “Statistical and Neural Network Based Speech Activity Detection in non-Stationary Acoustic Environments,” In: *INTERSPEECH 2020*, Shanghai, China; 2020.
- [70] K. Kinoshita, T.C. von Neumann, M. Delcroix, T. Nakatani, and R. Haeb-Umbach, “Multi-Path RNN for Hierarchical Modeling of Long Sequential Data and its Application to Speaker Stream Separation,” In: *Proc. INTERSPEECH 2020*, Shanghai, China; 2020.
- [71] T.C. von Neumann, C. Boeddeker, L. Drude, K. Kinoshita, M. Delcroix, T. Nakatani, and R. Haeb-Umbach, “Multi-Talker ASR for an Unknown Number of Sources: Joint Training of Source Counting, Separation and ASR,” In: *Proc. INTERSPEECH 2020*, Shanghai, China; 2020.
- [72] C. Boeddeker, T. Cord-Landwehr, J. Heitkaemper, C. Zorila, D. Hayakawa, M. Li, M. Liu, R. Doddipatla and R. Haeb-Umbach, “Towards a Speaker Diarization System for the CHiME 2020 Dinner Party Transcription,” in *Proc. CHiME 2020 Workshop on Speech Processing in Everyday Environments*, 2020.
- [73] T.C. von Neumann, K. Kinoshita, L. Drude, C. Boeddeker, M. Delcroix, T. Nakatani, and R. Haeb-Umbach, “End-to-End Training of Time Domain Audio Separation and Recognition,” In: *Proc. ICASSP*, Barcelona, Spain, 2020.
- [74] C. Boeddeker, T. Nakatani, K. Kinoshita and R. Haeb-Umbach, “Jointly Optimal Dereverberation and Beamforming,” In *Proc. ICASSP*, Barcelona, Spain, 2020.
- [75] J. Heitkämper, D. Jakobeit, C. Boeddeker, L. Drude and R. Haeb-Umbach, “Demystifying TasNet: A Dissecting Approach”, In *Proc. ICASSP*, Barcelona, Spain, 2020.
- [76] Heymann J, Drude L, Haeb-Umbach R, Kinoshita K, Nakatani T. Joint Optimization of Neural Network-based WPE Dereverberation and Acoustic Model for Robust Online ASR. In: *Proc. ICASSP 2019, Brighton, UK.*; 2019.
- [77] Kanda N, Boeddeker C, Heitkaemper J, Fujita Y, Horiguchi S, Haeb-Umbach R. Guided Source Separation Meets a Strong ASR Backend: Hitachi/Paderborn University Joint Investigation for Dinner Party ASR. In: *INTERSPEECH 2019, Graz, Austria*; 2019.
- [78] Nelus A, Ebbers J, Haeb-Umbach R, Martin R. Privacy-preserving Variational Information Feature Extraction for Domestic Activity Monitoring Versus Speaker Identification. In: *INTERSPEECH 2019, Graz, Austria.* ; 2019.
- [79] Heitkaemper J, Feher T, Freitag M, Haeb-Umbach R. A Study on Online Source Extraction in the Presence of Changing Speaker Positions. In: *International Conference on Statistical Language and Speech Processing 2019, Ljubljana, Slovenia.* ; 2019.
- [80] Gburrek T, Glarner T, Ebbers J, Haeb-Umbach R, Wagner P. Unsupervised Learning of a Disentangled Speech Representation for Voice Conversion. In: *Proc. 10th ISCA Speech Synthesis Workshop.* ; 2019:81-86. doi:[10.21437/SSW.2019-15](https://doi.org/10.21437/SSW.2019-15)
- [81] Martin-Donas JM, Heitkaemper J, Haeb-Umbach R, Gomez AM, Peinado AM. Multi-Channel Block-Online Source Extraction based on Utterance Adaptation. In: *INTERSPEECH 2019, Graz, Austria.* ; 2019.
- [82] Drude L, Hasenklever D, Haeb-Umbach R. Unsupervised Training of a Deep Clustering Model for Multi-channel Blind Source Separation. In: *ICASSP 2019, Brighton, UK.* ; 2019.
- [83] Drude L, Heymann J, Haeb-Umbach R. Unsupervised training of neural mask-based beamforming. In: *INTERSPEECH 2019, Graz, Austria.* ; 2019.
- [84] Zorila C, Boeddeker C, Doddipatla R, Haeb-Umbach R. An Investigation Into the Effectiveness of Enhancement in ASR Training and Test for Chime-5 Dinner Party Transcription. In: *ASRU 2019, Sentosa, Singapore.*; 2019.
- [85] Ebbers J, Drude L, Haeb-Umbach R, Brendel A, Kellermann W. Weakly Supervised Sound Activity Detection and Event Classification in Acoustic Sensor Networks. In: *CAMSAP 2019, Guadeloupe, West Indies.* ; 2019.
- [86] von Neumann T, Kinoshita K, Delcroix M, Araki S, Nakatani T, Haeb-Umbach R. All-neural Online Source Separation, Counting, and Diarization for Meeting Analysis. In: *ICASSP 2019, Brighton, UK.* ; 2019.

- [87] Ebbers J, Haeb-Umbach R. Convolutional Recurrent Neural Network and Data Augmentation for Audio Tagging with Noisy Labels and Minimal Supervision. In: DCASE2019 Workshop, New York, USA; 2019.
- [88] L. Drude, J. Heymann, C.Boeddeker and R. Haeb-Umbach, "NARA-WPE: A Python Package for Weighted Prediction Error Dereverberation in Numpy and Tensorflow for Online and Offline Processing", in *Proc. ITG Conference on Speech Communication*, Oldenburg, Germany, Okt. 2018.
- [89] J. Schmalenstroerer and R. Haeb-Umbach, "Insights into the Interplay of Sampling Rate Offsets and MVDR Beamforming", in *Proc. ITG Conference on Speech Communication*, Oldenburg, Germany, Okt. 2018.
- [90] H. Afifi, J. Schmalenstroerer, J. Ullmann, R. Haeb-Umbach and H. Karl "MARVELO – A Framework for Signal Processing in Wireless Acoustic Sensor Networks", in *Proc. ITG Conference on Speech Communication*, Oldenburg, Germany, Okt. 2018.
- [91] J. Heymann, L. Drude, R. Haeb-Umbach, K. Kinoshita and T. Nakatani, "Frame-Online DNN-WPE Dereverberation", in *Proc. International Conference on Acoustic Signal Enhancement (IWAENC)*, Tokio, Japan, Sep. 2018.
- [92] T. Glarner, P. Hanebrink, J. Ebbers and R. Haeb-Umbach, "Benchmarking Neural Network Architectures for Acoustic Sensor Networks", in *Proc. ITG Conference on Speech Communication*, Oldenburg, Germany, Okt. 2018.
