

**XI-th International Conference**  
**Knowledge-Dialogue-Solution**

**June 20-30, 2005, Varna (Bulgaria)**



**P R O C E E D I N G S**

**VOLUME 2**

**FOI-COMMERCE**

**SOFIA, 2005**

Gladun V.P., Kr.K. Markov, A.F. Voloshin, Kr.M. Ivanova (editors)

Proceedings of the XI-th International Conference "Knowledge-Dialogue-Solution" – Varna, 2005  
Volume 2

Sofia, FOI-COMMERCE – 2005

Volume 1 ISBN: 954-16-0032-8

Volume 2 ISBN: 954-16-0033-6

First Edition

The XI-th International Conference "Knowledge-Dialogue-Solution" (KDS 2005) continues the series of annual international KDS events organized by Association of Developers and Users of Intelligent Systems (ADUIS).

The conference is traditionally devoted to discussion of current research and applications regarding three basic directions of intelligent systems development: knowledge processing, natural language interface, and decision making.

Edited by :

Association of Developers and Users of Intelligent Systems, Ukraine

Institute of Information Theories and Applications FOI ITHEA, Bulgaria

Printed in Bulgaria by FOI ITHEA

Sofia-1090, P.O.Box 775, Bulgaria

e-mail: [foi@nlcv.net](mailto:foi@nlcv.net)

[www.foibg.com](http://www.foibg.com)

All Rights Reserved

© 2005 Viktor P. Gladun, Krassimir K. Markov, Alexander F. Voloshin, Krassimira M. Ivanova - Editors

© 2005 Krassimira Ivanova - Technical editor

© 2005 Association of Developers and Users of Intelligent Systems, Ukraine - Co-edition

© 2005 Institute of Information Theories and Applications FOI ITHEA, Bulgaria - Co-edition

© 2005 FOI-COMMERCE, Bulgaria - Publisher

© 2005 For all authors in the issue

Volume 1 ISBN: 954-16-0032-8

Volume 2 ISBN: 954-16-0033-6

C\o Jusautor, Sofia, 2005

## PREFACE

The scientific Eleventh International Conference "Knowledge-Dialogue-Solution" took place in June, 20-30, 2005 in Varna, Bulgaria. These two volumes include the papers presented at this conference. Reports contained in the Proceedings correspond to the scientific trends, which are reflected in the Conference name.

The Conference continues the series of international scientific meetings, which were initiated more than fifteen years ago. It is organized owing to initiative of ADUIS - Association of Developers and Users of Intelligent Systems (Ukraine), Institute of Information Theories and Applications FOI ITHEA, (Bulgaria), and IJ ITA - International Journal on Information Theories and Applications, which have long-term experience of collaboration.

Now we can affirm that the international conferences "Knowledge-Dialogue-Solution" in a great degree contributed to preservation and development of the scientific potential in the East Europe.

The conference is traditionally devoted to discussion of current research and applications regarding three basic directions of intelligent systems development: knowledge processing, natural language interface, and decision making.

The basic approach, which characterizes presented investigations, consists in the preferential use of logical and linguistic models. This is one of the main approaches uniting investigations in Artificial Intelligence.

KDS 2005 topics of interest include, but are not limited to:

Cognitive Modelling	Knowledge Engineering
Data Mining and Knowledge Discovery	Logical Inference
Decision Making	Machine Learning
Informatization of Scientific Research	Multi-agent Structures and Systems
Intelligent NL Text Processing	Neural and Growing Networks
Intelligent Robots	Philosophy and Methodology of Informatics
Intelligent Technologies in Control and Design	Planning and Scheduling
Knowledge-based Society	Problems of Computer Intellectualization

The organization of the papers in KDS-2005 is based on specialized sessions. They are

1. Cognitive Modelling
2. Data Mining and Knowledge Discovery
3. Decision Making
4. Intelligent Technologies in Control, Design and Scientific Research
5. Mathematical Foundations of AI
6. Neural and Growing Networks
7. Philosophy and Methodology of Informatics

The official languages of the Conference are English and Russian. Sections are in alphabetical order. The sequence of the papers in the sections has been proposed by the corresponded chairs and is thematically based. The Program Committee recommends the accepted papers for free publishing in English in the International Journal on Information Theories and Applications (IJ ITA).

