Expression of interest for research cooperation in Horizon 2020

Description of institution

Interestedinstitution:	AGH - University of Science & Technology
Department carrying out the proposed research	Department of Measurement & Electronics Signal processing team
Adress and webpage	http://www.kmet.agh.edu.pl/ http://www.kmet.agh.edu.pl/?lang=en
Contact person (name, e-mail address, phone)	Dr hab. inż. Krzysztof Duda kduda@agh.edu.pl

Research offer

Brief description of the department (key research facilities, infrastructure, equipment)

Signal processing team is experienced in development and application of frequency and damping estimation methods and signal compression. We developed new interpolated Discrete Fourier Transform (IpDFT) algorithms,new Flat-Top Windows(FTWs), and new lossless predictive coding methods. IpDFT algorithms were designed for single-frequency and multi-frequency sinusoidal and damped sinusoidal signals and applied in mechanical spectroscopy, Nuclear Magnetic Resonance spectroscopy, phasor estimation and power quality evaluation. FTWs were used for evaluation of narrow-band discrete-time Hilbert transform and applied in phasor estimation in Phasor Measurement Unit (PMU) model,as defined by IEEE Standard C37.118.1 with the Amendment 1. In the near future it is planned to apply our experience for Smart Grid purposes specifically for: phasor estimation, harmonic phasor estimation, power quality assessment, and dealing with Big Data problem having place in Smart Grid measurement layer.

Scientific area

☐	Chemistry	☐	Social Sciences and Humanities
☐	Economic Sciences	X	Information Science and Engineering
☐	Environment and Geosciences	☐	Life Sciences
☐	Mathematics	☐	Physics

Research field

Frequency and damping estimation.
Interpolated Discrete Fourier Transform (IpDFT).
Phasor estimation.
Phasor Measurement Unit (PMU) design and application.
Lossless and lossy signal compression.

The proposed research/project description

1. Smart Grid measurement layer development:
a) Design, validation and application of PMUs in distribution networks,
b) Handling the Big Data problem in PMUs measurements.
2. Power Quality evaluation.
3. Frequency analysis of measurement data.
4. Dedicated signal compression.

Additional information (key Persons and Expertise; additional trainings, research programme, other)

Selected JCR papers:

K. Duda: *Lossless predictive coding of electric signal waveforms*, Turk J Elec Eng&Comp Sci. 2017 vol. 25 no. 5, pp. 3540–3552.

T. P. Zieliński, K. Duda, K. Ostrowska: *Fast MinMax energy based phase correction method for NMR spectra with linear chase distortion*, Journal of Magnetic Resonance 281, 2017, pp. 104-117.

K. Duda, T. P. Zieliński, Sz. H. Barczentewicz: *Perfectly flat-top and equiripple flat-top cosine Windows.* IEEE Trans. Instrum. Meas., vol. 65 iss. 7, 2016, pp. 1558–1567.

K. Duda, T. P. Zieliński: *Fir filters compliant with the IEEE standard for M class PMU.* Metrology and Measurement Systems, vol. 23 no. 4, 2016, pp. 623-636.

K. Duda, Sz. Barczentewicz: *Interpolated DFT for* $\sin^{\alpha}(x)$ *Windows.* IEEE Trans. Instrum. Meas., vol. 63 no. 4, 2014, pp. 754–760.

K. Duda, T. P. Zieliński: *Efficacy of the frequency and damping estimation of a real-value sinusoid.* IEEE Instrumentation & Measurement Magazine, vol. 16, iss. 2, 2013, pp. 48–58.

T. P. Zieliński, K. Duda: *Frequency and damping estimation methods – an overview.* Metrology and Measurement Systems, vol. 18, no. 4, 2011, pp. 505–528.

K. Duda, L. B. Magalas, M. Majewski, T. P. Zieliński: *DFT based Estimation of Damped Oscillation's Parameters in Low–frequency Mechanical Spectroscopy*. IEEE Trans. Instrum. Meas., vol. 60, no. 11, 2011, pp. 3608–3618.

K. Duda: *DFT Interpolation Algorithm for Kaiser–Bessel and Dolph–Chebyshev Windows*. IEEE Trans. Instrum. Meas., vol. 60, no. 3, Mar. 2011, pp. 784–790.

K. Duda: *Accurate, Guaranteed–Stable, Sliding DFT*. IEEE Signal Processing Mag., November 2010, pp. 124–127.

K. Duda, D. Borkowski, A. Bień: *Computation of the network harmonic impedance with Chirp–Z transform*. Metrology and Measurement Systems vol. 16 no. 2, 2009, pp. 299–311.

K. Duda: *Lifting based compression algorithm for power system signals*. Metrology and Measurement Systems, vol. 15 no. 1, 2008, pp. 69–83.

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