- [93] T. Glarner, P. Hanebrink, J. Ebbers and R. Haeb-Umbach, "Full BayesianHidden Markov Model Variational Autoencoder for Acoustic Unit Discovery", in *Proc.Interspeech*, Hyderabad, Sep. 2018.
- [94] L. Drude, C. Boeddeker, J. heymann, K. Kinoshita, M. Delcroix, T. Nakatani and R. Haeb-Umbach, "Integrating Neural Network Based Beamforming and Weighted Prediction Error Dereverberation", in *Proc.Interspeech*, Hyderabad, Sep. 2018.
- [95] J. Schmalenstroerer and R. Haeb-Umbach,"Efficient Sampling Rte Offset Compensation – An Overlap-Save Based Approach", in *Proc. 26th European Signal Processing Conference (EUSIPCO)*, Rom, Sep. 2018
- [96] C. Grimm, T. Breddermann, R. Farhoud, T. Fei, E. Warsitz und R. Haeb-Umbach,"Discrimination of stationary from moving targets with recurrent neural networks in automotive radar", in *Proc.International Conference on Microwaves forIntelligent Mobility (ICMIM)*, Munich, 2018
- [97] J.Ebbers, A. Nelus, R. Martin and R. Haeb-Umbach,"Evaluation of Modulation-MFCC Features and DNN Classification for Acoustic Event Detection", in *Proc. Jahrestagung Deutsche Arbeitsgemeinschaft für Akustik (DAGA)*, München, März 2018.
- [98] C. Boeddeker, H. Erdogan, T. Yoshioka and R. Haeb-Umbach,"Exploring Pratictal Aspects of Neural Mask-Based Beamforming for Far-Field Speech Recognition," in *Proc. IEEE Int'l Conference on Acoustics, Speech, and Signal Processing*, Calgary, April 2018.
- [99] L. Drude, Thilo von Neumann and R. Haeb-Umbach,"Deep Attractor Networks for Speaker Re-Identificatin and Blind Source Separation", in *Proc. IEEE Int'l Conference on Acoustics, Speech, and Signal Processing*, Calgary, April 2018.
- [100] L. Drude, T. Higuchi,k K. Kinoshita, T. Nakatani and R. Haeb-Umbach,"Dual Frequency- and Block-Permutation Alignment for Deep Learning Based Block-Online Blind Source Separation", in *Proc. IEEE Int'l Conference on Acoustics, Speech, and Signal Processing*, Calgary, April 2018.
- [101] T. Fei, C. Grimm, R. Farhoud, T. Breddermann, E. Warsitz and R. Haeb-Umbach, "A Novel Target Separation Algorithm Applied to the Dwo-Deminsional Spectrum for FMCW Automotive Radar Systems", in *Proc.IEEE Int. Conf. on Microwaves, Communications, Antennas and Electronic Systems (COMCAS)*, Tel Aviv, Nov. 2017.
- [102] C. Grimm, T. Breddermann, R. Farhoud, T. Fei, E. Warsitz and R. Haeb-Umbach, "Hypothesis Test for the Detection of Moving Targets in Automotive Radar", in *Proc.IEEE Int. Conf. on Microwaves, Communications, Antennas and Electronic Systems (COMCAS)*, Tel Aviv, Nov. 2017.
- [103] C. Grimm, R. Farhoud, T. Fei, E. Warsitz and R. Haeb-Umbach, "Detection of Moving Targets in Automotive Radar with Distorted Ego-Velocity Information", in *Proc.IEEE Microwaves, Radar and Remote Sensing Symposium (MRRS)*, Kiev, Aug. 2017.

- [104] J. Schmalenstroerer, J. Heymann, L. Drude, C. Boeddeker, R. Haeb-Umbach, "Multi-Stage Coherence Drift Based Sampling Rate Synchronization for Acoustic Beamforming", in *Proc. IEEE Int. Workshop on Multimedia Signal Processing*, London, Okt. 2017.
- [105] P. Arora, R. Haeb-Umbach, "A Study on Transfer Learning for Acoustic Event Detectin in a Real Life Scenario", in *Proc. IEEE Int. Workshop on Multimedia Signal Processing*, London, Okt. 2017.
- [106] T. Glarner, B. Boenninghoff, O. Walter and R. Haeb-Umbach, "Leveraging Text Data for Word Segmentation for Underresourced Languages", in *Proc. Interspeech*, Stockholm, Aug. 2017.
- [107] L. Drude and R. Haeb-Umbach, "Tight Integration of Spatial and Spectral Features for BSS with Deep Clustering Embeddings", in *Proc. Interspeech*, Stockholm, Aug. 2017.
- [108] J. Ebbers, J. Heymann, L. Drude, T. Glarner, R. Haeb-Umbach and B. Raj, "Hidden Markov Model Variational Autoencoder for Acoustic Unit Discovery", in *Proc. Interspeech*, Stockholm, Aug. 2017.
- [109] J. Heymann, L. Drude, C. Boeddeker, P. Hanebrink, R. Haeb-Umbach, "BEAMNET: End-to-End Training of a Beamformer-Supported Multi-Channel ASR System", in *Proc. IEEE Int'l Conference on Acoustics, Speech, and Signal Processing*, New Orleans, March 2017
- [110] A. Chinaev, R. Haeb-Umbach, "A Generalized Log-Spectral Amplitude Estimator for Single-Channel Speech Enhancement", in *Proc. IEEE Int'l Conference on Acoustics, Speech, and Signal Processing*, New Orleans, March 2017
- [111] C. Boeddeker, P. Hanebrink, L. Drude, J. Heymann, R. Haeb-Umbach, "Optimizing Neural-Network Supported Acoustic Beamforming by Algorithmic Differentiation", in *Proc. IEEE Int'l Conference on Acoustics, Speech, and Signal Processing*, New Orleans, March 2017
- [112] T. Menne, J. Heymann, A. Alexandridis, K. Irie, A. Zeyer, M. Kitz, P. Golik, I. Kulikov, L. Drude, R. Schlüter, H. Ney, R. Haeb-Umbach, A. Mouchtaris, "The RWTH/UPB/FORTH System Combination for the 4th CHiME Challenge Evaluation", *CHiME-4 Workshop*, San Francisco, Sept. 2016
- [113] J. Heymann, L. Drude, R. Haeb-Umbach, "Wide Residual BLSTM Network with Discriminative Speaker Adaptation for Robust Speech Recognition", *CHiME-4 Workshop*, San Francisco, Sept. 2016
- [114] T. Glarner, M. Mahdi Momenzadeh, L. Drude, R. Haeb-Umbach, "Factor Graph Decoding for Speech Presence Probability Estimation", in *Proc ITG Conference on Speech Communication*, Paderborn, Oct. 2016.
