

AC measurement converters : analog and digital solutions

Märtens, Olev 2000 http://www.ester.ee/record=b1707866*est

AC measurements with digital signal processing

Märtens, Olev BEC'98 : the 6th Biennial Conference on Electronics and Microsystems Technology, October 7-9, 1998, Tallinn, Estonia : proceedings 1998 / p. 121-122 : ill

Acceleration data acquisition and processing system for structural health monitoring

Herranen, Henrik; Kuusik, Alar; Saar, Tõnis; Reidla, Marko; Land, Raul; Märtens, Olev; Majak, Jüri 2014 IEEE International Workshop On Metrology For Aerospace : May 29-30, 2014, Benevento, Italy : proceedings 2014 / p. 244-248 : ill

Acoustic spectrum analysis of genuine and counterfeit euro coins

Gavrijaševa, Alina; Märtens, Olev; Land, Raul Elektronika ir elektrotehnika = Electronics and electrical engineering 2015 / p. 54-57 : ill <https://doi.org/10.5755/j01.eee.21.3.10384> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Adaptively under sampled, circular histogram based image processing for rotation invariant coin detection

Mölder, Ago; Märtens, Olev; Saar, Tõnis BEC 2012 : 2012 13th Biennial Baltic Electronics Conference : proceedings of the 13th Biennial Baltic Electronics Conference : October 3-5, 2012, Tallinn, Estonia 2012 / p. 137-140 : ill

Adaptively undersampled image processing for fast multiline laser detection

Mölder, Ago; Märtens, Olev; Saar, Tõnis; Land, Raul 2013 IEEE 8th International Symposium on Intelligent Signal Processing (WISP 2013) : proceedings 2013 / p. 60-64 : ill [CD-ROM]

Adaptive-rate inductive impedance based coin validation

Märtens, Olev; Land, Raul; Gavrijaševa, Alina; Mölder, Ago 2011 IEEE 7th International Symposium on Intelligent Signal Processing (WISP) : Floriana, Malta, September 19-21, 2011 : proceedings 2011 / p. 122-125: ill

An ASIC for multifrequency bioimpedance analysis

Min, Mart; Holmström, Nils; Järverud, Karin; Land, Raul; Märtens, Olev; Parve, Toomas Proceedings of the XI International Conference on Electrical Bio-impedance : June 17-21, 2001, Oslo, Norway 2001 / p. 251-254 : ill

Antidictionary-based cardiac arrhythmia classification for smart ECG sensors

Duforest, Julien; Larras, Benoit; Frappe, Antoine; Deepu, John Deepu; **Märtens, Olev** 2022 IEEE International Symposium on Circuits and Systems (ISCAS) : proceedings 2022 / p. 414-418 : ill <https://doi.org/10.1109/ISCAS48785.2022.9937853> [Conference Proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Automatic detection of multisize pulmonary nodules in CT images : large-scale validation of the false-positive reduction step

Gupta, Anindya; Saar, Tõnis; Märtens, Olev; Le Moullec, Yannick Medical physics 2018 / p. 1135-1149 : ill <https://doi.org/10.1002/mp.12746> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Automatic detection of real and imaginary parts of electrical impedance with single synchronous demodulation channel

Annus, Paul; Priidel, Eiko; Land, Raul; Metshein, Margus; Krivošei, Andrei; Min, Mart; Ratassepp, Madis; Märtens, Olev 8th European Medical and Biological Engineering Conference : Proceedings of the EMBEC 2020, November 29 - December 3, 2020 Portorož, Slovenia 2021 / p. 151-157 https://doi.org/10.1007/978-3-030-64610-3_18 [Conference Proceedings at Scopus](#) [Article at Scopus](#)

Binary signals in impedance spectroscopy

Min, Mart; Ojarand, Jaan; Märtens, Olev; Paavle, Toivo; Land, Raul; Annus, Paul; Rist, Marek; Reidla, Marko; Parve, Toomas Conference proceedings : ... Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Conference 2012 / p. 134-137 : ill

Body fat proportion estimation by the segmental bioelectrical impedance analysis of forearm

Metshein, Margus; Tuulik, Varje-Riin; Tuulik, Viuu; Min, Mart; Kumm, Monika; Annus, Paul; Märtens, Olev 2024 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) : proceedings 2024 / 5 p <https://doi.org/10.1109/I2MTC60896.2024.10560671>

Capacitance measurement with MSP430 microcontrollers

Märtens, Olev; Pille, Siim; Reidla, Marko EDERC2014 : proceedings of the 6th European Embedded Design in Education and Research Conference, 11-12 September 2014, Milan, Italy 2014 / p. 260-263 : ill

Chirp signals in impedance spectroscopy

Min, Mart; Märtens, Olev; Land, Raul Book of abstracts : 16th International Conference on Electrical Bio-Impedance : 17th Conference on Electrical Impedance Tomography : ICEBI and EIT Stockholm, 19-23 June 2016 2016 / p. 72

Chirp-based impedance spectroscopy of piezo-sensors

Saar, Tõnis; Märten, Olev; Reidla, Marko; Ronk, Ants BEC 2010 : 2010 12th Biennial Baltic Electronics Conference : proceedings of the 12th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 4-6, 2010, Tallinn, Estonia 2010 / p. 339-342 : ill

Chirp-based piezo-impedance measurement

Saar, Tõnis; Reidla, Marko; Märten, Olev; Land, Raul; Min, Mart; Herranen, Henrik Proceedings : WISP'2013, 8th IEEE International Symposium on Intelligent Signal Processing 2013 / [4] p. : ill <https://ieeexplore.ieee.org/document/6657487>

Classification and denoising of objects in TEM and CT images using deep neural networks = Objektide klassifitseerimine ja müra eemaldamine TEM ja KT kujutistelt sügavate närvivõrkude abil

Gupta, Anindya 2018 <https://digi.lib.ttu.ee/i/?9954> https://www.ester.ee/record=b5056535*est

