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This book is the current 39-th issue of the Riga Technical University collection of scientific articles "Boundary Field Problems and Computers". This one contains materials about modelling of various objects: the optical guides, the signal processing, the computer diagnostics and the hydrogeological environment simulation.

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Dr.sc.ing. J.Bleiers

Prof., Dr.hab.ing. A.Majewski

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Address:

Riga Technical University, Environment Modelling Centre

9 Ausekla Street, Riga, LV-1010, Latvia

Phone: 371 7320378; Fax: 371 7820094;

E-mail: emc@egle.cs.rtu.lv

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Contents

Majewski A. and A. Przezdziecki SOLITON PROPAGATION IN LOSSY OPTICAL GUIDES

Warsaw University of Technology, Institute of Electronics Fundamentals

Address: 15/19 Nowowiejska Str., 00 - 665 Warsaw, Poland

Phone: 48 22 6607410; Fax: 48 22 252300; E-mail: am1@ipe.pw.edu.pl

Summary: The beam propagation method has been applied to determine the behaviour of ultrashort optical pulses in the lossy guides. The method can be used for arbitrary shapes of initial pulses. The computations were carried out for a fundamental soliton and pair of solitons. (pp. 2-7)

Majewski A. and A. Karczewski TAPERED NONLINEAR OPTICAL FIBER

Warsaw University of Technology,

Institute of Electronic Fundamentals

Address: 15/19 Nowowiejska Str., 00-665 Warsaw, Poland

Phone: 48 22 6607410; Fax: 48 22 252300;

E-mail: am1@ipe.pw.edu.pl

Summary: Numerical analysis of the tapered nonlinear optical fiber using the coupled mode theory and the split-step Fourier method is described. The tapered nonlinear optical fiber is divided into a large number of cylindrical segments of an appropriate diameter. In the analysis of light propagation between two segments of different diameter, the coupled mode theory is used. Propagation of pulses in the cylindrical nonlinear segment is analyzed using the split-step Fouried method. Some results of computation for the tapered nonlinear optical fiber are also presented. (pp. 8-15)

Majewski A. and S. Sujecki FINITE DIFFERENCE ANALYSIS OF SOIRIB LIGHTGUIDES AND COUPLERS

Warsaw University of Technology,

Institute of Electronic Fundamentals

Address: 15/19 Nowowiejska Str., 00-665 Warsaw, Poland

Phone: 48 22 6607410; Fax: 48 22 252300;

E-mail: am1@ipe.pw.edu.pl

Summary: The semivectorial finite difference method has been applied to solve the wave equation in the case of a rib lightguide and a coupler. It has been shown that the results are in good agreement with the results of full vectorial method. Some results of computation on propagation constants and electric field distribution of silicon based rib wave guides and couplers are given. The results are of practical value and can be used in the design of SOI rib-lightguide tructures. (pp. 16-25)

Majewski A. and S. Sujecki RECTANGULAR LIGHTGUIDE: BOUNDARYFIELD PROBLEM

Warsaw University of Technology,

Institute of Electronic Fundamentals

Address: 15/19 Nowowiejska Str., 00-665 Warsaw, Poland

Phone: 48 22 6607410; Fax: 48 22 252300;

E-mail: am1@ipe.pw.edu.pl

Summary: The wave equation in case of rectangular lightguiding structures of integrated optics, which guide two types of orthogonally polarised modes is solved. As an analysis technique, the Point Matching Method has been chosen. Many various examples of results have been presented, such as: transverse electric and magnetic field and power distributions, and mode characteristics. The convergence rate of the results obtained has been discussed. (pp. 26-33)

Bleiers J.) and N. Veselis**)PERFORMANCE EVALUATION FOR MULTIPROCESSOR DSP ARCHITECTURE*