- [115] A. Chinaev, J. Heymann, L. Drude, R. Haeb-Umbach, "Noise –Presence–Probabgility–Based Noise PSD Estimation by Using DNN", in *Proc ITG Conference on Speech Communication*, Paderborn, Oct. 2016.
- [116] A. Chinaev, J. Heitkaemper, R. Haeb-Umbach, "A Priori SNR Estimation Using Weibull Mixture Model", in *Proc ITG Conference on Speech Communication*, Paderborn, Oct. 2016.
- [117] M. Kitz, A. Zeyer, R. Schlüter, J. Heymann, R. Haeb-Umbach, "Robust Online Multi-Channel Speech Recognition", in *Proc ITG Conference on Speech Communication*, Paderborn, Oct. 2016.
- [118] F. Jacob and R. Haeb-Umbach, "On the Bias of Direction of Arrival Estimation Using Linear Microphone Arrays", in *Proc ITG Conference on Speech Communication*, Paderborn, Oct. 2016
- [119] A. Chinaev and R. Haeb-Umbach, "A Priori SNR Estimation Using a Generalized Decision Directed Approach", in *Proc. Interspeech*, San Francisco, Sept. 2016.
- [120] L. Drude, B. Raj, R. Haeb-Umbach, "On the Appropriateness of Complex-valued Neural Networks for Speech Enhancement", in *Proc. Interspeech*, San Francisco, Sept. 2016.
- [121] J. Schmalenstroerer and R. Haeb-Umbach, "Investigations into Bluetooth Low Energy Localization Precision Limits", in *Proc. 24th European Signal Processing Conference*, Budapest, Hungary, Aug. 2016
- [122] O. Walter and R. Haeb-Umbach, "Unsupervised Word Discovery from Speech using Bayesian Hierarchical Models", in *Proc. 38th German Conference on Pattern Recognition (GCPR2016)*, Hannover, Sept. 2016.
- [123] L. Drude, C. Boeddeker, R. Haeb-Umbach, "Blind Speech Separation Based on Complex Spherical K-Mode Clustering", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Shanghai, China, March 2016.
- [124] J. Heymann, L. Drude, R. Haeb-Umbach, "Neural Network Based Spectral Mask Estimation for Acoustic Beamforming", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Shanghai, China, March 2016.

- [125] J. Heymann, L. Drude and R. Haeb-Umbach, "BLSTM supported GEV Beamformer Front-End for the 3RD CHiME Challenge", in *Proc. IEEE Automatic Speech Recognition and Understanding Workshop*, Scottsdale, Dez. 2015.
- [126] A. Chinaev and R. Haeb-Umbach, "On Optimal Smoothing in Minimum Statistics Based Noise Tracking", in *Proc. INTERSPEECH*, Dresden, Sept. 2015.
- [127] V. Despotovic, O. Walter, and R. Haeb-Umbach, "Semantic Analysis of Spoken Input using Markov Logic Networks", in *Proc. INTERSPEECH*, Dresden, Sept. 2015.
- [128] E. Marchi, B. Schuller, S. Baron-Cohen, O. Golan, S. Boelte, P. Arora and R. Haeb-Umbach, "Typicality and Emotion in the Voice of Children with Autism Spectrum Condition: Evidence Across Three Languages", in *Proc. INTERSPEECH*, Dresden, Sept. 2015.
- [129] L. Drude, F. Jacob and R. Haeb-Umbach, R.: "DOA-Estimation based on a Complex Watson Kernel Method", in *Proc. European Signal Processing Conference (EUSIPCO)*, Nizza, Aug. 2015.
- [130] J. Heymann, R. Haeb-Umbach, P. Golik and R. Schlueter, "Unsupervised Adaptation of a Denoising Autoencoder by Bayesian Feature Enhancement for Reverberant ASR under Mismatch Conditions", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Brisbane, Australia, April 2015.
- [131] R. Haeb-Umbach, M.K. Hoang and J. Schmalenstroer, "Aligning Training Models with Smartphone Properties in WiFi Fingerprinting Based Indoor Localization", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Brisbane, Australia, April 2015.
- [132] O. Walter, L. Drude and R. Haeb-Umbach, "Source Counting in Speech Mixtures by Nonparametric Bayesian Estimation of an Infinite Gaussian Mixture Model", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Brisbane, Australia, April 2015.
- [133] A. Chinaev, M. Puels and R. Haeb-Umbach: Spectral Noise Tracking for Improved Nonstationary Noise Robust ASR, ITG Fachtagung Sprachkommunikation, Erlangen, Sept. 2014
- [134] J. Schmalenstroer, W. Zhao and R. Haeb-Umbach: Online Observation Error Model Estimation for Acoustic Sensor Network Synchronization, ITG Fachtagung Sprachkommunikation, Erlangen, Sept. 2014
- [135] F. Jacob and R. Haeb-Umbach: Coordinate Mapping Between an Acoustic and Visual Sensor Network in the Shape Domain for a Joint Self-Calibrating Speaker Tracking, ITG Fachtagung Sprachkommunikation, Erlangen, Sept. 2014
- [136] O. Walter, V. Despotovic, R. Haeb-Umbach, J. Gemmeke, B. Ons, H. Van hamme "An Evaluation of Unsupervised Acoustic Model Training for a Dysarthric Speech Interface", in *Proc. INTERSPEECH*, Singapore, Sept. 2014
- [137] L. Drude, A. Chinaev, D.H. Tran Vu and R. Haeb-Umbach, "Towards Online Source Counting in Speech Mixtures Applying a Variational EM for Complex Watson Mixture Models", in *Proc. International Workshop on Acoustic Signal Enhancement (IWAENC)*, Juan les Pins, France, Sept. 2014.
- [138] J. Heymann, O. Walter, R. Haeb-Umbach and B. Raj, "Iterative Bayesian Word Segmentation for Unsupervised Vocabulary Discovery from Phoneme Lattices", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Florence, Italy, Mai 2014.
- [139] J. Schmalenstroer, P. Jembrancik and R. Haeb-Umbach, "A Gossiping Approach to Wireless Acoustic Sensor Network Sampling Clock Synchronization", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Florence, Italy, Mai 2014.
- [140] L. Drude, A. Chinaev, D.H. Tran Vu and R. Haeb-Umbach, "Source Counting in Speech Mixtures Using a Variational EM Approach for Complex Watson Mixture Models", in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Florence, Italy, Mai 2014.
- [141] O. Walter, T. Korthals, R. Haeb-Umbach and B. Raj, "A Hierarchical System for Word Discovery Exploiting DTW-Based Initialization", in *Proc. IEEE Automatic Speech Recognition and Understanding Workshop*, Olomouc, Czech Republic, Dec. 2013.