Coin recognition using line scan camera

Gavrijaševa, Alina; Märten, Olev; Land, Raul; Reidla, Marko BEC 2014 : 2014 14th Biennial Baltic Electronics Conference : proceedings of the 14th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 6-8, 2014, Tallinn, Estonia 2014 / p. 161-164 : ill

Coin validation by electromagnetic, acoustic and visual features = Müundi valideerimine elektromagnetiliste, akustiliste ja visuaalsete tunnuste järgi

Gavrijaševa, Alina 2015 <https://digi.lib.ttu.ee/i/?2408> https://www.ester.ee/record=b4480613*est

Comparison of eddy current theory and Finite Element Method for metal evaluation

Gordon, Rauno; Märten, Olev; Kolyshkin, Andrei Lecture notes on impedance spectroscopy : measurement, modeling and applications. Vol. 3 2012 / p. 41-45 : ill

Correlation between electrical bioimpedance and pressure waveform in radial artery and in mechanical pulsating pipe system

Metshein, Margus; Annus, Paul; Land, Raul; Rist, Marek; Min, Mart; Märten, Olev 2020 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2020), May 25-29, 2020, Dubrovnik, Croatia : proceedings 2020 <https://doi.org/10.1109/I2MTC43012.2020.9128972>

Cross-correlation-based image matching of coins

Gavrijaševa, Alina; Mölder, Ago; Märten, Olev; Kyrkou, C.; Theocharides, T. BEC 2012 : 2012 13th Biennial Baltic Electronics Conference : proceedings of the 13th Biennial Baltic Electronics Conference : October 3-5, 2012, Tallinn, Estonia 2012 / p. 319-322 : ill

Cross-correlation-based image matching of coins

Gavrijaševa, Alina; Mölder, Ago; Märten, Olev Info- ja kommunikatsioonitehnoloogia doktorikooli IKTDK kuuenda aastakonverentsi artiklite kogumik : 3.-5. oktoobril 2012, Laulasmaa 2012 / p. 17-20 : ill

Design and manufacturing of composite laminates with structural health monitoring capabilities

Herranen, Henrik; Majak, Jüri; Tšukrejev, Pavel; Karjust, Kristo; Märten, Olev Procedia CIRP 2018 / p. 647-652 : ill <https://doi.org/10.1016/j.procir.2018.03.128> [Conference Proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Detection of cracks in a sawblade by eddy current measurements

Märten, Olev; Land, Raul; Metshein, Margus; Abdullayev, Anar; Vennikas, Henri; Le Moullec, Yannick 2024 19th Biennial Baltic Electronics Conference (BEC) 2024 / 6 p <https://doi.org/10.1109/BEC61458.2024.10737981> [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Detection of pulmonary micronodules in computed tomography images and false positive reduction using 3D convolutional neural networks

Gupta, Anindya; Saar, Tõnis; Märten, Olev; Le Moullec, Yannick; Sintorn, Ida-Maria International Journal of Imaging Systems and Technology 2019 / p. 327-339 : ill <https://doi.org/10.1002/ima.22373> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Detection of surface defects in metals : a case study

Märten, Olev; Land, Raul; Metshein, Margus; Abdullayev, Anar; Vennikas, Henri; Le Moullec, Yannick; Rist, Marek Proceedings of the Estonian Academy of Sciences 2025

Determination of electrical conductivity of metal plates using planar spiral coils

Kolyshkin, Andrei; Kübarsepp, Toomas; Märten, Olev; Pokatilov, Andrei Recent Advances in Systems : proceedings of the 13th International Conference of Systems 2009 / p. 545-550

Digital multichannel bioimpedance analyser : signal processing approaches

Ronk, Ants; Annus, Paul; Kuusik, Alar; Land, Raul; Märten, Olev Proceedings of the 3rd European Medical & Biological

A digital multichannel bioimpedance analyser : signal processing task and its solution

Annus, Paul; Kuusik, Alar; Land, Raul; Märten, Olev; Ronk, Ants Proc. of the IEEE Instrumentation and Measurement Technology Conference : IMTC 2006 : Sorrento, Italy, April 24-27, 2006 2006 / p. 1405-1409 <https://doi.org/10.1109/IMTC.2006.328596>

Digital post-processing of the bio-impedance signal

Märten, Olev; Martin, Hannes; Min, Mart; Parve, Toomas; Ronk, Ants Proceedings of X International Conference on Electrical Bio-Impedance : ICEBI'98 : 5-9 April 1998, Barcelona 1998 / p. 445-448

Direct eddy current method for volumetric flaws of cylindrical shape

Koliškina, Valentina; Kolyshkin, Andrei; **Gordon, Rauno; Märten, Olev** ECCOMAS Congress 2016 : VII European Congress on Computational Methods in Applied Sciences and Engineering : proceedings. Vol. 1 2016 / p. 7659-7665 : ill
<https://www.eccomas2016.org/proceedings/pdf/5264.pdf>

DSP-based AC measurement unit

Märten, Olev Proceedings of the 1999 Finnish Signal Processing Symposium FINNSIG'99 : May 31, 1999, University of Oulu, Finland 1999 / p. 247-251

DSP-based device for multi-frequency bio-impedance measurement

Märten, Olev Medical & biological engineering & computing 1999 / Suppl. 1, Proceedings of the 11th Nordic-Baltic Conference on Biomedical Engineering : NBCBME'99 : June 6-10, 1999, Tallinn, Estonia, p. 165-170

A DSP-based EBI, ECG and PPG measurement platform

Abdullayev, Anar; Rist, Marek; Märten, Olev; Metshein, Margus; Larras, Benoit; Frappe, Antoine; Gautier, Antoine; Min, Mart; John, Deepu; Cardiff, Barry; Krivošei, Andrei; Annus, Paul IEEE transactions on instrumentation and measurement 2023 / art. 2007808, 8 p <https://doi.org/10.1109/TIM.2023.3320771> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