The Conference is sponsored by FOI Bulgaria ( [www.foibg.com](http://www.foibg.com) ).

We appreciate the contribution of the members of the KDS 2005 Program Committee.

On behalf of all the conference participants we would like to express our sincere thanks to everybody who helped to make conference success and especially to Kr.Ivanova, I.Mitov, N.Fesenko and V.Velichko.

V.P. Gladun, A.F. Voloshin, Kr.K. Markov

### CONFERENCE ORGANIZERS

National Academy of Sciences of Ukraine  
 Association of Developers and Users of Intelligent Systems (Ukraine)  
 International Journal "Information Theories and Applications"  
 V.M.Glushkov Institute of Cybernetics of National Academy of Sciences of Ukraine  
 Institute of Information Theories and Applications FOI ITHEA (Bulgaria)  
 Institute of Mathematics and Informatics, BAS (Bulgaria)  
 Institute of Mathematics of SD RAN (Russia)  
 New Technik Publishing Ltd. (Bulgaria)

### PROGRAM COMMITTEE

Victor Gladun (Ukraine) – chair  
 Alexey Voloshin (Ukraine) - co-chair  
 Krassimir Markov (Bulgaria) - co-chair

Igor Arefiev (Russia)	Genady Osipov (Russia)
Frank Brown (USA)	Alexander Palagin (Ukraine)
Alexander Eremeev (Russia)	Vladimir Pasechnik (Ukraine)
Natalia Filatova (Russia)	Zinoviy Rabinovich (Ukraine)
Konstantin Gaidrik (Moldova)	Alexander Reznik (Ukraine)
Tatyana Gavrilova (Russia)	Galina Rybina (Russia)
Vladimir Donskoy (Ukraine)	Vladimir Ryazanov (Russia)
Krassimira Ivanova (Bulgaria)	Vasil Sgurev (Bulgaria)
Natalia Ivanova (Russia)	Vladislav Shelepov (Ukraine)
Vladimir Jotsov (Bulgaria)	Anatoly Shevchenko (Ukraine)
Julia Kapitonova (Ukraine)	Ekaterina Solovyova (Ukraine)
Vladimir Khoroshevsky (Russia)	Vadim Stefanuk (Russia)
Rumyana Kirkova (Bulgaria)	Tatyana Taran (Ukraine)
Nadezhda Kiselyova (Russia)	Valery Tarasov (Russia)
Alexander Kleshchev (Russia)	Adil Timofeev (Russia)
Valery Koval (Ukraine)	Vadim Vagin (Russia)
Oleg Kuznetsov (Russia)	Jury Valkman (Ukraine)
Vladimir Lovitskii (GB)	Neonila Vashchenko (Ukraine)
Vitaliy Lozovskiy (Ukraine)	Stanislav Wrycza (Poland)
Ilia Mitov (Bulgaria)	Nikolay Zagoruiko (Russia)
Nadezhda Mishchenko (Ukraine)	Larissa Zainutdinova (Russia)
Xenia Naidenova (Russia)	Jury Zaichenko (Ukraine)
Olga Nevzorova (Russia)	Arkady Zakrevskij (Belarus)

TABLE OF CONTENTS

VOLUME 1

Section 1. Cognitive Modelling

1.1. Conceptual Modelling of Thinking as Knowledge Processing during the Recognition and Solving the Problems

Концептуальное представление об опознании образов и решении проблем в памяти человека и возможностях его использования в искусственном интеллекте  
*З.Л. Рабинович* ..... 1

Новое содержание в старых понятиях: К пониманию механизмов мышления и сознания  
*Геннадий С. Воронков* ..... 9

Формирование нейронных элементов в обонятельной коре: обучение путем прорастания  
*Геннадий С. Воронков, Владимир А. Изотов* ..... 17