- [142] J. Heymann, O. Walter, R. Haeb-Umbach and B. Raj, "Unsupervised Word Segmentation from Noisy Input", in *Proc. IEEE Automatic Speech Recognition and Understanding Workshop*, Olomouc, Czech Republic, Dec. 2013.
- [143] K. Kinoshita, M. Delcroix, T. Yoshioka, T. Nakatani, E. Habets, R. Haeb-Umbach, V. Leutnant, A. Sehr, W. Kellermann, R. Maas, S. Gannot and B. Raj, "The REVERB Challenge: A Common Evaluation

Framework for Dereverberation and Recognition of Reverberant Speech“, in *Proc. IEEE Workshop on Applications of Signal Processing to Audio and Acoustics*, New Paltz, NY, Okt. 2013

- [144] D. H. Tran Vu and R. Haeb-Umbach, “Blind Speech Separation Exploiting Temporal and Spectral Correlations Using Turbo Decoding of 2D-HMMs”, in *Proc. European Signal Processing Conference (EUSIPCO)*, Marrakesch, Marokko, Sep. 2013.
- [145] J. Schmalenstroerer and R. Haeb-Umbach, “Sampling Rate Synchronisation in Acoustic Sensor Networks with a Pre-Trained Clock Skew Error Model”, in *Proc. European Signal Processing Conference (EUSIPCO)*, Marrakesch, Marokko, Sep. 2013.
- [146] M. K. Hoang, J. Schmalenstroerer, C. Druke, D. H. Tran Vu and R. Haeb-Umbach, “A Modified Hidden Markov Model for Indoor User Tracking Based on WiFi Fingerprinting and Step Detection”, in *Proc. European Signal Processing Conference (EUSIPCO)*, Marrakesch, Marokko, Sep. 2013.
- [147] G. Enzner, D. Schmid and R. Haeb-Umbach, “On the Acoustic Channel Identification in Multi-Microphone via Adaptive Blind Signal Enhancement Techniques”, in *Proc. European Signal Processing Conference (EUSIPCO)*, Marrakesch, Marokko, Sep. 2013.
- [148] D. H. Tran Vu and R. Haeb-Umbach, “Using the Turbo Principle for Exploiting Temporal and Spectral Correlations in Speech Presence Probability Estimation”, in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Vancouver, Kanada, May 2013.
- [149] M. K. Hoang and R. Haeb-Umbach, “Parameter Estimation and Classification of Censored Gaussian Data with Application to WiFi Indoor Positioning”, in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Vancouver, Kanada, May 2013.
- [150] F. Jacob, J. Schmalenstroerer and R. Haeb-Umbach, “DoA-Based Microphone Array Position Self-Calibration Using Circular Statistics”, in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Vancouver, Kanada, May 2013.
- [151] A. Chinaev and R. Haeb-Umbach, “MAP-Based Estimation of the Parameters of a Gaussian Mixture Model in the Presence of Noisy Observations”, in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Vancouver, Kanada, May 2013.
- [152] A. Chinaev, R. Haeb-Umbach, J. Taghia and R. Martin “Improved Single-Channel Nonstationary Noise Tracking by an Optimized MAP-Based Postprocessor”, in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Vancouver, Kanada, May 2013.
- [153] A. Abdelaziz, S. Zeiler, D. Kolossa, V. Leutnant and R. Haeb-Umbach, “GMM-Based Significance Decoding”, in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Vancouver, Kanada, May 2013.
- [154] O. Walter, R. Haeb-Umbach, S. Chaudhuri and B. Raj, “Unsupervised Word Discovery from Phonetic Input Using Nested Pitman-Yor Language Modeling”, in *Proc. IEEE International Conference on Robotics and Automation*, Karlsruhe, May 2013.
- [155] M. K. Hoang, J. Schmalenstroerer, C. Druke, D. H. Tran Vu and R. Haeb-Umbach, “Server Based Indoor Positioning Using RSSI and Step Detection”, in *Proc. Workshop on Positioning, Navigation and Communication (WPNC)*, Dresden, March 2013.
- [156] A. Krueger, O. Walter, V. Leutnant and R. Haeb-Umbach, “Bayesian Feature Enhancement for ASR of Noisy Reverberant Real-World Data”, in *Proc. Interspeech*, Portland, OR, Sept. 2012
- [157] D.H. Tran Vu and R. Haeb-Umbach, “Exploiting Temporal Correlations in Joint Multichannel Speech Separation and Noise Suppression Using Hidden Markov Models”, in *Proc. International Workshop on Acoustic Signal Enhancement (IWAENC)*, Aachen, Sept. 2012
- [158] F. Jacob, J. Schmalenstroerer and R. Haeb-Umbach, “Microphone Array Position Self-Calibration from Reverberant Speech Input”, in *Proc. International Workshop on Acoustic Signal Enhancement (IWAENC)*, Aachen, Sept. 2012
- [159] V. Leutnant, A. Krueger and R. Haeb-Umbach, “A Statistical Observation Model for Noisy Reverberant Speech Features and its Application to Robust ASR”, in *Proc. IEEE Int. Conf. on Signal Processing, Communications and Computers*, Hong Kong, Aug. 2012.
- [160] A. Chinaev and R. Haeb-Umbach, “Quality Analysis and Optimization of the MAP-Based Noise Power Spectral Density Tracker”, in *ITG Fachtagung Sprachkommunikation*, Braunschweig, Sept. 2012

- [161] V. Leutnant, A. Krueger and R. Haeb-Umbach, “Investigations into a Statistical Observation Model for Logarithmic Mel Power Spectral Density Features of Noisy Reverberant Speech”, in *ITG Fachtagung Sprachkommunikation*, Braunschweig, Sept. 2012
- [162] A. Chinaev, A. Krueger, D.H. Tran Vu and R. Haeb-Umbach, “Improved Noise Power Spectral Density Tracking by a MAP-Based Postprocessor”, in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing*, Kyoto, Japan, March 2012
- [163] O. Walter, J. Schmalenstroer, A. Engler and R. Haeb-Umbach, “.: Smartphone-Based Sensor Fusion for Improved Vehicular Navigation”, in *Workshop on Positioning, Navigation and Communication (WPNC) 2012*, Dresden, March.2012.
- [164] V. Leutnant, A. Krueger and R. Haeb-Umbach, “A Versatile Gaussian Splitting Approach to Non-Linear State Estimation and its Application to Noise-Robust ASR”, in *Proc. INTERSPEECH*, Florence, Italy, Aug. 2011
- [165] J. Schmalenstroer, F. Jacob, R. Haeb-Umbach, M. Hennecke and G. Fink, “Unsupervised Geometry Calibration of Acoustic Sensor Networks Using Source Correspondences”, in *Proc. INTERSPEECH*, Florence, Italy, Aug. 2011
- [166] J. Schmalenstroer, M. Bartek and R. Haeb-Umbach, “Unsupervised Learning of Acoustic Events Using Dynamic Time Warping and Hierarchical K-Means++ Clustering”, in *Proc. INTERSPEECH*, Florence, Italy, Aug. 2011
- [167] D.H. Tran Vu and R. Haeb-Umbach, “On Initial Seed Selection for Frequency Domain Blind Speech Separation”, in *Proc. INTERSPEECH*, Florence, Italy, Aug. 2011
- [168] A. Krueger and R. Haeb-Umbach, “MAP-Based Estimation of the Parameters of Non-Stationary Gaussian Processes from Noisy Observations”, in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing*, Prag, May 2011.