DSP-based electrical impedance tomography device: implementation and experiments

Abdullayev, Anar; Rist, Marek; Metshein, Margus; Märten, Olev 2025 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) 2025 / 6 p <https://doi.org/10.1109/I2MTC62753.2025.11079140>

A DSP-based impedance measurement device

Abdullayev, Anar; Märten, Olev; Rist, Marek; Metshein, Margus; Min, Mart; Annus, Paul 2022 18th Biennial Baltic Electronics Conference (BEC) 2022 / 5 l. <https://doi.org/10.1109/BEC56180.2022.9935588>

A DSP-based laser scanner

Saar, Tõnis; Märten, Olev BEC 2008 : 2008 International Biennial Baltic Electronics Conference : proceedings of the 11th Biennial Baltic Electronics Conference : Tallinn University of Technology : October 6-8, 2008, Tallinn, Estonia 2008 / p. 345-348 : ill

A DSP-based multichannel EBI measurement device

Abdullayev, Anar; Rist, Marek; Krivošei, Andrei; Metshein, Margus; Land, Raul; Märten, Olev 2024 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) : proceedings 2024
<https://doi.org/10.1109/I2MTC60896.2024.10560714>

DSP-based power-quality monitoring device

Märten, Olev; Trappärk, Harri; Liimets, Aivar; Nobel, Peter; Vesikimeister, Andres; Järvalt, Aldur WISP2007 proceedings : 5th IEEE International Symposium on Intelligent Signal Processing : Alcala de Henares, Madrid (Spain), October 3-5, 2007 2007 / [5] p <https://ieeexplore.ieee.org/document/4447591>

DSP-based RMS measurement converter

Märten, Olev Telekommunikatsioon '98 : rahvusvahelise telekommunikatsioonipäeva konverentsi ettekannete materjalid, 15. mai 1998 1998 / lk. 66-72: ill

ECG classification with event-driven sampling

Saeed, Maryam; **Märten, Olev**; Larras, Benoit; Frappe, Antoine; John, Deepu; Cardiff, Barry IEEE Access 2024 / p. 25188-25199
<https://doi.org/10.1109/ACCESS.2024.3364115>

Eddy current corrosion measurement of steel

Märten, Olev; Land, Raul; Min, Mart; Rist, Marek; Ferenets, Marju; Käsper, Andres International Workshop on Impedance Spectroscopy : IWIS 2016 : September 26-28, 2016, Technische Universität Chemnitz, Germany : abstract book 2016 / p. 40-41 : ill

Eddy current corrosion measurement of steel

Märten, Olev; Land, Raul; Min, Mart; Rist, Marek; Ferenets, Marju; Käsper, Andres Impedance spectroscopy : advanced

applications : battery research, bioimpedance, system design 2018 / p. 125–134 : ill <https://doi.org/10.1515/9783110558920-012>

Eddy current testing models for the analysis of corrosion effects in metal plates

Koliškina, Valentina; Kolyshkin, Andrei; **Gordon, Rauno; Märten, Olev** 19th European Conference on Mathematics for Industry : June, 13-17, 2016, Santiago de Compostela (Spain) : book of abstracts 2016 / p. 200 <http://dx.doi.org/10.15304/cc.2016.968>

Eddy current validation of Euro-coins

Gordon, Rauno; Märten, Olev; Land, Raul; Min, Mart; Rist, Marek; Gavrijaševa, Alina; Pokatilov, Andrei; Kolyshkin, Andrei
Lecture notes on impedance spectroscopy : measurement, modeling and applications. Vol. 3 2012 / p. 47-63 : ill

Elektroonsed mõõtmised inseneerias : [kõrgkooliõpik]

Märten, Olev 2022 <https://digikogu.taltech.ee/et/Item/205a1fc3-4743-4c50-9f0e-c13ce9b0649e>

Elektroonsed mõõtmised inseneerias : [kõrgkooliõpik]

Märten, Olev 2023 https://www.ester.ee/record=b5557611*est

Embedded ICG-based stroke volume measurement system : comparison of discrete-time and continuous-time architectures

Gautier, Antoine; Larras, Benoit; **Märten, Olev;** John, Deepu; Frappe, Antoine IEEE International SOC Conference 2022 / p. 46-51
<https://doi.org/10.1109/SOCC52499.2021.9739386>

Evaluation of level-crossing ADCs for event-driven ECG classification

Saeed, Maryam; Wang, Qingyuan; **Märten, Olev** IEEE Transactions on Biomedical Circuits and Systems 2021 / p. 1129-1139
<https://doi.org/10.1109/TBCAS.2021.3136206> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Evaluation of two-electrode system configurations for forearm arteries bioimpedance measurement

Metshein, Margus; Pesti, Ksenija; Lapsa, Didzis; **Annus, Paul;** Janeliukstis, Rims; Elsts, A.; **Märten, Olev** 2024 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) : proceedings 2024 / 6 p
<https://doi.org/10.1109/I2MTC60896.2024.10561178>

Event-driven ECG classification using an open-source, LC-ADC based non-uniformly sampled dataset

Saeed, Maryam; Wang, Qingyuan; **Märten, Olev;** Larras, Benoit; Frappe, Antoine; Cardiff, Barry; John, Deepu 2021 IEEE International Symposium on Circuits and Systems (ISCAS), Daegu, Korea May 22-28, 2021 : proceedings 2021 / 5 p
<https://doi.org/10.1109/ISCAS51556.2021.9401333> [Conference Proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Event-driven ECG classification using functional approximation and Chebyshev polynomials

Saeed, Maryam; **Märten, Olev;** Larras, Benoit; Frappe, Antoine; John, Deepu; Cardiff, Barry 2022 IEEE Biomedical Circuits and Systems Conference (BioCAS), 13-15 Oct. 2022 2022 / p. 595-599 <https://doi.org/10.1109/BioCAS54905.2022.9948612>