Mathematical and Computer Modelling and Research of Cognitive Processes in Human Brain.  
 Part I. System Compositional Approach to Modelling and Research of Natural Hierarchical Neuron Networks. Development of Computer Tools  
*Yuriy A. Byelov, Sergiy V. Tkachuk, Roman V. Iamborak* ..... 23

Mathematical and Computer Modelling and Research of Cognitive Processes in Human Brain.  
 Part II. Applying of Computer Toolbox to Modelling of Perception and Recognition of Mental Pattern by the Example of Odor Information Processing  
*Yuriy A. Byelov, Sergiy V. Tkachuk, Roman V. Iamborak* ..... 32

О моделировании образного мышления в компьютерных технологиях: общие закономерности мышления  
*Юрий Валькман, Вячеслав Быков* ..... 37

Модели биоритмов взаимодействия  
*Степан Г. Золкин* ..... 45

Section 2. Data Mining and Knowledge Discovery

2.1. Actual Problems of Data Mining

Автоматизация процессов построения онтологий  
*Николай Г. Загоруйко, Владимир Д. Гусев, Александр В. Завертайлов, Сергей П. Ковалёв, Андрей М. Налёттов, Наталия В. Саломатина* ..... 53

Application of the Multivariate Prediction Method to Time Series  
*Tatyana Stupina, Gennady Lbov* ..... 60

К определению интеллектуального анализа данных  
*Ксения А. Найденова* ..... 67

The Development of the Generalization Algorithm based on the Rough Set Theory  
*M. Fomina, A. Kulikov, V. Vagin* ..... 76

Extreme Situations Prediction by Multidimensional Heterogeneous Time Series Using Logical Decision Functions  
*Svetlana Nedel'ko* ..... 84

Co-ordination of Probabilistic Expert's Statements and Sample Analysis in Recognition Problems  
*Tatyana Luchsheva* ..... 88

Evaluating Misclassification Probability Using Empirical Risk  
*Victor Nedel'ko* ..... 92

## 2.2. Structural-Predicate Models of Knowledge

SCIT — Ukrainian Supercomputer Project <i>Valeriy Koval, Sergey Ryabchun, Volodymyr Savyak, Ivan Sergienko, Anatoliy Yakuba</i> .....	98
Discovery of New Knowledge in Structural-predicate Models of Knowledge <i>Valeriy N. Koval, Yuriy V. Kuk</i> .....	104
Cluster Management Processes Organization and Handling <i>Valeriy Koval, Sergey Ryabchun, Volodymyr Savyak, Anatoliy Yakuba</i> .....	112
Multi-agent User Behavior Monitoring System Based on Aglets SDK <i>Alexander Lobunets</i> .....	119

## 2.3. Ontologies

Development of Educational Ontology for C-Programming <i>Sergey Sosnovsky, Tatiana Gavrilova</i> .....	127
How Can Domain Ontologies Relate to One Another? <i>Alexander S. Kleshchev, Irene L. Artemjeva</i> .....	132
Development of Procedures of Recognition of Objects with Usage Multisensor Ontology Controlled Instrumental Complex <i>Alexander Palagin, Victor Peretyatko</i> .....	140
A concept of the Knowledge Bank on Computer Program Transformations <i>Margarita A. Knyazeva, Alexander S. Kleshchev</i> .....	147
Implementation of Various Dialog Types Using an Ontology-based Approach to User Interface Development <i>Valeriya Gribova</i> .....	153
Онтологии как перспективное направление интеллектуализации поиска информации в мульти-агентных системах е-коммерции <i>Анатолий Я. Гладун, Юлия В. Рогущина</i> .....	158
Implementing Simulation Modules as Generic Components <i>Anton Kolotaev</i> .....	165
Использование Semantic Web технологий при аннотировании программных компонентов <i>Михаил Рощин, Алла Заболеева-Зотова, Валерий Камаев</i> .....	171