- [169] M. Bevermeier, S. Flake, R. Häb-Umbach, J. Stehr, “A Platform for Efficient Supply Chain Management Support in Logistics”, in *Proc.8.International Workshop on Intelligent Transportation*, Hamburg, March 2011.
- [170] D. H. Tran Vu and R. Haeb-Umbach, “An EM Approach to Multichannel Speech Separation and Noise Suppression”, *International Workshop on Acoustic Echo and Noise Control (IWAENC)*, Tel Aviv, Israel, Aug. 2010.
- [171] A. Krueger, V. Leutnant, R. Haeb-Umbach, M. Ackermann and J. Blömer, “On the Initialization of Dynamic Models for Speech Features”, *ITG Fachtagung Sprachkommunikation*, Bochum , Oct. 2010.
- [172] B. Raj, K.W. Wilson, A. Krueger and R. Haeb-Umbach, “Ungrounded Independent Non-Negative Factor Analysis”, in *Proc. INTERSPEECH*, Makuhari, Japan, Sept. 2010
- [173] V. Leutnant and R. Haeb-Umbach, “On the Exploitation of Hidden Markov Models and Linear Dynamic Models in a Hybrid Decoder Architecture for Continuous Speech Recognition”, in *Proc. Interspeech*, Makuhari, Japan, Sept, 2010.
- [174] D.H Tran Vu and R. Haeb-Umbach, “Blind Speech Separation Employing Directional Statistics in an Expectation Maximization Framework”, in *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing*, Dallas, March 2010.
- [175] M. Bevermeier, O. Walter, S. Peschke and R. Haeb-Umbach, “Barometric Height Estimation Combined with Map-Matching in a Loosely-Coupled Kalman-Filter”, in *7th Workshop on Positioning, Navigation and Communication, WPNC 2010*, Dresden, March 2010.
- [176] J. Schmalenstroer and R. Haeb-Umbach, “Fusing Audio and Video Information for Online Speaker Diarization”, in *Proc. Interspeech*, Brighton, U.K., Sep. 2009.
- [177] V. Leutnant and R. Haeb-Umbach, “An Analytic Derivation of a Phase-Sensitive Observation Model for Noise Robust Speech Recognition”, in *Proc. Interspeech*, Brighton, U.K., Sep. 2009.
- [178] A. Krueger and R. Haeb-Umbach, “Model Based Feature Enhancement for Automatic Speech Recognition in Reverberant Enviornments”, in *Proc. Interspeech*, Brighton, U.K., Sep. 2009.
- [179] M. Hennecke, T. Ploetz, G. A. Fink, J. Schmalenstroer and R. Haeb-Umbach, “A Hierarchical Approach to Unsupervised Shape Calibration of Microphone Array Networks”, in *IEEE 15th Workshop on Statistical Signal Processing*, Cardiff, U.K., Sep. 2009.

- [180] S. Peschke, M. Bevermeier and R. Haeb-Umbach, "A GPS Positioning Approach Exploiting GSM Velocity Estimates", in *6th Workshop on Positioning, Navigation and Communication, WPNC 2009*, Hannover, March 2009.
- [181] M. Bevermeier, S. Peschke and R. Haeb-Umbach, "Robust Vehicle Localization Based on Multi-Level Sensor Fusion and Online Parameter Estimation", in *6th Workshop on Positioning, Navigation and Communication, WPNC 2009*, Hannover, March 2009.
- [182] M. Bevermeier, S. Peschke and R. Haeb-Umbach, "Joint Parameter Estimation and Tracking in a Multi-Stage Kalman Filter for Vehicle Positioning", in *Proc. IEEE Vehicular Technology Conference, Spring 2009*, Barcelona, Spain, April 2009.
- [183] D.H. Tran Vu and R. Haeb-Umbach, "Generalized Eigenvector Blind Speech Separation under Coherent Noise in a GSC Configuration", in *Proc. International Workshop on Acoustic Echo and Noise Control (IWAENC)*, Seattle, USA, Sept. 14-17, 2008.
- [184] D.H. Tran Vu and R. Haeb-Umbach, "Blind Speech Separation in Presence of Correlated Noise with Generalized Eigenvector Beamforming", in *Proc. ITG-Fachtagung Sprachkommunikation*, Aachen, 8.-10.10. 2008.
- [185] S. Windmann and R. Haeb-Umbach, "A Novel Approach to Noise Estimation in Model-Based Speech Feature Enhancement", in *Proc. ITG-Fachtagung Sprachkommunikation*, Aachen, 8.-10.10. 2008.
- [186] S. Windmann, R. Haeb-Umbach and V. Leutnant, "A Segmental HMM Based on a Modified Emission Probability", in *Proc. ITG-Fachtagung Sprachkommunikation*, Aachen, 8.-10.10. 2008.
- [187] V. Ion and R. Haeb-Umbach, "Investigations into Uncertainty Decoding Employing a Discrete Feature Space for Noise Robust Automatic Speech Recognition", in *Proc. ITG-Fachtagung Sprachkommunikation*, Aachen, 8.-10.10. 2008.
- [188] R. Haeb-Umbach, "Uncertainty Decoding in Automatic Speech Recognition", in *Proc. ITG-Fachtagung Sprachkommunikation*, Aachen, 8.-10.10. 2008.
- [189] S. Windmann and R. Haeb-Umbach, "Modeling the Dynamics of Speech and Noise for Speech Feature Enhancement in ASR", in *Proc. IEEE ICASSP*, Las Vegas, April 2008.
- [190] E. Warsitz, A. Krüger and R. Haeb-Umbach, "Speech Enhancement with a New Generalized Eigenvector Blocking Matrix for Application in a Generalized Sidelobe Canceller", in *Proc. IEEE ICASSP*, Las Vegas, April 2008.
- [191] V. Ion and R. Haeb-Umbach, "Multi-Resolution Soft Features for Channel-robust Distributed Speech Recognition", in *Proc. Interspeech*, Antwerp, Belgium, Sep. 2007.
- [192] J. Schmalenstroer and R. Haeb-Umbach, "Joint Speaker Segmentation, Localization and Identification for Streaming Audio", in *Proc. Interspeech*, Antwerp, Belgium, Sep. 2007.