Experimental modal analysis of maritime composite panel

Gavrijaševa, Alina; Märten, Olev; Land, Raul; Saar, Tõnis; Herranen, Henrik; Majak, Jüri; Reidla, Marko; **Kuusik, Alar** BEC 2016 : 2016 15th Biennial Baltic Electronics Conference : proceedings of the 15th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 3-5, 2016, Tallinn, Estonia 2016 / p. 143-146 : ill http://www.ester.ee/record=b2150914*est

Extraction of the variable width laser line

Mölder, Ago; Märten, Olev; Saar, Tõnis; Land, Raul BEC 2014 : 2014 14th Biennial Baltic Electronics Conference : proceedings of the 14th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 6-8, 2014, Tallinn, Estonia 2014 / p. 157-160 : ill

Fast impedance spectroscopy of piezosensors for structural health monitoring

Märten, Olev; Saar, Tõnis; Min, Mart; Land, Raul; Reidla, Marko Elektronika ir elektrotehnika = Electronics and electrical engineering 2010 / 7, p. 31-34 : ill

Fast precise eddy current measurement of metals

Märten, Olev; Land, Raul; Min, Mart; Rist, Marek; Annus, Paul; Pokatilov, Andrei 2018 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2018) : proceedings 2018 / 5 p. : ill <https://doi.org/10.1109/I2MTC.2018.8409781>

Feasibility of utilizing air gapped toroidal magnetic cores for detecting pulse wave in radial artery

Metshein, Margus; Pesti, Ksenija; Min, Mart; Annus, Paul; Märten, Olev 2020 17th Biennial Baltic electronics conference, Tallinn, Estonia, October 6-8, 2020 : proceedings 2020 / 5 p. : ill <https://doi.org/10.1109/BEC49624.2020.9277197>

Feasibility study : a DM3730-based data acquisition and processing solution

Mölder, Ago; Reidla, Marko; Märten, Olev; Land, Raul EDERC 2012 : proceedings of the 5th European DSP in Education & Research Conference : 13-14 September 2012, Amsterdam, The Netherlands 2012 / p. 58-61
<https://ieeexplore.ieee.org/document/6532225>

Fiducial point estimation solution for impedance cardiography measurements

Märtens, Olev; Metshein, Margus; Abdullayev, Anar; Larras, Benoit; Frappe, Antoine; Gautier, Antoine; Saeed, Maryam; John, Deepu; Cardiff, Barry; Krivošei, Andrei; **Annus, Paul; Rist, Marek** 2022 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) 2022 / Code 180602 <https://doi.org/10.1109/I2MTC48687.2022.9806596> [Conference Proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Flexible data acquisition system with custom front-end for ultrasonic NDT research

Peng, Chengxiang; Ratassepp, Madis; Annus, Paul; Rist, Marek; Land, Raul; Märtens, Olev 2024 19th Biennial Baltic Electronics Conference (BEC) 2024 / 4 p <https://doi.org/10.1109/BEC61458.2024.10737989> [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

FPGA-based 16-bit 20 MHz device for the inductive measurement of electrical bio-impedance

Priidel, Eiko; Pesti, Ksenija; Min, Mart; Ojarand, Jaan; Märtens, Olev 2021 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2021), May 17-20, 2021 : proceedings 2021 / 5 p. : ill <https://doi.org/10.1109/I2MTC50364.2021.9460073>

Grid-based computational algorithm for accurate AC conductivity measurements

Pokatilov, Andrei; Parker, Martin; Kübarsepp, Toomas; Märtens, Olev; Kolyshkin, Andrei 16th International Congress of Metrology 2013 / p. 1-4 : ill

Hankel matrix based algorithm for cardiac pulse wave base and peak lines Correction

Krivošei, Andrei; Min, Mart; Annus, Paul; Märtens, Olev; Metshein, Margus; Lotamõis, Kristina; Rist, Marek IEEE International Workshop on Medical Measurement and Applications (MEMEA) 2022 / 6 p <https://doi.org/10.1109/MeMeA54994.2022.9856564>

High-accuracy eddy current measurements of metals

Märtens, Olev; Land, Raul; Rist, Marek; Pokatilov, Andrei 2014 IEEE International Workshop On Metrology For Aerospace : May 29-30, 2014, Benevento, Italy : proceedings 2014 / p. 155-160 : ill

High-performance analogue measurement using internal enhanced PWM and ADC of a DSP-chip

Märtens, Olev; Min, Mart; Trampärk, Harri; Liimets, Aivar WISP2007 proceedings : 5th IEEE International Symposium on Intelligent Signal Processing : Alcala de Henares, Madrid (Spain), October 3-5, 2007 2007 / [5] p <https://ieeexplore.ieee.org/document/4447593>

Image based counterfeit coin validation

Gavrijaševa, Alina; Märtens, Olev BEC 2014 : 2014 14th Biennial Baltic Electronics Conference : proceedings of the 14th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 6-8, 2014, Tallinn, Estonia 2014 / p. 153-156 : ill

Image processing in the woodworking industry : challenges, solutions and platforms

Mölder, Ago; Märtens, Olev Elektronika ir elektrotehnika = Electronics and electrical engineering 2011 / p. 43-46 : ill

Image processing solutions for precise road profile measurement systems = Pilditöötluse lahendused täpsetele tee profiili mõõtesüsteemidele

Mölder, Ago 2015 https://www.ester.ee/record=b4476678*est

Impedance cardiography signal processing with Savitzky-Golay and frequency sampling kernels

Märtens, Olev; Metshein, Margus; Tamberg, Gert; Abdullayev, Anar 2022 18th Biennial Baltic Electronics Conference (BEC) 2022 / 5 l. <https://doi.org/10.1109/BEC56180.2022.9935597>

