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Faculty of Electrical and Computer Engineering

SUMMARY OF THE DOCTORAL DISSERTATION

ESTIMATION OF THE CONDITIONAL AVERAGE VALUE OF ELECTRICAL CORRELATED SIGNALS IN SELECTED MEASUREMENT APPLICATIONS

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The development of measurement applications in science and technology increa-ses the requirements for metrology.In technical and research work, signals sampled at high sampling rates are used. This results in statistically related (correlated) signals. There are few research studies that take statistical relation into account. Failure to take statistical relation into account may result in overestimated or underestimated test re-sults. In the analysis of statistically related signals, correlation methods are most often used. Analyzes based on the correlation function are complex. An alternative to correla-tion methods is the conditional average value, which is relatively easy in practical ap-plications and in mathematical notation. Conditional averaging can be used to study linear and nonlinear signal transformations.

The goals of the doctoral dissertation are to search for less complicated algo-rithms in the statistical analysis of electrical signals in measurement applications.The research goals of the dissertation are: simplifying mathematical models in signal ana-lysis, striving to obtain more accurate research results, lower or comparable costs and analysis time than for applications of correlation functions. The author used the condi-tional average value in signal and object identification tasks. Physical low-band noises with exponential and oscillation-exponential correlation were investigated. The noises had near-normal probability distributions. The processing systems were: a first-order inertial system and a second-order oscillatory system. Computer modeling of signals with given statistical characteristics was also carried out. Conditional averaging was used to evaluate the degree of statistical relation. The author proposed their own crite-ria for assessing correlation. The conditional average value was used to statistically describe the series of measurement results. The analysis shows that the accuracy of the evaluation of the normalized autocorrelation function using conditional averaging is the highest for strong correlation. The opposite is true with the autocorrelation func-tion determined classically. The conditional average value was used to determine and study correlation intervals. Knowing the correlation interval allows you to determine the uncertainty value of the arithmetic mean. The uncertainty value of the arithmetic mean using WWS is close to the uncertainty value for FA. The conditional average value can be used in the reconstruction of continuous random signals, measurements of transport delay, impulse response and parameters of the processing system.

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