- [193] S. Windmann and R. Haeb-Umbach, "An Approach to Iterative Speech Feature Enhancement and Recognition", in *Proc. Interspeech*, Antwerp, Belgium, Sep. 2007.
- [194] E. Warsitz, R. Haeb-Umbach and D.H. Tran Vu, "Blind Adaptive Principal Eigenvector Beamforming for Acoustical Source Separation", in *Proc. Interspeech*, Antwerp, Belgium, Sep. 2007.
- [195] M. Bevermeier and R. Haeb-Umbach, "Combined time and frequency domain OFDM channel estimation", in *Multi-Carrier Spread Spectrum 2007*, S. Plass, S. Kaiser, A. Dammann, K. Fazel (Eds.), Springer 2007.
- [196] M. Bevermeier, T. Ebel and R. Haeb-Umbach, "Channel estimation by exploiting sublayer information in OFDM systems", in *Multi-Carrier Spread Spectrum 2007*, S. Plass, S. Kaiser, A. Dammann, K. Fazel (Eds.), Springer 2007.
- [197] R. Haeb-Umbach and M. Bevermeier, "OFDM channel estimation based on combined estimation in time and frequency domain", in *Proc. IEEE ICASSP*, Hawaii, April 2007.
- [198] S. Peschke and R. Haeb-Umbach, "Velocity estimation of mobile terminals by exploiting GSM downlink signalling", in *Proc. 4th Workshop on Positioning, Navigation and Communication, WPNC 2007*, Hannover, 22.3.2007.
- [199] J. Schmalenstroer and R. Haeb-Umbach, "Online Speaker Change Detection by Combining BIC with Microphone Array Beamforming", in *Proc. Interspeech 2006*, Pittsburgh, Pa, Sept. 2006.

- [200] V. Ion and R. Haeb-Umbach, "Improved Source Modeling and Predictive Classification for Channel Robust Speech Recognition", in *Proc. Interspeech 2006*, Pittsburgh, Pa, Sept. 2006.
- [201] E. Warsitz and R. Haeb-Umbach, "Controlling speech distortion in adaptive frequency-domain eigenvector beamforming", in *Proc. International Workshop on Acoustic Echo and Noise Control*, Paris, Sept. 2006.
- [202] V. Ion and R. Haeb-Umbach, "An inexpensive packet loss compensation scheme for distributed speech recognition based on soft-features", in *Proc. IEEE ICASSP*, Toulouse, France, May 2006.
- [203] S. Windmann and R. Haeb-Umbach, "Iterative Speech Enhancement Using a Non-Linear Dynamic State Model of Speech and its Parameters", in *Proc. IEEE ICASSP*, Toulouse, France, May 2006.
- [204] S. Peschke and R. Haeb-Umbach, "A Probabilistic Similarity Measure and a Non-Linear Post-Filter for Mobile Phone Positioning Using GSM Signal Power Measurements", in *Proc. European Navigation Conference*, Manchester, May 2006.
- [205] V. Ion and R. Haeb-Umbach, "Comparison of Decoder-Based Transmission-Error Compensation Techniques for Distributed Speech Recognition", in *Proc. ITG-Fachtagung Sprachkommunikation*, Kiel, April 2006.
- [206] S. Windmann und R. Haeb-Umbach, "Single-Channel Speech Enhancement Using a Marginalized Particle Filter", in *Proc. ITG-Fachtagung Sprachkommunikation*, Kiel, April 2006.
- [207] S. Peschke und R. Haeb-Umbach, "Particle Filtering of Database assisted Positioning Estimates Using a Novel Similarity Measure for GSM Signal Power Level Measurements", in *Proc. 3rd Workshop on Positioning, Navigation and Communication, WPNC 2006*, Hannover, 16.3.2006.
- [208] R. Haeb-Umbach und E. Warsitz, "Adaptive filter-and-sum beamforming in spatially correlated noise", in *Proc. Int. Workshop on Acoustic, Echo and Noise Control*, Eindhoven, Sep. 2005
- [209] R. Haeb-Umbach, B. Kladis und J. Schmalenstroer, "Speech processing in the networked home environment – a view on the Amigo project", in *Proc. Interspeech*, Lissabon, Sept. 2005.
- [210] V. Ion und R. Haeb-Umbach, "A unified probabilistic approach to error concealment for distributed speech recognition", in *Proc. Interspeech*, Lissabon, Sept. 2005.
- [211] R. Haeb-Umbach und J. Schmalenstroer, "A comparison of particle filtering variants for speech feature enhancement", in *Proc. Interspeech*, Lissabon, Sept. 2005.
- [212] E. Warsitz, R. Haeb-Umbach, "Acoustic Filter-And-Sum Beamforming by Adaptive Principal Component Analysis", in *Proc. ICASSP*, Philadelphia, March 2005.
- [213] V. Ion, R. Haeb-Umbach, "A Comparison of Soft-Feature Distributed Speech Recognition with Candidate Codecs for Speech Enabled Mobile Services", in *Proc. ICASSP*, Philadelphia, March. 2005.
- [214] R. Haeb-Umbach, V. Ion, "Soft Features for Improved Distributed Speech Recognition over Wireless Networks", in *Proc. Intl'l Conference on Spoken Language Processing ICSLP'04*, Jeju, Korea, Oct. 2004.
- [215] E. Warsitz, R. Haeb-Umbach, S. Peschke, "Adaptive Beamforming Combined with Particle Filtering for Acoustic Source Localization", in *Proc. Intl'l Conference on Spoken Language Processing ICSLP'04*, Jeju, Korea, Oct. 2004.
- [216] E. Warsitz, R. Haeb-Umbach, "Robust Speaker Direction Estimation with Particle Filtering", in *Proc. IEEE Int'l Workshop on Multimedia Signal Processing*, Siena, Italy, Oct. 2004.
- [217] R. Bischoff, G. Heinrichs, R. Haeb-Umbach, "A Joint Time Multiplex Receiver for UMTS and Galileo", in *Proc. of ION-GPS-2002*, Portland, September 2002.
- [218] R. Bischoff, R. Haeb-Umbach, W. Schulz, G. Heinrichs, "Employment of a Multipath Receiver Structure in a Combined Galileo/UMTS Receiver", in *Proc. 55th IEEE Vehicular Technology Conference*, Spring 2002, Birmingham, Alabama, USA, May 6-9, 2002.
- [219] R. Bischoff, G. Heinrichs, W. Schulz, R. Haeb-Umbach, "Implementation of a Rake Receiver Architecture into a Galileo Receiver", in *Proc. of 1st ESA Workshop on Satellite Navigation User Equipment Technologies, NAVITEC 2001*, Noordwijk, December 2001.
- [220] R. Haeb-Umbach, "Data-Driven Phonetic Regression Class Tree Estimation for MLLR Adaptation", in *Proc. ICSLP*, Beijing, China, Oct. 2000, pp. III857-III860.