Impedance measurement solution based on the high time resolution DSP

Märtens, Olev; Land, Raul; Min, Mart; Annus, Paul; Rist, Marek 2020 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2020), May 25-29, 2020, Dubrovnik, Croatia : proceedings 2020 <https://doi.org/10.1109/I2MTC43012.2020.9128843>

Improved impedance analyzer with binary excitation signals

Märtens, Olev; Land, Raul; Min, Mart; Annus, Paul; Rist, Marek; Reidla, Marko 2015 IEEE 9th International Symposium on Intelligent Signal Processing (WISP 2015) : Siena, Italy, 15-17 May 2015 : [proceedings] 2015 / p. 25-29 : ill

Improved PWM-based sinewave generation : example of the impedance measurement

Abdullayev, Anar; Annus, Paul; Krivošei, Andrei; Metshein, Margus; Märtens, Olev; Rist, Marek Automatic control and computer sciences 2023 / p. 449-458 <https://doi.org/10.3103/S0146411623050024> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Induction brazing of cermets to steel and eddy current testing of joint quality

Laansoo, Andres; Kübarsepp, Jakob; Surženkov, Andrei; Land, Raul; Märtens, Olev; Viljus, Mart Welding in the World 2020 / p. 563-571 <https://doi.org/10.1007/s40194-020-00854-x> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Infotehnoloogia teaduskond

Gordon, Boris; Velmre, Enn; Einer, Lauri; Tamm, Uljas; Meister, Ants; Korsen, Viljo; Märtens, Olev; Parve, Toomas; Ubar, Raimund-Johannes; Min, Mart Leiutajaid ja leiutisi Tallinna Tehnikaülikoolis 1922-2007 2008 / lk. 34-47 : ill
https://www.ester.ee/record=b2412718*est

Inhomogeneity correction in calibration of electrical conductivity standards

Pokatilov, Andrei; Parker, Martin; Kolyshkin, Andrei; Märtens, Olev; Kübarsepp, Toomas Measurement 2013 / p. 1535-1540 : ill
<https://doi.org/10.1016/j.measurement.2012.12.007> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Investigation of planar coil for eddy current conductivity measurements in wide frequency range

Parker, Martin; Pokatilov, Andrei; Kübarsepp, Toomas; Märtens, Olev; Kolyshkin, Andrei 19th Symposium IMEKO TC 4 Symposium and 17th IWADC Workshop Advances in Instrumentation and Sensors Interoperability, July 18-19, 2013, Barcelona, Spain 2013 / p. 55-59

60 aastat elektroonikainstituuti : 1962-2022

2023 https://www.ester.ee/record=b5557188*est

Laser line detection with sub-pixel accuracy

Mölder, Ago; Märtens, Olev; Saar, Tõnis; Land, Raul Elektronika ir elektrotehnika = Electronics and electrical engineering 2014 / p. 132-135 : ill <https://doi.org/10.5755/j01.eee.20.5.7114> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Laser scanner calibration dependency on the line detection method

Mölder, Ago; Märtens, Olev; Saar, Tõnis; Land, Raul Elektronika ir elektrotehnika = Electronics and electrical engineering 2015 / p. 66-69 : ill <https://doi.org/10.5755/j01.eee.21.6.13765> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Lock-in integration for detection of tiny bioimpedance variations [Online resource]

Priidel, Eiko; Annus, Paul; Metshein, Margus; Land, Raul; Märtens, Olev; Min, Mart BEC 2018 : 2018 16th Biennial Baltic Electronics Conference (BEC) : proceedings of the 16th Biennial Baltic Electronics Conference, October 8-10, 2018 2018 / 4 p. : ill
<https://doi.org/10.1109/BEC.2018.8600965>

Lock-in measurement of bio-impedance variations

Min, Mart; Märtens, Olev; Parve, Toomas Measurement 2000 / 1, p. 21-28

Lock-in measurement of the hand-hand bio-impedance

Min, Mart; Haldre, H.; Härm, Härmo; Märtens, Olev; Märtin, Hannes; Parve, Toomas; Ronk, Ants 8th International IMEKO Conference on Measurement in Clinical Medicine Biomedical Measurement and Instrumentation & 12th International Symposium on Biomedical Engineering, Dubrovnik, Croatia, September 16-19, 1998 : proceedings 1998 / p. 2.49-2.52

Measurement of the electric conductivity of highly conductive metals with 4-electrode impedance method

Gordon, Rauno; Rist, Marek; Märtens, Olev; Min, Mart Lecture notes on impedance spectroscopy : measurement, modeling and applications. Vol. 1 2011 / p. 35-40 <https://www.taylorfrancis.com/chapters/edit/10.1201/b11339-8/measurement-electric-conductivity-highly-conductive-metals-4-electrode-impedance-method-gordon-rist-m%C3%A4rtens-min>

Methods for detection of bioimpedance variations in resource constrained environments

Priidel, Eiko; Annus, Paul; Krivošei, Andrei; Rist, Marek; Land, Raul; Min, Mart; Märtens, Olev Sensors 2020 / art. 1363, 16 p. : ill <https://doi.org/10.3390/s20051363> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Methods for increased sensitivity and scope in automatic segmentation and detection of lung nodules in CT images

Gupta, Anindya; Märtens, Olev; Le Moullec, Yannick; Saar, Tõnis The 15th IEEE International Symposium on Signal Processing and Information Technology ISSPIT 2015 : December 7-10, 2015, Abu Dhabi, UAE : proceedings 2015 / p. 370-375 : ill

Militaarobjektide valvetehnoloogia areng

Udal, Andres; Kaugerand, Jaanus; Savimaa, Raul; Märtens, Olev Sõjateadlane = Estonian journal of military studies 2023 / lk. 194-224 : ill <https://www.kvak.ee/sojateadlane22/> https://www.ester.ee/record=b4555087*est

