ABSTRACT AND REFERENCES

INFORMATION TECHNOLOGY

INDEXING FULL-TEXT DOCUMENTS FOR INTELLIGENT KEYWORD INFORMATION SEARCH (p. 4-8)

Natalia Borysova, Zoia Kochuieva

The issue of indexing full-text documents automatically for solving the problem of intellectualizing data searches is considered in the paper. The main objective of the study lies in developing a full-text keyword search model, taking into account morphological features of Russian, as well as in developing algorithms of indexing and a full-text search. For a practical implementation of the system in the form of a web application, the PHP programming language was chosen, as a relational full-text index database, i.e. DBMS MySQL. For a morphological analysis a "demon" normalizer, serving as a tcp-server and including the Dialing morph-analyzer, was developed. The given system retains a number of features: it can be used by several users simultaneously, operate great indices, maintain the optimum ratio of selectivity and sensitivity at searching.

The research results can be used by analytical linguists, specialists in the field of automation of library activities, as well as other specialists and experts in creating automated library information systems, automatic abstracting systems, etc. Thus, using the above-described software and applications has allowed developing an effective system of indexing full-text documents and full-text keyword searching

Keywords: full-text search, intelligent systems, indexing, morphological analysis, automation of library activities

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THE CONCEPT OF INTELLIGENT MANUFACTURING AGENTS AND ITS IMPLEMENTATION FEATURES (p. 9-13)

Olexandr Tsymbal, Artem Bronnikov, Oleg Kutsenko, Eugen Shein

The architecture of agent-based manufacturing systems is considered, a conceptual model of a manufacturing agent (MA) is described. The required operation features of manufacturing agent systems is self-learning, self-organization and self-adapting. The purpose of multi-agent systems is achieved by the interaction of manufacturing agents. In practice, it is offered to implement a manufacturing agent as an intelligent robotic system, which can move within the manufacturing area, carry out transport, auxiliary and separate manufacturing operations.

One of the peculiar features of the MA operation at the workspace is the determination of the process equipment position and indetermination of the transport system position, other agents and humans. Therefore, a peculiar feature of the manufacturing agent control system should be the adaptability of a decision-making system, which can create and, if necessary, modify plans of the MA operation in conditions of changing the workspace of a flexible integrated manufacturing. It is offered to observe the MA workspace by using advanced sensor systems. Herewith, one of the methods of setting assignments for the MA can be the setting by visual methods and thus, the implementation of the MA visual control. It should take into account the possible multi-zone nature of MA workspaces. The paper results were used in developing the intelligent robotic system of assembling

Keywords: manufacturing system, intelligent agent, decision-making

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VERBAL METHOD OF MIXED FUZZY EVALUATION IN DECISION-MAKING PROBLEMS (p. 14-17)

Aleksandr Stenin, Michail Tkach, Andrey Gubskiy, Valeriy Kurbanov

The problems of decision-making under uncertainty are considered in the paper. Uncertainties are an integral part of decision-making processes in almost all organizational and technical systems. It is the practice to divide decision-making problems into well-structured, semi-structured and unstructured ones.

The latter are the subject of the study in this paper. The methodology of a verbal decision analysis is regarded as the basis for unstructured decision-making problems. In combination with the known scientific approach in the decision theory MAUT (Multi-Attribute Utility Theory), the basis for implementing the verbal ap-

proach to decision-making serves the construction of a utility function, being axiomatically justified and providing a decision rule for any hypothetical alternatives. For decision-making, the mixed fuzzy evaluation method, which allows in contrast to the known methods avoiding a time-consuming procedure of pair-wise comparison of alternatives, is proposed in the paper. Since the method is based on a verbal analysis, it allows "communicating" in a natural language with an intelligent decision-making support system

Keywords: verbal analysis, decision-making, utility function, fuzzy evaluation, compliance scales

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ASSESSMENT OF STRUCTURAL AND FUNCTIONAL RISKS OF COMPLEX TECHNICAL SYSTEMS (p. 18-22)

Vladimir Vychuzhanin, Nicholas Rudchenko

Despite the large amount of discussions concerning the definition of technical condition of complex technical systems (CTS) on risk assessment, the most vulnerable interrelated and interacting components of such systems in various emergency scenarios when assessing the structural and functional risks are still determined as a result of complex procedures, containing nonlinear operations. In this paper, the CTS structural and functional risk assessments in emergency scenarios were defined using the cognitive simulation model, represented as a directed graph, as well as by the calculation results. Destructive transmission pulses are used for modeling the destructive effect of each component on the CTS structure.

