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SUBTRACTION METHOD FOR REMOVING POWERLINE INTERFERENCE FROM ECG IN CASE OF FREQUENCY DEVIATION

Georgy Slavtchev Mihov, Ratcho Marinov Ivanov, Chavdar Lev Levkov

Abstract: *Extension of the subtraction method for power-line interference removing from ECG signals is proposed in case of power-line frequency variations. The existing version suitable for non-multiplicity between sampling rate and interference frequency is improved and adapted to dynamic deviations around the rated power-line frequency. The ongoing interference values, which are stored in temporary buffer, are used for recalculation of the filter's coefficients. A simplified algorithm is elaborated and experimented in case of odd sample number in one period of the interference. The corresponding formulae for even sample number are also derived. The proposed procedure successfully compensates abrupt and gradual changes of the power-line frequency allowed by the standards.*

Keywords: Digital filtering, ECG filtering, Interference rejection.

INVESTIGATION OF THE LINEARITY CRITERION USED BY THE SUBTRACTION METHOD FOR REMOVING POWERLINE INTERFERENCE FROM ECG

Georgy Slavtchev Mihov

Abstract: *The detection of linear segments in ECG signals is the most important phase of the subtraction method for removing powerline interference. This is done by a criterion for linearity using second differences in the sampled signal. The criterion is interpreted as mathematical estimate of the acceleration within the segment and is substituted by a non-recursive digital filter. The transfer functions of simple and complex linearity criteria have been synthesized. They have been used for analysis of existing solutions. Conclusions have been formulated as a result of numerous and thorough experiments and a qualitative estimate of the criteria efficiency are confirmed. Requirements for the equivalent filter have been formulated. It was found that the filter analyzing the longest section of the signal is closest to the complex criteria and can be independently applied.*

Keywords: Digital filtering, ECG filtering, Interference rejection.

DIGITAL REGULATED PARALLEL POWER AND CURRENT SOURCES FOR LASER DIODES DRIVING

Dimitar Georgiev Todorov, Asparuh Ivanov Grigorov

Abstract: *This paper is about some switching regulator improvement techniques, especially designed for high power laser diode driving. The first one consists in the usage of several power stage capacitors connected in parallel, forming a capacitance sum, which is determining the output current or power. In this way an easier and more accurate digital control over the output parameters is achieved. Another improvement technique consists in the usage of several power stages, connected in parallel. In this way the output pulsations are much less. A practical solution circuit is designed to illustrate the improvement techniques.*

Keywords: Laser diode, driving, power source.

HIGH POWER LASER DIODE DRIVING TECHNIQUES

Dimitar Georgiev Todorov, Asparuh Ivanov Grigorov

Abstract: *The present paper is about driving high power laser diodes. In many areas, such as communication, medicine and military equipments, the high power laser diodes find many applications. In the same time there isn't a lot of literature about their driving. In this paper some driving circuits and algorithms are discussed. The driving circuits are based on the forward d 2 dc/dc converter. They are designed as power sources with current and voltage limitations. The discussed driving algorithms are based on the one-cycle control. Regulation of this type offers high accuracy and high speed reaction.*

Keywords: Laser diode, driving, power source.

DESIGN OF RLC TO FREQUENCY CONVERTER

Ivan Iliev Stoyanov, Georgi Todorov Nikolov, Boyanka Marinova Nikolova

Abstract: *This application specific paper describes a design approach for RLC to frequency converter based on relaxation oscillator techniques. The designed circuit is proposed to convert resistive, inductive and capacitive values into corresponding frequency. The design process is accomplished using electronic design automation environments. Using simulation technique, RLC to frequency transfer functions are derived and presented graphically. Simulated results are compared with measured data generated from realized prototype circuit. Such design approach lets significantly simplify the design process, facilitate prototyping and reduce time-to-market in order to produce low-cost measurement systems or sensor platforms with fair metrological performances.*

Keywords: Frequency Conversion, Relaxation Oscillator, RLC Measurement, Sensor Platforms, SPICE Simulation.

