CONTENTS AND ABSTRACTS

RADIO ENGINEERING AND RADAR

Keywords: frequency-modulated level gauge, irregular waveguide, unevenness of characteristics, level measurement error, individual calibration parameters, error reduction.

The problem of measuring the level of filling the tank with liquid substance by means of waveguide frequency-modulated level gauge is considered. The level estimation error is considered to be caused by dispersion of electromagnetic waves in a waveguide and is easily eliminated by introducing the predistortions to the law of frequency modulation. Additional error arises when using an irregular waveguide. The irregularity is caused by the need to use a compound waveguide when heterogeneity of properties of the pieces used is observed. The aim of the work is to estimate possible measurement error caused by piecewise heterogeneity of a waveguide and to develop a method allowing us to make this error significantly lower. Error estimation caused by waveguide irregularity at practical realization of a waveguide level gauge is made. The method of reducing the error by using individual calibration parameters for each site of quasiuniformity is offered. The technique of practical determination of individual parameters is offered. Quantitative assessment of reached effect is carried out.

Keywords: shield, shielded structure, shielding efficiency, radio signal, radio signal attenuation.

Shielded structures are widely used today to perform various tasks ranging from providing EMC equipment and ending with the protection of information processed by the technical means located in such a shielded structure. At the same time, when a shielded structure performs the function of protecting information, it is important to understand how significant the influence on the signal propagation to the location of the alleged intruder is made not only by the shielded structure used, but also by other obstacles located on signal propagation path. The aim of the work is to develop a methodology for estimating the attenuation of the radio signal introduced by various obstacles, which are various previously known materials with known characteristics. The dependence of the effectiveness of screening, absorption and internal multiple reflection of electromagnetic waves on the type and characteristics of both conductors and dielectrics is considered.

Keywords: electric field strength, earth wave, underlying surface, forecasting, very low frequencies.

The shortcomings of existing methods for calculating the ground wave field strength are determining the relevance of the study. Despite the detailed theoretical study in this area, known software implementations of the techniques do not allow taking into account an arbitrary number of sections with specified characteristics of underlying surface on a ground wave propagation path. The aim of the research is to generalize well-known theoretical studies on predicting the ground wave field strength and to develop an applied automated technique that allows calculations on the routes with an arbitrary number of homogeneous sections with data input from corresponding digital maps. This technique is implemented in the form of a script and a set of auxiliary functions in MatLab environment. The example of calculations for a path consisting of six segments is presented.

INTELLIGENT INFORMATION SYSTEMS AND TECHNOLOGIES

Keywords: neural Bert networks, natural language analysis, identification of news content, transformer architecture, text corpus assembly, pre-trained models.

A new technology for automatic identification of news media materials is being considered, dividing them into pro-Western content and the articles from independent states. Domestic publishers are used as content sources: RT, Meduza, Kremlin, Globalaffairs, Themoscowtimes, RussiaBeyond, Rossiyasegodnya, Interfax, SputnikInternational and others. Western information publications are repre-sented in the study by publishers: msnbc, bloomberg, cnn, springer, nbcnew, thrguardian, Facebook, nytimes, france24 and others. The theoretical foundations used in the study are based on the concept of neural networks with concentration of attention, namely a bidirectional model with Bert transformer architecture.

The experimental part of the material uses software oriented to Python v.3 (Anaconda 3). The software implementation of text corpus collection, subsequent content processing and neural network analysis involves the use of nltk, transformers 4.34.1, BeautifulSoup, wordcloud, BertForSe-quenceClassification, torch 3.12.4, newspaper, json, tensorflow 2.14.0, accelerate 0.20.1, sklearn. In addition to the listed software, the research uses the htmlgrabber v.2.0 package developed by the author. The performed series of experiments allows us to qualify the presented technology as an electronic news identification technology, which is not inferior in efficiency to the international analogues available today.

The aim of the work is to create a new neural network technology used in the automated identification of information content in natural language to classify electronic news into Western and independent.

Keywords: knowledge base, intelligent system, ontology, application domain, complex-structured system, applied logics theory, intermediary concepts, reaction capacity identification.

Concept systems and knowledge bases for application domains with complex-structured objects are expanded rapidly. Time-consuming operations for knowledge base design, which includes choosing its scheme, savvy selection of interim concepts, designating its filling type are performed by application domain experts. The question is whether it is possible to automate this process. Can we suggest any specialized expert decision support toolkits? The aim is to develop and research specialized program toolkits for structuring applied concept systems and knowledge bases grounded on them for application domains with complex-structured objects (based on a chemical compound reaction capacity identification problem). This research suggests that the hybrid editor be used, which works in two automation regimes. It allows any application domain expert to choose – to make minimum effort or to customize the process of concept system and knowledge base development, whichever is preferable. Basic elements of hybrid editor are complex-structured system metagraph editor, metaconcept genera-tor, and function and predicate constructor. Complex-structured system is created with the help of metagraph editor. The subsystems of complex-structured system can be of four structural types: elementary system, descriptive system, system-subset, and system-process. Metaconcept generator automatically forms the set of metaconcepts that match with interim concepts. Function and predicate sig-natures are set by an application domain expert with the help of function and predicate constructor with arbitrary argument list and function and predicate metaconcept constructor. The latter automatically sets some of the allowable arguments, which facilitates application domain expert work during concept system and knowledge base formation.

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MATHEMATICAL AND COMPUTER MODELING

Keywords: technical object control, PID controller synthesis, analytical and graphical model, frequency transfer function, logarithmic amplitude-frequency response.

An analytical model of a control system based on PID controller is considered, for which the limited application associated with the inability to meet all requirements for system quality is shown. To eliminate these disadvantages, the authors propose to additionally use a graphical model based on desired logarithmic amplitude-frequency response of the system. The aim of the work is to develop an analytical and graphical model that allows combining the advantages of formalized and non-formalized approaches to the design of modern control systems for technical objects. A technique for parametric synthesis of PID controller, based on this model, has been developed that provides specified requirements for the system in terms of accuracy, speed and quality of transients. The application of the proposed technique is shown on the example of synthesizing a control system for an unstable technical object. The simulation results in

SYSTEM ANALYSIS, MANAGEMENT AND INFORMATION PROCESSING

INFORMATION-MEASUREMENT AND BIOMEDICAL SYSTEMS

Keywords: tremor, intoxication, pre-trip, analysis, postural, driver.

The article discusses an electromagnetic method for tracking postural tremor within the framework of the task of pre-trip driver analysis. The resolution of the method was studied, and the optimal working area in which it is necessary to measure tremor parameters was found. The performance of the method, as well as the circuit solution, was determined.

PHYSICAL ELECTRONICS

Keywords: high-voltage pulse generator, inductive energy storage, gas-discharge current interrupter, output capacitor charging time, current interruption time, high-voltage system.

The problem of constructing power systems based on high-voltage pulse generator with inductive energy storage device that can be used as control and testing systems for high-voltage equipment is considered. The aim of the work is to build a new type of high-voltage pulsed voltage generators using a combined type of energy storage. Two methods of constructing high-voltage systems are considered (with high-voltage electronic valve connected to load capacitor, and using pulse transformer). Based on the results of computer modeling, the operating ranges of values for the main elements of the circuits have been determined.