CONTENTS AND ABSTRACTS

RADIO ENGINEERING AND RADAR

Key words: multispectral vision system, image fusion, principal component analysis, signal to noise ratio, modified gray level variance, image quality measures.

We consider the problem of image fusion by multispectral vision system in which quality criterion is peak signal-to-noise ratio. The aim of the work is to develop a fusion algorithm that allows creating an image that is comfortable for a subjective observer, even if the image in one of the channels of multispectral vision system contains powerful high-frequency noise component. Experimental results show that the algorithm developed provides the gain in a peak signal-to-noise ratio by 3.4 and 4.6 times compared with the known fusion methods based on principal component analysis and arithmetic mean calculation respectively.

Key words: MEMS accelerometer calibration, Gauss – Newton method, Levenbergh – Marquardt method.

The aim of the work is a comparative analysis of Gauss – Newton and Levenberg – Marquardt optimization algorithms in the calibration problem of triaxial micro electromechanical accelerometer. A mathematical description of these algorithms is given; their advantages and disadvantages in solving the problem of optimizing the parameters of a simplified mathematical model of triaxial micro electromechanical accelerometer by the criterion of minimum error squared are noted. It is shown that with identical parameters of the model, Levenberg – Marquardt algorithm requires an average of 30 % more iterations to complete than Gauss – Newton algorithm, however, when applied, the error in estimating the elements of the vector of calibration parameters decreases by 20-30 %.

Key word: directional coupler, electrodynamics and circuit modeling, phase-shifting circuit with distributed and lumped parameters, data from a machine experiment, divider-combiner power, submodules of power amplifiers of L, S and X-band.

The problem of electrodynamics and circuitry modeling of a three-stage three-decibel microstrip directional coupler with phase-shifting circuit between sections is considered. The aim is to research the original design solutions of three-stage directional couplers with a phase-shifting circuit between quarter-wave sections. The possibility of eliminating jumpers between sections due to the use of phase-shifting circuit with distributed and lumped parameters to increase the manufacturability and stability of the parameters of directional couplers with strong coupling is justified. The correctness of the simulation results obtained is confirmed by a comparative analysis of machine experiment data and the introduction of directional couplers into the submodules of power amplifiers of L, S and X-ranges.

Key words: small-signal model of transistor, noise model of transistor, noise figure, smoothing technique, low noise amplifier.

The problem of preliminary processing of measurement results of a microwave transistor in terms of building a small-signal noise model with subsequent application of these models in de-

MATHEMATIC AND SOFTWARECOMPUTER SYSTEMS AND COMPUTER NETWORKS

INTELLIGENT INFORMATION SYSTEMS AND TECHNOLOGIES

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PHYSICAL ELECTRONICS AND NANOELECTRONICS

The aim of this work is to identify the main reasons for the decrease in efficiency of «blue» GaN/InGaN chips with quantum wells and light output of powerful single crystal SWL based on them - TDS-P003L4U10 (3 W, 220 Lm), Cree XM-L2 (10 W, 1040 Lm), identification of best operating conditions and development of recommendations to improve SWL quality. The results of measuring relative brightness of chips blue radiation and total brightness of SWL white color formed by the radiation of chip and photoluminophore are presented. Calculation of change in diode voltage was carried out taking into account the dependence of free carriers concentration, band gap, and the density of states on temperature. It was revealed that in TDS-P003L4U10 the CVC deviation and decrease in efficiency are caused by increasing (0,6-0,86) Om resistance of contact wires connecting the crystal with high-current output with increasing current (temperature) and in Cree XM-L2 – decreasing with increasing series resistance (0,46-0,24) Om of GaN layers (p, n) and substrate. The calculated efficiency value at operating currents for TDS-P003L4U10 (0,7 A) is 0,82, for Cree XM-L2 at the current of 0,7 A – 0,91, and at 3 A – 0,79. The decrease in relative light output is also associated with CVC deviation.

Key words: gas discharge indicator, delay time of discharge occurrence, exponential distribution, estimation of average delay time, sample size, errors of statistical estimates, histogram, confidence interval, statistical modeling.

Temporal processes in gas-discharge matrix indicators, both under autonomous excitation of elements and under ionization conditions, are quite accurately described by exponential distribution. The aim of this work is to analyze methods for calculating the number of elements in a sample that provide determination of ignition delay times statistics. Methods for calculating a sample size for estimating mathematical expectation of delay time, the number of measurements and the quantity of histogram intervals, which ensure that experimental distribution agrees with exponential parametric and nonparametric methods, and that the histogram is presented with necessary accuracy, are considered. Confidence intervals of mathematical expectation estimates, displacements and probabilities of random values falling into the histogram intervals are defined. Recommendations to determine sample size needed to build a histogram and to estimate mathematical expectation are formulated. The accuracy of the results was confirmed by statistical modeling.

Key words: EKV model, semiconductor device modeling, analog IC designing, MOS transistor, CAD Cadence Virtuoso.

This paper provides a brief description of the algorithm for extracting and selecting parameters of the EKV model of the MOS transistor. The aim of the article is develop program to convert the BSIM model to the EKV model based on the original methodology for extracting parameters of a compact model developed at the Ecole polytechnique federale de Lausanne. In this work SPICE model for standards 0.35 microns technology from XFAB was converted. Converted EKV model well correlated with the simulation data of the BSIM model. Based on the EKV compact model, parameters were extracted for the simplified EKV model for manual calculations. In the future, the resulting models can be used in the design of low-voltage analog circuits and RF circuits.