RLC MEASUREMENT USING VIRTUAL COUNTING TECHNIQUES

Georgi Todorov Nikolov, Ivan Iliev Stoyanov, Boyanka Marinova Nikolova

Abstract: *In the present paper a frequency mode data acquisition technique, which converts resistance, capacitance or inductance values into a frequency-based signal by placing the measured element into a relaxation oscillator is considered. The system is realized using low cost oscillator with one comparator and capability of virtual instrumentation. The design process of the software that controls the virtual RLC meter is explained in brief. In order to increase the measurement accuracy and due to possibility of virtual instrumentation the ratiometric calibration method is suggested and put into practice. The fair accuracy of the virtual RLC meter is verified by experimental results from resistance and capacitance measurements. As example of the versatile applications of the system, the virtual system based on RH capacitive sensor is realized.*

Keywords: Counting Techniques, Ratiometric Calibration Method, RLC Measurement, Sensor Platforms, Virtual Instrumentation.

AIR QUALITY MONITORING SYSTEM

Boyanka Marinova Nikolova, Marin Berov Marinov, Georgi Todorov Nikolov

Abstract: *Detection of low concentration of air pollution, like cigarette smoke, cooking fumes, etc. is possible with the combination of an air quality sensor and data acquisition system. In present paper is presented approach for design and implementation of air quality monitoring system based on tin dioxide gas sensor, integrated temperature and humidity sensors, portable modular data acquisition system and graphical programming language. An interpolation method reducing influence from temperature and humidity is suggested. This approach can be used for automatic controls in ventilation systems by detecting rapid changes in the air quality from the base levels.*

Keywords: Air Contaminants Detection, Logging and Monitoring Systems, Portable USB DAQ, Taguchi Gas Sensors, Virtual Instrumentation.

MEASURING PHYSICAL DIMENSIONS WITH LASER BEAM AND PROGRAMMABLE LOGIC

Todor Djamiykov, Yavor Donkov, Atanas Rusev

Abstract: *In this report are represented the possibilities of the contemporary electronic elements when building optoelectronic measurement devices. In this type of devices the basic components are: a light beam source, photo receiver, managing system for both the light source and the light receiver (this system also processes the received light information and displays it on an indicator). The universal digital managing and processing unit of the devices is based on FPGA. One of its advantages is the possibility to load different processing algorithms for the received information through JTAG interface with no changes on the schematic of the devices. In this report are described two practical approaches for measurement of distance based on triangulation and measurement of physical dimensions based on laser parallel scanning beam.*

Keywords: Measurement system, Laser, FPGA, VHDL, Real-time applications

SMART OBDII INTERFACE ADAPTER

Peter Dzhelekarski, Dimitar Alexiev

Abstract: *The vehicle on-board diagnostics system (OBDII) provides a serial diagnostic link for communication with scan tools. There are 4 diagnostic interfaces: ISO 9141-2, KWP 2000, SAE J1850 and ISO 15765. A PC-based scan tool consists of an interface adapter and specialized diagnostic software. This paper presents the implementation of a smart OBDII interface adapter. The adapter is build of a protocol converter, interface transceivers and protective devices. The full schematic circuit of the adapter is presented and explained in detail. The protocol converter (MCU) processes and transfers diagnostic messages. It communicates with PC via serial port using ASCII messages. The software for the protocol converter has been developed in C language. A state diagram of software is presented. The functions performed by the software for different interfaces are explained in detail. The adapter is successfully verified in practice.*

Keywords: OBD, scan tool, interface adapter, K-Line, CAN

FLUID LEVEL REGULATOR

Slavy Georgiev Mihov, Stoyan Nikolov Jilov

Abstract: Beverage lines are very common installations in food production industry. They automate the processes of washing and labeling bottles, bottling liquids in them, counting and sorting the production and so on. The present paper concentrates on the process of bottling. It aims filling the bottles with beverages such as beer or any kind of carbonized soft drink. For the purposes of bottling, it is essential, a constant liquid pressure in the bottle to be provided. This can be achieved by numerous of ways listed below. Providing constant fluid pressure for the bottling machine is the main problem treated by the present work. The method used depends on manipulating the hydrostatic pressure of the liquid in a tank. A controller is designed, particularly for this purpose. It serves as a relay regulator of fluid level in a container, keeping it between two values (minimum and maximum).

Keywords: beverage container, hydrostatic pressure, fluid level, probes

ANALYSIS ON CHOOSING THE APPROPRIATE ACCELEROMETER FOR TRANSPORT VEHICLE DIAGNOSTIC SYSTEMS

Kristian Dilov Dilov

Abstract: A big variety of integral accelerometers is available nowadays. For the goal it is necessary to be made an accuracy analysis of the parameters of the separate presents that would had help at choice of accelerometer in concrete application. The head parameters of this analysis are frequency bandwidth, noise stable and sum error from the transduction.