Modular system for fast impedance spectrum analysis of biomedical objects

Rist, Marek; Reidla, Marko; Märtens, Olev; Land, Raul; Min, Mart; Parve, Toomas; Annus, Paul XVth International Conference on Electrical Bio-Impedance (ICEBI) and XIVth Conference on Electrical Impedance Tomography (EIT) : 22-25 April 2013, Heilbad Heiligenstadt : abstracts 2013 / p. 151 : ill

Modular system for spectral analysis of time-variant impedances

Rist, Marek; Reidla, Marko; Land, Raul; Parve, Toomas; Märtens, Olev; Annus, Paul; Ojarand, Jaan; Min, Mart 6th European Conference of the International Federation for Medical and Biological Engineering : MBEC 2014, 7-11 September 2014, Dubrovnik, Croatia 2015 / p. 858-861 : ill https://doi.org/10.1007/978-3-319-11128-5_213 [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Multi-frequency and multi-channel bio-impedance measurement solution [Electronic resource]

Märtens, Olev; Min, Mart; Land, Raul; Annus, Paul Proceedings of 7th Nordic Signal Processing Symposium (NORSIG 2006) : Reykjavik, Iceland, June 7-9, 2006 2006 / [4] p. [CD-ROM] <https://ieeexplore.ieee.org/document/4052217>

Multi-frequency bioimpedance measurement : undersampling approach

Märtens, Olev; Min, Mart Proceedings of the 6th Nordic Signal Processing Symposium : NorSig 2004 : June 9-11, 2004, Espoo, Finland 2004 / p. 145-148

Multifrequency vector impedance measurement: undersampled DFT with noise pre-filtering

Märtens, Olev; Min, Mart BEC 2006 : 2006 International Baltic Electronics Conference : Tallinn University of Technology, October 2-4, 2006, Tallinn, Estonia : proceedings of the 10th Biennial Baltic Electronics Conference 2006 / p. 217-220 : ill

Multisine dynamic EBI spectrum analyser for in vivo experiments

Min, Mart; Märtens, Olev; Parve, Toomas Medical & biological engineering & computing 1999 / Suppl. 2, Proceedings of the European Medical & Biomedical Engineering Conference : EMBEC'99 : November 4-7, 1999, Vienna, Austria. Part 1, p. 144-145

Non-standard electrode placement strategies for ECG signal acquisition

Metshein, Margus; Krivošei, Andrei; Abdullayev, Anar; Annus, Paul; Märtens, Olev Sensors 2022 / art. 9351 <https://doi.org/10.3390/s22239351> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Nonuniform sampling and demodulation for wideband multi-frequency bioimpedance measurements

Min, Mart; Bilinskis, Ivars; Artyukh, Y.; Annus, Paul; Land, Raul; Märtens, Olev Proceedings of the "2007 Workshop on digital Alias-free Signal Processing" (WDASP'07) : 17 April 2007, London, UK 2007 / [7] p

On-Desk Model-Based Study for Evaluating the Effect of Squeezing the Arteries in the Forearm on the Bioimpedance and Pressure of Blood

Metshein, Margus; Annus, Paul; Land, Raul; Rist, Marek; Min, Mart; Lotamõis, Kristina; Märtens, Olev Journal of sensors 2023 / art. 5710835 <https://doi.org/10.1155/2023/5710835> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Parameter estimation by sparse reconstruction with wideband dictionaries = Signaali parameetrite hindamine kasutades hajusat taastamist laiaribaliste sõnastikega

Butsenko, Maksim 2018 <https://digi.lib.ttu.ee/ii/?11199> https://www.ester.ee/record=b5176162*est

Phase-increment sampling in chirp signal based impedance measurements

Märtens, Olev; Min, Mart; Land, Raul; Ojarand, Jaan; Rist, Marek Sampling Theory and Applications 2017 : 12th International Conference : Tallinn, Estonia, July 3-7 : program and abstracts 2017 / p. 65

Phase-increment sampling in chirp signal based impedance measurements [Electronic resource]

Märtens, Olev; Min, Mart; Land, Raul; Ojarand, Jaan; Rist, Marek 2017 International Conference on Sampling Theory and Applications (SampTA) : 12th International Conference : Tallinn, Estonia, July 3-7 : [abstracts] 2017 / p. 66. [USB]

Phase-increment sampling in chirp signal based impedance measurements [Online resource]

Märtens, Olev; Min, Mart; Land, Raul; Ojarand, Jaan; Rist, Marek 2017 International Conference on Sampling Theory and Applications (SampTA) : 12th International Conference : Tallinn, Estonia, July 3-7 : [proceedings] 2017 / p. 604-608 : ill <https://doi.org/10.1109/SAMPTA.2017.8024393>

Phase-sensitive detectors

Märtens, Olev IEEE transactions on instrumentation and measurement 2000 / 5, p. 1046-1049

Photoplethysmography as an alternative to impedance cardiography-based hemodynamic feature point detection

Metshein, Margus; Annus, Paul; Abdullayev, Anar; Krivošei, Andrei; Land, Raul; Märtens, Olev 2024 19th Biennial Baltic Electronics Conference (BEC) 2024 / 5 p <https://doi.org/10.1109/BEC61458.2024.10737936> [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Piccolo-stick and pcb-coil based simple coin validator

Reidla, Marko; Märtens, Olev; Land, Raul; Rist, Marek EDERC 2012 : proceedings of the 5th European DSP in Education & Research Conference : 13-14 September 2012, Amsterdam, The Netherlands 2012 / p. 81-84 <https://ieeexplore.ieee.org/document/6532230>

PLL-based extraction of the cardiac component from the bio-impedance signal

Märtens, Olev; Min, Mart; Annus, Paul; Land, Raul; Krivošei, Andrei; Metshein, Margus 2018 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2018) : proceedings 2018 / 6 p. : ill <https://doi.org/10.1109/I2MTC.2018.8409848>