**) Riga Technical University, Environment Modelling Centre*

Address: 9 Ausekla Str., Riga, LV-1010, Latvia

Phone: 371 7321798; E-mail: emc@egle.cs.rtu.lv

***) Institute of Mathematics and Computer Science of the University of Latvia, Laboratory of Programming Automation*

Address: 29 Raina Blvd., Riga, LV-1459, Latvia

Phone: 371 7225497; E-mail: gints@acad.latnet.lv

Summary: In this paper, several benchmarks and principal characteristics of DSP nodes for the evaluation of multiprocessor architectures are considered. One of the ways for the creating of a multiprocessor configuration is the use of a global memory shared by multiple processors. Three kinds of the global memory access are discussed and compared. The basic features for the arbitration, fixed time and sequence cases are pointed out and summarized. (pp. 34-39)

Kovalev V.), A. Yurovetski*) and M. Ziema**) THE ELEMENT POLARITY RECOGNITION IN THE AUTOMATED VISUAL INSPECTION SYSTEM*

**)ELKO-Riga Ltd.*

***)Riga Technical University, Department of Computer Engineering;*

Address: 11 Ausekla Str. , Riga, LV-1010 , Latvia

Phone: 371 7321292, 371 7321350; Fax: 371 7830116

Summary: One of the most significant features expected from the automated visual quality control systems in electronics is the electric and electonic elements orientation check according to the device electric scheme. The present paper deals with the methods developed by the authors for the solution of this problem and realized in the element recognition and polarity check algorithm. (pp. 40-45)

Spalvins A., I. Lace and J. Slangens INTERPOLATION RESULTS ON HIGH DENSITY GRIDS

Riga Technical University, Environment Modelling Centre

Address: 9 Ausekla Str., Riga, LV-1010, Latvia

Phone: 371 7320378; E-mail: emc@egle.cs.rtu.lv

Summary: Usually, only regular data of uniform grids can be visualized as isoline maps. Due to such a limitation it is not possible to account directly for important irregularly sited data sources, for example, observation and groundwater production wells. This paper describes an interpolation algorithm which generates data distributions on high density grids. If these distributions are applied for visualization, irregular data can be partly accounted. (pp. 46-49)

Janbickis R. and I. Lace SOFTWARE ARRANGEMENTS OF THE REGIONAL HYDROGEOLOGICAL MODEL REMO

Riga Technical University, Environment Modelling Centre

Address: 9 Ausekla Str., Riga, LV-1010, Latvia

Phone: 371 7320378; Fax: 371 7820094;

E-mail: emc@egle.cs.rtu.lv

Summary: The software organization of the REgional hydrogeological MOdel (REMO) "Large Riga" is explained. Its main components are described and their functional interaction is shown. The list of publications of this paper includes references to all main sources showing the REMO system development. (pp. 50-58)

Vizulis P. and G. Burov METHODS OF DECODING OF PROCESSED SIGNALS DURING COMPUTER DIAGNOSING OF ANALOG OBJECTS

Riga Tecnical University, Institute of Information Technology

Address: 11 Ausekla Str., Riga, LV-1010, Latvia

Phone: 371 2370414; E-mail: peter@vvisc.gov.lv

Summary: The inverse Z-transformation is offered for decoding the diagnostic information. Mathematical relations, deduced from such a model have universal and formalized character. For their creation a minimal apriori information about a object - its multiplicity and linearity is required. The necessary diagnosis depth is controlled by the amount of corresponding mathematical transformations.(pp. 59-69)

Andersons K. and G. Burov ACCURACY OF DIGITAL DIAGNOSTIC MODELS IN THE DYNAMIC CONTROL MODES OF ANALOG OBJECTS

Riga Technical University, Institute of Information Technology

Address: 11 Ausekla Str., Riga, LV-1010, Latvia

Phone: 371 7324510; E-mail: krish@csb.lv

Summary: Problems of accuracy of diagnostic models of technical objects, constructed on conditions view of indemnification of errors of discrete approximations, arising at computer processing of analog signals, are considered. Opportunities of indication of occurrence of computing unstability at working algorithms are analysed and recommendations for improvement of their regular properties are given. (pp. 70-84)