- [221] M. Loog, R. Haeb-Umbach, "Multi-class Linear Dimension Reduction by Generalized Fisher Criteria", in *Proc. ICSLP*, Beijing, China, Oct. 2000, pp. II1069-II1072.

- [222] R.P.W. Duin, M. Loog, R. Haeb-Umbach, „Multi-class Linear Feature Extraction by Nonlinear PCA“, in *Proc. 15th Int. Conference on Pattern Recognition*, vol. 2, Barcelona, Spain, Sep. 2000, pp. 398-401.
- [223] M. Lieb, R. Haeb-Umbach, „LDA Derived Cepstral Trajectory Filters in Adverse Environmental Conditions“, in *Proc. ICASSP*, Istanbul, June 5-9, 2000, pp. 1671-1674.
- [224] P. Beyerlein, X. Aubert, R. Haeb-Umbach et. al, „The Philips System for Transcription of Broadcast News“, in *Proc. EUROSPEECH*, Budapest, Sep. 1999, pp. 647-650.
- [225] M. Harris, X. Aubert, R. Haeb-Umbach, P. Beyerlein, „A Study of Broadcast News Audio Stream Segmentation and Segment Clustering“, in *Proc. EUROSPEECH*, Budapest, Sep. 1999, pp. 1027-1030.
- [226] R. Haeb-Umbach, M. Loog, „An Investigation of Cepstral Parameterisations for Large Vocabulary Speech Recognition“, in *Proc. EUROSPEECH*, Budapest, Sep. 1999, pp. 1323-1326.
- [227] R. Haeb-Umbach, „Investigations on Inter-Speaker Variability in the Feature Space“, in *Proc. ICASSP*, Phoenix, AZ, March 1999, pp. I397-I400.
- [228] L. Welling, R. Haeb-Umbach, X. Aubert, N. Haberland, „A Study on Speaker Normalization Using Vocal Tract Normalization and Speaker Adaptive Training“, in *Proc. ICASSP*, Seattle, May 12-15, 1998, pp. 797-800.
- [229] D. Langmann, A. Fischer, F. Wuppermann, R. Haeb-Umbach, T. Eisele, „Acoustic Front Ends for Speaker-Independent Digit Recognition in Car Environments“, in *Proc. EUROSPEECH*, Rhodos, Griechenland, Sep. 1997, pp. 2571-2574.
- [230] R. Haeb-Umbach, „Robust Speech Recognition for Wireless Networks and Mobile Telephony“, in *Proc. EUROSPEECH*, Rhodos, Griechenland, Sep. 1997, pp. 2427-2430.
- [231] H. Höge, H.S. Tropf, R. Winsky, H. van den Heuvel, R. Haeb-Umbach, K. Choukri, „European Speech Databases for Telephone Applications“, in *Proc. ICASSP*, Munich, April 20-24, 1997, pp. 1771-1774.
- [232] J.G.A. Dolfig, R. Haeb-Umbach, „Signal Representations for Hidden Markov Model Based On-Line Handwriting Recognition“, in *Proc. ICASSP*, Munich, April 20-24, 1997, pp. 3385-3388.
- [233] S. Gamm, R. Haeb-Umbach, D. Langmann, „Findings with the Design of a Command-Based Speech Interface for a Voice Mail System“, in *Proc. 3rd IEEE Workshop on Interactive Voice Technology for Telecommunications Applications*, Basking Ridge, NJ, Oct. 1996.
- [234] D. Langmann, R. Haeb-Umbach, L. Boves, E. den Os, „FRESCO: The French Telephone Speech Data Collection - Part of the European SpeechDat(M) Project“, in *Proc. ICSLP*, Philadelphia, PA, Oct. 1996, pp. 1918-1921.
- [235] T. Eisele, R. Haeb-Umbach, D. Langmann, „A Comparative Study of Linear Feature Transformation Techniques for Automatic Speech Recognition“, in *Proc. ICSLP*, Philadelphia, PA, Oct. 1996, pp. 252-255.
- [236] D. Langmann, R. Haeb-Umbach, T. Eisele, „Robust Rejection Modeling for a Small-Vocabulary Application“, *ITG Fachtagung Sprachkommunikation*, Sept. 17-18, 1996, Frankfurt.
- [237] R. Haeb-Umbach, S. Gamm, „Human Factors of a Voice-Controlled Car Stereo“, in *Proc. EUROSPEECH*, Madrid, Sep. 1995, pp. 1453-1456.
- [238] C. Dugast, P. Beyerlein, R. Haeb-Umbach „Application of Clustering Techniques to Mixture Density Modelling for Continuous-Speech Recognition“, in *Proc. ICASSP*, Detroit, Mi, May 1995, pp. 524-527.
- [239] R. Haeb-Umbach, P. Beyerlein, E. Thelen, „Automatic Transcription of Unknown Words in a Speech Recognition System“, in *Proc. ICASSP*, Detroit, Mi, May 1995, pp. 840-843.
- [240] S. Gamm, R. Haeb-Umbach, D. Langmann, „The Usability Engineering of a Voice-Controlled Answering Machine“, in *Proc. 15. Int'l Symposium on Human Factors in Telecommunications*, Melbourne, Australia, Mar. 1995, pp. 177-184.
- [241] V. Steinbiss, H. Ney, R. Haeb-Umbach, B.-H. Train, U. Essen, R. Kneser, M. Oerder, H.-G. Meier, X. Aubert, C. Dugast, D. Geller, W. Hoellerbauer, H. Bartosik, „The Philips Research System for Large-Vocabulary Continuous-Speech Recognition“, in *Proc. EUROSPEECH*, Berlin, Sep. 1993, pp. 2125-2128.
- [242] R. Haeb-Umbach, D. Geller, H. Ney, „Improvements in Connected Digit Recognition Using Linear Discriminant Analysis and Mixture Densities“, in *Proc. ICASSP*, Minneapolis, MN, Apr 1993, pp. II239-II242.

- [243] X. Aubert, R. Haeb-Umbach, H. Ney, „Continuous Mixture Densities and Linear Discriminant Analysis for Improved Context-Dependent Acoustic Models“, in *Proc. ICASSP*, Minneapolis, MN, Apr. 1993, pp. II648-II651.
- [244] D. Geller, R. Haeb-Umbach, H. Ney, „Improvements in Speech Recognition for Voice Dialling in the Car Environment“, in *Proc. ESCA Workshop on Speech Recognition in Adverse Conditions*, Cannes-Mandelieu, Nov. 1992, pp. 203-206.
- [245] H. Ney, R. Haeb-Umbach, B.-H. Tran, M. Oerder, „Improvements in Beam Search for 10,000-Word Continuous Speech Recognition“, in *Proc. ICASSP*, San Francisco, CA, Mar. 1992, pp. I9-I12.