Keywords: acceleration, analog output, pulse width modulation output, serial peripheral interface, automotive diagnostic, noise.

DC MOTOR CONTROL SYSTEMS

Marin Hristov Hristov, Gavrail Shtilionov Kubatev, Dobromir Nikolov Arabadzhiev

Abstract: Modern day decisions, when classifying motor controllers are divided into two categories. The first is swiftness and accuracy at the price of expensive products and the other – worse characteristics, but with more affordable prices. The presented article shows a method for digital control of a DC brush motor, and by this, showing one good decision for creating a system with good characteristics and low price.

Keywords: DC motor, control system, VHDL, FPGA

INTERPOLATION OF GREEN COLOR IN FRAMES FROM CMOS IMAGE SENSOR

Todor Djamiykov, Nikolay Nenov

Abstract: *The paper presents an algorithm for interpolation of the green pixels in frames from CMOS image sensor. The result is a monochrome frame calculated directly from the data from the primary BAYER matrix in the sensor. An algorithm and VHDL module work in real time were developed. The aim is simple and easy for usage algorithm, which uses small amount of macro-cells, to be implemented in FPGA. The algorithm is a part of optoelectronic system for measurements of the plane coordinates of a light spot. The system is based on PLD. The monochrome frame calculated with this module is used by other image processing algorithms in the system. FPGA XC3S400 by XILINX is used.*

Keywords: CMOS image sensor, VHDL, Color interpolation, Real-time applications

LABORATORY STAND FOR INVESTIGATION OF OPTOELECTRONIC MEASUREMENT DEVICES WITH CMOS IMAGE SENSORS AND PROGRAMMABLE LOGIC

Todor Djamiykov, Nikolay Nenov

Abstract: *The proposed paper presents features of laboratory stand for investigation of optoelectronic measurement devices. Various methods for measurement of different parameters with high accuracy in real time are described. CMOS image sensor is used. For calculations in each measurement programmable logic is used. PLDs have great advantages in fast parallel processes. In the paper are described special features in realization of the stand. Other useful feature of the stand is visualization of the frames from image sensor directly on a monitor. The results of the calculations can be visualized on the same monitor, on separate display or sent to the computer. All image processing algorithms are implemented in XC3S400 FPGA.*

Keywords: Measurement system, CMOS image sensor, Image processing, VHDL, Real-time applications

ANALYSIS OF POSSIBILITIES FOR DIGITAL DATA TRANSFER USING POWERLINE

Stefan Jordanov Ovcharov, Peter Ivanov Yakimov, Nikolay Todorov Tuliev, Emiliya Georgieva Balkanska, Dobromir Georgiev Penev

Abstract: *The paper discusses application of power line modems in homes and industry. The requirements of the standard EN 50065 are explained. Problems in power line modems operation are presented. The comparison of different devices is performed. The methods for electrical isolation are described. Proposals for using electric power network for data transfer are offered.*

Keywords: Power Line Modem (PLM), communications, data transfer

MICROCONTROLLER ORIENTATED DUAL - SLOPE ANALOG-TO-DIGITAL CONVERTER DESIGN

Peter Ivanov Yakimov

Abstract: *The paper discusses application of the dual slope analog-to-digital converters. Problems in power line noise suppression are presented. A possible solution of this problem is described using hardware and software designed phase locked loop. The paper presents solution the problems in dual-slope ADC by using microcontroller orientated design of the analog circuitry and the control logic. The common operation of the dual slope ADC and a microcontroller is shown. The interface design between the ADC and the microcontroller is proposed.*

Keywords: Dual - slope, measurement, PLL, interface

ANALYSIS OF A SHIELDED COUPLED MICROSTRIP LINE BY THE BOUNDARY ELEMENTS METHOD

Vessel Savov, Zhivko Georgiev, Emil Bogdanov, Irina Karagineva

Abstract: *A method for quasi-TEM analysis of a shielded coupled microstrip line is suggested. The main point in carrying out this analysis is the solving of a system of two integral equations, which is performed by applying the boundary elements technique. Upon solving this system, the normal derivative of the electric potential is determined, as well as the electric charge density along the two conducting strips. The electromagnetic parameters of the line are defined.*