Precise eddy current impedance measurement of metal plates

Märtens, Olev; Gordon, Rauno; Rist, Marek; Min, Mart; Pokatilov, Andrei; Kolyshkins, A. Lecture notes on impedance

spectroscopy : measurement, modeling and applications. Vol. 1 2011 / p. 43-45

<https://www.taylorfrancis.com/chapters/edit/10.1201/b11339-10/precise-eddy-current-impedance-measurement-metal-plates-m%C3%A4rtens-gordon-rist-min-pokatilov-kolyshkins>

Precise eddy current measurements : improving accuracy of determining of electrical conductivity of metal plates

Märtens, Olev; Land, Raul; Gordon, Rauno; Min, Mart; Rist, Marek; Pokatilov, Andrei Lecture notes on impedance

spectroscopy : measurement, modeling and applications. Vol. 4 2014 / p. 109-115 : ill

Precise mixed signal synchronous detector with spectrally improved binary switching

Märtens, Olev 6th IEEE International Symposium on Intelligent Signal Processing : WISP 2009 : 26-28 August 2009, Budapest 2009

/ p. 77-80 : ill <https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=5286575>

Precise synchronous detectors

Märtens, Olev Ringhääling '99 : VI Rahvusvahelise Telekommunikatsioonipäeva konverentsi ettekannete materjalid 1999 / lk. 74-79:

ill

A preliminary computer-aided technique for CT based lung segmentation

Gupta, Anindya; Märtens, Olev; Le Moullec, Yannick Proceedings of the 8th Annual Conference of the Estonian National Doctoral School in Information and Communication Technologies : December 5-6, 2014, Rakvere 2014 / p. 43-46 : ill

Pseudorandom sampling in a multi-frequency bioimpedance analyser

Märtens, Olev; Min, Mart BEC 2002 : proceedings of the 8th Biennial Baltic Electronics Conference : October 6-9, 2002, Tallinn, Estonia 2002 / p. 253-256 : ill

Pöörisvool tuvastab völtsmündid ja liigutab hõljukronge

Vill, Ants Director. Inseneeria 2021 / lk. 74-80 : fot https://www.ester.ee/record=b1519314*est <https://director.ee/2021/09/01/poorisvool-tuvastab-voltsmundid-ja-liigutab-holjukronge/>

QUADRA impedance spectroscopy devices for dynamic measurements of bio-objects

Rist, Marek; Reidla, Marko; Märtens, Olev; Min, Mart; Annus, Paul; Land, Raul; Parve, Toomas 34th Annual International IEEE EMBS Conference : August 28 - September 1, 2012, Hilton Bayfront Hotel in San Diego, California, USA : abstracts 2012 / p. 557 : ill

Quantization of the response signal differences for the electrical bioimpedance measurement

Annus, Paul; Land, Raul; Priidel, Eiko; Metshein, Margus; Min, Mart; Märtens, Olev EMBEC & NBC 2017 : joint conference of the European Medical and Biological Engineering Conference (EMBEC) and the Nordic-Baltic Conference on Biomedical Engineering and Medical Physics (NBC), Tampere, Finland, June 2017 2018 / p. 290-293 : ill https://doi.org/10.1007/978-981-10-5122-7_73 [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

A sampling multichannel bioimpedance analyzer for tissue monitoring

Min, Mart; Land, Raul; Märtens, Olev; Parve, Toomas; Ronk, Ants Proc. of the 26. Annual International Conference of the IEEE EMBS : September 1-5, 2004, San Francisco, California, USA 2004 / p. 902-905

Sensor-location-specific joint acquisition of peripheral artery bioimpedance and photoplethysmogram for wearable applications

Metshein, Margus; Abdullayev, Anar; Gautier, Antoine; Larras, Benoit; Frappe, Antoine; Cardiff, Barry; Annus, Paul; Land, Raul; Märtens, Olev Sensors 2023 / art. 7111 <https://doi.org/10.3390/s23167111> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Signal acquisition and algorithm design for bioimpedance-based heart rate estimation from the wrist

Lapsa, Didzis; **Metshein, Margus; Krivošei, Andrei; Janeliukstis, Rims; Märtens, Olev; Elsts, Atis** Applied sciences 2024 / art. 9632 <https://doi.org/10.3390/app14219632> [Journal proceedings at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Simple acoustical signature based coin validation

Märtens, Olev; Gavrijaševa, Alina; Land, Raul; Min, Mart 2015 IEEE 9th International Symposium on Intelligent Signal Processing (WISP 2015) : Siena, Italy, 15-17 May 2015 : [proceedings] 2015 / p. 120-123 : ill

Simple DSP interface for impedance spectroscopy of piezo-sensors

Märtens, Olev; Reidla, Marko; Saar, Tõnis BEC 2010 : 2010 12th Biennial Baltic Electronics Conference : proceedings of the 12th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 4-6, 2010, Tallinn, Estonia 2010 / p. 343-344 : ill

Simplified DFT with sorted accumulation of input samples

Märtens, Olev BEC 2008 : 2008 International Biennial Baltic Electronics Conference : proceedings of the 11th Biennial Baltic Electronics Conference : Tallinn University of Technology : October 6-8, 2008, Tallinn, Estonia 2008 / p. 329-332 : ill

Slope-based event-driven feature extraction for cardiac arrhythmia classification

Duforest, Julien; Larras, Benoit; John, Deepu; **Märtens, Olev; Frappe, Antoine** 2021 IEEE Biomedical Circuits and Systems

Soojussaarte hindamine Eesti linnades 2014-2019

Märtens, Olev; Pärn, Riina; Služenikina, Jekaterina 2020 https://keskkonnaportaali.ee/sites/default/files/2024-08/2020_02_22_om_kka_report.pdf

Sparse reconstruction method for separating cardiac and respiratory components from electrical bioimpedance measurements