- [246] R. Haeb-Umbach, H. Ney, „Linear Discriminant Analysis for Improved Large Vocabulary Continuous Speech Recognition“, in *Proc. ICASSP*, San Francisco, CA, Mar. 1992, pp. I13-I16.
- [247] R. Haeb-Umbach, H. Ney, „A Look-Ahead Technique for Large Vocabulary Continuous Speech Recognition“, In *Proc. EUROSPEECH*, Genova, Italy, Sep. 1991, pp. 495-498.
- [248] R. Haeb, D. Rugar, T. Howell, G. P. Coleman, „Coding and Signal Processing for a Magneto-optical Resonant Bias Coil Overwrite Experiment“, in *Proc. IEEE Int'l Conf. on Commun.*, Atlanta, GA, Apr. 1990.
- [249] R. Haeb, „A Comparison of Coherent and Differentially Coherent Detection Schemes for Fading Channels“, in *Proc. IEEE Int'l Conf. on Vehicular Techn.*, Philadelphia, PA, Jun. 1988.
- [250] R. Haeb, H. Meyr, „A digital Synchronizer for Linearly Modulated Signals Transmitted over a Frequency-Nonselective Fading Channel“, in *Proc. IEEE Int'l Conf. on Commun.*, Philadelphia, PA, Jun. 1988.
- [251] R. Haeb, H. Meyr, „Optimal Carrier Recovery and Detection on Frequency-Nonselective Fading Channels“, in *Proc. Symposium on Inf. Theory and Appl. (SITA)*, Tokio, Nov. 1987

Other Publications

- [252] C. Bøddeker, P. Hanebrink, L. Drude, J. Heymann, R. Haeb-Umbach, “On the Computation of Complex-valued Gradients with Application to Statistically Optimum Beamforming“, *ArXiv:1701.00392v*, Jan. 2017.
- [253] F. Jacob and R. Haeb-Umbach, “Absolute Geometry Calibration of Distributed Microphone Arrays in an Audio-Visual Sensor Network“, *ArXiv e-prints*, 2015.
- [254] J. Schmalenstroer, M. Bartek and R. Haeb-Umbach, “Investigation into Features for Robust Classification into Broad Acoustic Categories“, in *Proc. 37. Deutsche Jahrestagung für Akustik, DAGA-2011*, Düsseldorf, März 2011.
- [255] V. Leutnant and R. Haeb-Umbach, “Options for Modelling Temporal Statistical Dependencies in an Acoustic Model for ASR“, in *Proc. 36. Deutsche Jahrestagung für Akustik, DAGA-2010*, Berlin, März 2010.
- [256] J. Schmalenstroer, V. Leutnant and R. Haeb-Umbach, “Audio-Visual Data Processing for Ambient Communication“, in *Proc. 1st Int'l Workshop on Distributed Computing in Ambient Environments* within 32nd Annual Conference on Artificial Intelligence, Paderborn, Sep. 2009.
- [257] V. Leutnant and R. Haeb-Umbach, “On the Estimation and Use of Feature Reliability Information for Noise-Robust Speech Recognition“, in *Proc. NAG/DAGA-2009*, Rotterdam, März 2009.
- [258] A. Krüger, E. Warsitz und R. Haeb-Umbach, “Blinde akustische Strahlformung für Anwendungen im KFZ“, in *Proc. 34. Deutsche Jahrestagung für Akustik, DAGA-2008*, Dresden, März 2008.
- [259] J. Schmalenstroer, V. Leutnant and R. Haeb-Umbach, “Amigo Context Management Service with Applications in Ambient Communication Scenarios“, in *Proc. AMI-07 - European Conference on Ambient Intelligence*, Darmstadt, Deutschland, Nov. 2007
- [260] J. Schmalenstroer and R. Haeb-Umbach, “Project Amigo – Sprachsignalverarbeitung im vernetzten Haus“, in *Proc. 33. Deutsche Jahrestagung für Akustik, DAGA-2007*, Stuttgart, March 2007.
- [261] E. Warsitz and R. Haeb-Umbach, “Zweistufige Sprach/Pause-Detektion in stark gestörter Umgebung“, in *Proc. 33. Deutsche Jahrestagung für Akustik, DAGA-2007*, Stuttgart, March 2007.
- [262] E. Warsitz und R. Haeb-Umbach, “Mehrkanalige Sprachsignalverarbeitung durch adaptives Eigenbeamforming für Freisprecheinrichtungen im Kraftfahrzeug“, in *Proc. 32. Deutsche Jahrestagung für Akustik, DAGA-2006*, Braunschweig, March 2006.

- [263] R. Häb-Umbach, „Auf ein Wort – Möglichkeiten und Grenzen der automatischen Spracherkennung“, *Forschungsforum Paderborn*, S. 68-71, 6-2003.
- [264] P. Beyerlein, X. Aubert, R. Haeb-Umbach, et al., „The Philips/RWTH System for Transcription of Broadcast News“, in *Proc. Broadcast News Transcription and Understanding Workshop*, Washington, March 1999.
- [265] P. Beyerlein, X. Aubert, R. Haeb-Umbach et al., „Automatic Transcription of English Broadcast News“, in *Proc. DARPA Broadcast News Transcription and Understanding Workshop*, Lansdowne, VA, Feb. 8-11, 1998.
- [266] D. Klakow, X. Aubert, R. Haeb-Umbach et al., „Language-Model Investigations related to Broadcast News“, in *Proc. DARPA Broadcast News Transcription and Understanding Workshop*, Lansdowne, VA, Feb. 8-11, 1998.
- [267] R. Haeb-Umbach et al., „Acoustic Modeling in the Philips Hub-4 Continuous-Speech Recognition System“, in *Proc. DARPA Broadcast News Transcription and Understanding Workshop*, Lansdowne, VA, Feb. 8-11, 1998.
- [268] D. Langmann, F. Wuppermann, R. Haeb-Umbach, A. Fischer, T. Eisele, „Investigation of Acoustic Front Ends for Speaker-Independent Speech Recognition in the Car“, in *Proc. 9th Aachener Kolloquium on Signal Theory*, Aachen, March 18-20, 1997.
- [269] H. Ney, V. Steinbiß, X. Aubert, R. Haeb-Umbach, „Progress in Large-Vocabulary, Continuous Speech Recognition“, in *Proc. in Artificial Intelligence, Progress and Prospects of Speech Research and Technology*, Munich, Germany, Sep. 1994, pp. 75-92.
- [270] X. Aubert, H. Ney, R. Haeb-Umbach, „The Philips Research System for Continuous-Speech Recognition: Overview and Evaluation on the DARPA RM Task“, In *Proc. of DARPA Speech Workshop*, Sep. 1992.