HIGH PRESSURE SODIUM LAMPS LUMINOUS FLUX EXPRESSION BY THE LAMP ELECTRICAL VARIABLES AND PARAMETERS

Neli Ratz

Abstract: *Own experience results, targeting analytical and quantitative expression of the luminous flux of high pressure sodium lamps (HPSL) dependable on the HPSL electrical values; power, voltage, current, conductance, for nominal conditions and at dimming are generalized in the present paper. The analytical models are verified by experimental measurement and simulation of HPSL of power 70W, 100W, 150W, 250W, 400W and 1000W produced by PHILIPS. The analyze displays that the proposed analytical dependencies for HPSL luminous flux expression at dimming are precise enough for the engineering practice.*

EXPERIMENTAL AND SIMULATION INVESTIGATION OF 1000W HIGH PRESSURE SODIUM LAMP

Neli Ratz

Abstract: *The purpose of the present study is to investigate and validate of the developed in [1] analytical description and models of high pressure sodium lamps (HPSL). Experimental and simulation results of HPSL investigation of power 1000W “Ceramalux Alto” produced by PHILIPS, are covered in the present work. The analysis of the received results proves the reliability of the developed analytic models, which reflect the dynamics of the electrical quantities (voltage and current) as also of the luminous flux at 1000W HPSL dimming.*

INDUCTIV BALLAST NONLINEAR DYNAMICAL MODEL

Neli Ratz

Abstract: *The modeling of the illumination devices with discharge lamps at dimming requires adequate model of the discharge lamps and of the inductive ballast. The nonlinear dynamical model in the present work is described in Matlab environment. The model represents the electromagnetic behavior of the ballast, as well as the electrical and the magnetic losses. The model is suitable for simulation of amplitude dimming at 50 Hz frequency.*

GENERATION OF SOLITONS IN NON-LINEAR TRANSMISSION LINE

**Grigori Grigorov, Atanas Chervenkov, Valeri Mladenov,
Todorka Chervenкова, Sava Papazov**

Abstract: *The generation of solitary waves (solitons) in communication line is investigated. Fundamental equations for describing of electromagnetic processes, which give the solitons solution are considered. The solitons solution of Korteweg de Vries equation is solved numerical. The comparison of finding solutions with numerical solution of circuit's model of transmission line is done. The model presents communication line as non-linear circuit with distribution parameters. The solitons solutions of Korteweg de Vries equation are identical with solitary waves, which are solved by computer simulation of non-linear circuit.*

INFLUENCE OF THE VELOCITY ON THE OUTPUT SIGNAL OF ELECTROMAGNETIC TRANSDUCER WITH DISPLAYED RECTANGULAR COILS

Valery Ivanov, Stefcho Guninski

Abstract: *The influence of the relative velocity between transformer electromagnetic transducer with parallel displaced coils and conductive flat ferromagnetic object is presented in this paper. Three designs of transducer with rectangular coils are investigated. The plan diagrams at different displacements are given and the influence of the velocity on the RMS value and the phase of the output sinusoidal voltage is analyzed.*

GENERATION OF SOLITONS IN NON-LINEAR TRANSMISSION LINE

**Grigori Grigorov, Atanas Chervenkov, Valeri Mladenov,
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EXPERIMENTAL AND NUMERICAL INVESTIGATION OF BALLAST CHOKE

Miho Mihov, Neli Ratz

Abstract: *The present work represents experimental and numerical investigations of ballast choke for discharge lamps. Purpose of the investigation is to define the non-linear relationship between the choke inductance and the current flowing through it. The investigated object is HBI 250/220-Bulgarian and BSN 250 L300 – made in Poland. The numerical investigation has been made in FEMM environment. By means of the supporting of the FEMM postprocessor functions a corresponding to the experimentation approach for calculations is used. The obtained from the experimental and numerical investigations dependencies for both type of the chokes are disposed for discharge lamps simulation models realization.*

ALGORITHM FOR ANALYSIS OF CHUA'S CIRCUIT

Stoitscho Manev, Vladimir Georgiev

Abstract: *An algorithm for analysis of Chua's circuit has been proposed. The effectiveness of the algorithm, used by the analysis of the circuit for a fixed set of values of the parameters of the differential equations, has been shown. The Lyapunov's exponents are found and some respective conclusions have been made.*

COMPUTER BASED MEASUREMENT SYSTEMS FOR SEMICONDUCTOR DEVICES LABS

Ivan Furnadziev, Vassiliy Tchoumatchenko, Tania Vasileva, Dimitar Tenev

Abstract: *The paper describes the developed software architecture of computer based measurement system for semiconductor devices labs. The architecture is specifically targeted towards Web based Java applications, where the browser becomes the platform for a lightweight hypertext-based user interface. An overview of some data acquisition (DAQ) devices is performed.*