Butsenko, Maksim; Märtens, Olev; Krivošei, Andrei; Le Moullec, Yannick Elektronika ir elektrotehnika = Electronics and electrical engineering 2018 / p. 57-61 : ill <https://doi.org/10.5755/j01.eie.24.5.21844> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Study of electrode locations for joint acquisition of impedance- and electro-cardiography signals

Metshein, Margus; Gautier, Antoine; Larras, Benoit; Frappe, Antoine; John, Deepu; Cardiff, Barry; **Annus, Paul; Land, Raul; Märtens, Olev** 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC) Oct 31 - Nov 4, 2021 : virtual conference 2021 / p. 7264-7267 : ill <https://doi.org/10.1109/EMBC46164.2021.9629504> [Conference Proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Study of various excitation and reference signals for pulsed correlation-based ultrasound signal processing

Märtens, Olev; Saar, Tõnis; Reidla, Marko Elektronika ir elektrotehnika = Electronics and electrical engineering 2010 / 9, lk. 89-92 : ill https://www.researchgate.net/publication/268043244_Study_of_Various_Excitation_and_Reference_Signals_for_Pulsed_Correlation-based_Ultrasound_Signal_Processing

A survey on open-access reference image database for lung cancer

Gupta, Anindya; Märtens, Olev; Le Moullec, Yannick Proceedings of the 8th Annual Conference of the Estonian National Doctoral School in Information and Communication Technologies : December 5-6, 2014, Rakvere 2014 / p. 47-50 : ill

Synchronization algorithm for RFID-reader and its implementation

Märtens, Olev; Liimets, Aivar; Kuusik, Alar 2015 Advances in Wireless and Optical Communications RTUWO : 5-6 November 2015, Riga, Latvia : proceedings 2015 / p. 82-85 : ill <https://doi.org/10.1109/RTUWO.2015.7365725>

Teaduse ja ülikoolide rahastamisest tehnikateaduse poolelt

Märtens, Olev Sirp 2021 / lk. 15 <https://www.sirp.ee/s1-artiklid/c21-teadus/vastukaja-teaduse-ja-ulikoolide-rahastamisest-tehnikateaduse-poolt/>

The piezo-electric impedance spectroscopy : solutions and applications = Piesoelektriline impedants-spektroskoopia : lahendused ja rakendused

Saar, Tõnis 2013 https://www.eester.ee/record=b2967240*est

TMS320F2811-based multi-frequency multi-channel bio-impedance measurement device

Märtens, Olev; Min, Mart; Land, Raul; Liimets, Aivar; Trampärk, Harri; Annus, Paul EDERS 2008 : 3rd European DES Education & Research Symposium : proceedings : Tel Aviv, Israel, 18th June 2008 / p. 179-183. [CD-ROM]

TMS320F28069-based impedance spectroscopy with binary excitation

Rist, Marek; Reidla, Marko; Min, Mart; Parve, Toomas; Märtens, Olev; Land, Raul EDERC 2012 : proceedings of the 5th European DSP in Education & Research Conference : 13-14 September 2012, Amsterdam, The Netherlands 2012 / p. 217-220 <https://ieeexplore.ieee.org/document/6532258>

TMS320F28335-based high-accuracy complex network analyzer instrument

Reidla, Marko; Märtens, Olev; Land, Raul EDERC 2012 : proceedings of the 5th European DSP in Education & Research Conference : 13-14 September 2012, Amsterdam, The Netherlands 2012 / p. 44-47 <https://ieeexplore.ieee.org/abstract/document/6532222>

TMS320F28335-based piezosensor monitor-node

Märtens, Olev; Saar, Tõnis; Reidla, Marko EDERC2010 European DSP in Education and Research Conference : proceedings, (Nice, France, Dec 1-2, 2010) 2010 / p. 62-65 <https://ieeexplore.ieee.org/document/6151408>

A tool for lung nodules analysis based on segmentation and morphological operation

Gupta, Anindya; Märtens, Olev; Le Moullec, Yannick; Saar, Tõnis 2015 IEEE 9th International Symposium on Intelligent Signal Processing (WISP 2015) : Siena, Italy, 15-17 May 2015 : [proceedings] 2015 / p. 193-197 : ill <http://dx.doi.org/10.1109/WISP.2015.7139186>

Unsupervised feature mapping via stacked sparse autoencoder for automated detection of large pulmonary nodules in CT images

Gupta, Anindya; Saar, Tõnis; Märtens, Olev; Le Moullec, Yannick Elektronika ir elektrotehnika = Electronics and electrical engineering 2017 / p. 59-63 : ill <https://doi.org/10.5755/j01.eie.23.6.19695> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Urban temperatures in Estonia 2014-2024 by Landsat data

Vint, Kairi; **Märtens, Olev**; Služenikina, Jekaterina Conference Program : 7th Winter Satellite Workshop 2025 / 2 p
<https://drive.google.com/file/d/1O04gQvxOtypWq6Wu02oWrVdZtlxO4POr/view?pli=1>

Uus sensorsignaaltöötluse õppetool : [elektroonikainstituudi rakenduselektroonika õppetooli muutmisest sensorsignaaltöötluse õppetooliks]

Märtens, Olev Mente et Manu 2009 / 16. jaan., lk. 2 : fot https://www.ester.ee/record=b1242496*est

Variable-resolution image processing for validation of coins

Märtens, Olev; Saar, Tõnis; Gavrijaševa, Alina; Mölder, Ago 2011 IEEE 7th International Symposium on Intelligent Signal Processing (WISP) : Floriana, Malta, September 19-21, 2011 : proceedings 2011 / p. 176-179: ill
<https://ieeexplore.ieee.org/document/6051711>

Verification of performance of commercial LCR meters

Satrapinski, Alexandre; **Kübarsepp, Toomas; Märtens, Olev** Conference on Precision Electromagnetic Measurements, DCC, Daejeon, Korea 2010 <https://ieeexplore.ieee.org/document/5545242>