Normalizing effect on the vertices and edges of the model digraph is used to assess the CTS functional risk. A software package is presented in the paper, and the calculation results of assessment of structural and functional risks of interrelated CTS components, obtained with its help are described. The results of development and research, which consider the structural and functional features, interrelation and interaction of elements and inter-element relations in the CTS hierarchy and topology in emergency scenarios are given. The method for assessing the structural and functional risks does not contain labor-intensive, complex procedures and will allow to automate the decision-making process in CTS emergency scenarios

Keywords: complex technical systems, structural and functional risks, cognitive simulation model

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THE PECULIARITIES OF CREATING A CALCULATION STABILITY ASSESSMENT MODULE OF LANDSLIDE SLOPES FOR MAPINFO (p. 22-26)

Igor Kryvjuk

The relevance of an integrated approach for landslide hazard evaluation, providing combining the studies of geological, geophysical and geotechnical methods with a subsequent calculation of slope stability and predicting the possibility of occurrence or landslide activation at the probabilistic and quantitative levels is evident. Considering the specifics of such studies, a module for the MapInfo geographic information system, which allows calculating the stability factor of landslide and landslide-prone slopes, consisting of homogeneous rocks in a circular cylindrical form of a slip surface, was developed. The given module not only extends the standard capabilities of the MapInfo GIS, but also allows creating a database, which includes the cadastral data, as well as the parameter of slope stability. This will facilitate predicting landslide hazard for individual administrative units, using the GIS MapInfo analytical tools, taking into account the slope stability factor

Keywords: landslide processes, slope stability factor, slip surface, geographic information system

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AN INTRODUCTION TO KNOWLEDGE COMPUTING (p. 27-40)

Vagan Terziyan, Oleksandr Shevchenko, Mariia Golovianko

This paper deals with the challenges related to self-management and evolution of massive knowledge collections. We can assume that a self-managed knowledge graph needs a kind of a hybrid of: an explicit declarative self-knowledge (as knowledge about own properties and capabilities) and an explicit procedural self-knowledge (as knowledge on how to utilize own properties and the capabilities for the self-management). We offer an extension to a traditional RDF model of describing knowledge graphs according to the Semantic Web standards so that it will also allow to a knowledge entity to autonomously perform or query from remote services different computational executions needed. We also introduce the concepts of executable knowledge and knowledge computing on the basis of adding an executable property to traditionally used (datatype and object) properties within the RDF model. The knowledge represented with such an extended model we call as an executable knowledge, or the one which contains explicit (executable) instructions on how to manage itself.

The appropriate process of the executable knowledge (self-) management we call as a Knowledge Computing. Unlike the knowledge answering machines, where computations over knowledge are used just for addressing a user query, the knowledge computing in addition provides computations for various self-management purposes.

The paper also presents some pilot (proof-of-concept) implementation of the executable knowledge as a plug-in to Protégé ontology development environment.

Keywords: self-managed systems, knowledge, RDF-graph, knowledge management, Semantic Web, knowledge ecosystems, executable knowledge, knowledge computing, knowledge processor

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CONSTRUCTION AND MODELING OF UNIFIED CONTROL SYSTEMS OVER ACTUATING MECHANISMS OF GAS-TRANSPORT SYSTEM OBJECTS (p. 41-48)

Igor Nazarenko, Vladimir Ferenets, Denis Suchanov, Nykolai Nykolajchuk

Based on the current situation at production facilities of the gas transportation system it is possible to summarize that the control methods and algorithms for actuating mechanisms are very specific and are tied to a specific hardware. Additional complication is that the control algorithms and methods are developed and implemented by different manufacturers that significantly affects the maintainability, maintenance and operation of actuating mechanisms.

The control method for the actuating mechanism of technological equipment of the gas transportation system with constant control circuits monitoring based on the "Siemens" equipment is proposed.

The electrical schematic diagram for voltage control in the actuating mechanism control circuits in the command mode and during the operation, was developed.

The control algorithm for the actuating mechanism of EPPU-4-1 with constant control circuit monitoring, was worked out.

To work out the algorithm, the mathematical control model for the actuating mechanism with control circuit monitoring based on the MatLab software was developed.