Keywords: Instrumentation, data acquisition, computer based laboratory

WEB BASED SOFTWARE FOR SEMICONDUCTOR DEVICES LAB MEASUREMENT SYSTEM

Ivan Furnadziev, Vassiliy Tchoumatchenko, Tania Vasileva, Dimitar Tenev

Abstract: *The advance of the technologies nowadays allows putting many laboratory measurement instruments in a single desktop box. This desktop box combined with a personal computer and Internet connection, gives a perfect opportunity for a laboratory which is accessible at any time and place. Many companies have created different measurement boxes with different virtual instruments attached to them, but it is still difficult for the trainee to make use of all of them. The article proposes common software architecture, which is suitable for all existing measurement boxes. The proposed software architecture is web based and creates a single view of the virtual instruments, so a trainee could easily use any hardware from single software.*

Keywords: software architecture, virtual instruments, web based measurement

ARCHITECTURE OF KNOWLEDGE ARTIFACT TOOL AIMING TO SUPPORT COLLABORATIVE KNOWLEDGE CREATION

Vassiliy Tchoumatchenko, A. M. Scapolla, Tania Vasileva,
Ivan Furnadzhiev, A. Poggi

Abstract: *In recent years, semantic web based applications have been developed in numerous fields, including those of knowledge management and education/training. EU project KP-Lab is intended to productively utilize emerging technologies of the semantic web infrastructure. The paper considers the functional requirements and the architecture of Knowledge artifact tools developed to support collaborative knowledge creation. These tools are responsible for Knowledge Artifact (KA) management and annotations. KA annotations taxonomy and relationship between KA tools, repositories and artifact are also discussed.*

Keywords: Knowledge practices, Semantic Web, Knowledge artifact

A NEW APPROACH TO CONDUCTING EDUCATIONAL TESTS IN A WEB ENVIRONMENT

Valentin Videkov, Todor Djamiykov, Rossen Radonov

Abstract: *This paper treats a new approach to the conduction of educational tests in different subjects in a web environment. An environment for electronic management and its functions are presented. Up to now the educational tests in that kind of environment were carried out on computers with controlled IP addresses and in the presence of a lecturer. The new functions allow the students to perform their tests on any computer and without the presence of a lecturer. A comparison between the two approaches has been made.*

Keywords: education, web environment, tests

EMBEDDED SOFTWARE DEVELOPMENT: PROBLEMS IN EDUCATION

Vesselin Gueorguiev, Ivan Ivanov, Desislava Georgieva

Abstract: *Programming for embedded devices and systems is modern and preferable, and there are work positions in many companies – so students and engineers are interested in it. After few months a great percent of them quit or hesitate to work in this area. As a result – we have a lot of programmers and control engineers but there is lack of people working in the area of mobile and embedded devices and people from industry are asking.*

Our observations and conclusions do not pretend for generality. This paper is only a part of authors' attempt to offer in Bulgaria a new world approaches how to teach students to work in this multi-disciplinary area.

AN APPROACH FOR DETERMINING THE DIFFICULTY OF TEST ITEMS FOR ASSESSMENT THE QUALITY OF KNOWLEDGE MASTERING

Gospodin Jelev, Daniela Minkovska, Yoana Minkova

Abstract: *The paper presents the results from research and analyses of computerized test control for students' knowledge assessment. One of the basic test characteristic – it's difficulty is examined and analyzed. The quality of used test items is verified and estimated through experimental data, obtained from researches on two groups of students in two different universities. The relationship between students' motivation for learning and test difficulty is considered.*

AN APPROACH TO OBJECT-ORIENTED PROGRAMMING IN STUDENT'S TRAINING

Dimitar Jetchev, Stoyan Maleshkov

Abstract: *Based on the experience gained in object-oriented programming (OOP) the paper proposes a practical approach for student's training at a technical university. Studying the Java language the main attention is focused on understanding the general philosophy of OOP. This is achieved by building up a general package of classes for processing of geometric objects. In strict sequence the following topics are considered: defining a class with attributes and methods, data capsulation, using a class, abstract class and inheritance. Widening the functionality of the defined classes is obtained by an interface, implemented with new classes. Detailed implementation issues for applications and applets are given. The problem of developing a robust program is considered and the main topics in exceptions handling are discusses. The experience of training students at a technical university is analyzed.*