To unify the proposed solutions, the method for generating functional blocks in the IEC 61131 standard from the mathematical models of control algorithms, pre-made in the MATLAB Simulink environment was developed.

The procedures were approved, and the information processes of automatic generation of the IEC 61131 function blocks for programmable logic controllers were investigated.

The IEC 61131 function blocks based on the mathematical models of the control algorithms for the actuating mechanisms were developed.

The hardware-software complex for studying and testing the main operation modes of electro-pneumatic actuating mechanisms of a linear part of the main gas pipelines was created.

As a result, using the proposed scientific and technological solutions, control algorithms and methods for actuating mechanisms of different production equipment allows to unify and improve the economic and performance characteristics.

Keywords: gas transportation system, actuating mechanisms, control algorithms, modeling, mathematical model, programming

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FUZZY CONTROL SYSTEM OF TEMPERATURE REGIME OF ACETYLENE GENERATOR (p. 48-51)

Anatoliy Zhuchenko, Dmytro Kovalyuk, Yelyzaveta Dziuba

Despite the widespread acetylene production by the carbide method, today there are still problems of controlling an acetylene generator, related to perturbations that act on the object. For improving the regulation quality a fuzzy control system of acetylene generator temperature regime is proposed in the paper. The fuzzy system includes a controller, designed in the Fuzzy Logic Toolbox, and using the triangular membership functions and the Mamdani's fuzzy inference algorithm.

A mathematical model of the object was analytically obtained and given by a transfer function in the form of the first-order lag block with delay. Using the Simulink environment, the simulation and comparative analysis of the fuzzy control system and with PI controller was carried out.

The comparison of the integral performance index allows drawing the conclusion that the control system with a fuzzy controller has a smaller deviation from the predetermined value

Keywords: fuzzy control system, system simulation, fuzzy controller, Simulink, acetylene generator

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ANALOG INTERFACE FOR REMOTE MEASUREMENTS BY DIFFERENTIAL-TRANSFORMER INDUCTIVE SENSOR (p. 52-57)

Dmytro Ornatsky, Mykola Mikhalko, Oleksandr Osmolovsky

An analog interface for remote motion measurement using LVDT-sensors is considered. A feature of the proposed technical solution is the lack of active components in immediate proximity to the sensor.

Using balancing, measuring amplifier with differential-current inputs, automatic sensor common-mode and instrumental errors cor-

rection allows to measure dynamic signals from distant objects with high accuracy and speed at low hardware costs. For example, analog interfaces of the National Instruments [5], which use measuring voltage-voltage amplifiers, are under substantial negative influence of parasitic communication line capacitances and resistors manufacture inaccuracy [3].

Using digital interfaces for remote measurements leads to a significant limiting of the useful signal band [4]. The analog interface for the information-measuring system with inductive motion sensors is proposed, which has the reduced effect of the in-phase component of the input signal on the measurement accuracy, taken into account ambient temperature influence on the sensor sensitivity, and consequently, increased analog interface accuracy

Keywords: analog interface, LVDT-sensor, signal in-phase component, automatic error correction

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EVALUATION OF A COMPLEX QUALITY INDEX USING NUMERICAL AND VERBAL ORDINAL SCALE (p. 58-62)

Nina Yaremchuk, Olga Redyoga

When determining the complex objects quality, verbal-numerical scales are used, in which, along with quantitative estimates of the scale points or equivalence classes boundaries their verbal interpretation is given. The objective of the paper is to compare the aggregation results of the single quality indexes, presented in verbal and numerical ordinal scales, obtained by arithmetization of these verbal scales.

The aggregation result is the complex quality index, obtained based on the set of single indexes (provided that the weight coefficients are equal to one). The conditions, under which the results of aggregation, performed by aggregation operators in different scales (verbal and numerical) coincide (or not) within certain boundaries are determined, additional rules for determining the complex quality index scale are introduced. The study allowed to obtain the compliance matrix for verbal-numerical scale of complex quality index. It was found that unambiguous compliance in aggregation results occurs only for extreme and central from the ranked quality profiles. For other profiles, the compliance probability (or incompliance) of the data, obtained on numerical and verbal scales, used in referring the quality level to a certain equivalence class on the complex index, was determined

Keywords: evaluation of complex quality index, numerical and verbal scales

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