## 2.4. Computer Models of Common Sense Reasoning

DIAGaRa: An Incremental Algorithm for Inferring Implicative Rules from Examples (Part 1) <i>Xenia Naidenova</i> .....	174
DIAGaRa: An Incremental Algorithm for Inferring Implicative Rules from Examples (Part 2) <i>Xenia Naidenova</i> .....	182
Программные системы и технологии для интеллектуального анализа данных <i>Александр Е. Ермаков, Ксения А. Найденова</i> .....	190
Модуль формирования таблиц соответствия измерительных шкал в подсистеме индуктивного вывода знаний проблемно-ориентированного инструментального средства <i>Александр Е. Ермаков, Вадим А. Ниткин</i> .....	199

## Section 3. Decision Making

### 3.1. Actual Problems of Decision Making

О проблемах принятия решений в социально-экономических системах <i>Алексей Ф. Волошин</i> .....	205
Оптимальная траектория модели динамического межотраслевого баланса открытой экономики <i>Игорь Ляшенко, Елена Ляшенко</i> .....	212
Нечеткие множества: Аксиома абстракции, статистическая интерпретация, наблюдения нечетких множеств <i>Владимир С. Донченко</i> .....	218

Технология классификации электронных документов с использованием теории возмущения псевдообратных матриц <i>Владимир С. Донченко, Виктория Н. Омардибирова</i> .....	223
Векторные равновесия во многокритериальных играх <i>Сергей Мащенко</i> .....	226
Эволюционная кластеризация сложных объектов и процессов <i>Виталий Снитюк</i> .....	232
Система качественного прогнозирования на основе нечетких данных и психографии экспертов <i>А.Ф. Волошин, В.М. Головня, М.В. Панченко</i> .....	237
Процедуры локализации вектора весовых коэффициентов за обучающими выборками в задаче потребления <i>Елена В. Дробот</i> .....	243
Нечеткие модели многокритериального коллективного выбора <i>Алексей Ф. Волошин, Николай Н. Маляр</i> .....	247
Алгоритм последовательного анализа и отсеивания элементов в задаче определения медианы строгих ранжирований объектов <i>Павел П. Антосяк, Григорий Н. Гнатиенко</i> .....	250
Один подход к модели теории инвестиционного анализа с учетом фактора нечеткости <i>Ольга В. Дьякова</i> .....	253
Model of Active Monitoring <i>Sergey Mostovoi, Vasilij Mostovoi</i> .....	256
Towards the Problems of an Evaluation of Data Uncertainty in Decision Support Systems <i>Victor Krissilov, Daria Shabadash</i> .....	262
<b>3.2. Decision Support Systems</b>	
Применение квалиметрических моделей при решении социально-экономических задач <i>А. Крисилов, В. Степанов, И. Голяева, Б. Блюхер</i> .....	265
Analogous Reasoning for Intelligent Decision Support Systems <i>A.P. Ereemeev, P.R. Varshavsky</i> .....	272
A Multicriteria Decision Support System <i>MultiDecision-1</i> <i>Vassil Vassilev, Krasimira Genova, Mariyana Vassileva</i> .....	279
Recognition on Finite Set of Events: Bayesian Analysis of Statistical Regularity and Classification Tree Pruning <i>Vladimir B. Berikov</i> .....	286
Decision Forest versus Decision Tree <i>Vladimir Donskoy, Yuliya Dyulicheva</i> .....	289
Generalized Scalarizing Problems <i>GENS</i> and <i>GENS</i> Lex of Multicriteria Optimization <i>Mariyana Vassileva</i> .....	297
Information System for Situational Design <i>T. Goyvaerts, A. Kuzemin, V. Levikin</i> .....	305
Implementation of the System Approach in Designing Information System for Ensuring Ecological Safety of Mudflow and Creep Phenomenae <i>E. Petrov, A. Kuzemin, N.Gusar, D. Fastova, I. Starikova, O. Dytsenko</i> .....	307
A Method of the Speaker Identification on Basis of the Individual Speech Code <i>M.F. Bondarenko, A.V. Rabotyagov, M.I. Sliptshenko</i> .....	312
Mathematical Model for Situational Center Development Technology <i>V.M. Levykin</i> .....	318
Index of Authors .....	319

## VOLUME 2

### Section 4. Intelligent Technologies in Control, Design and Scientific Research

#### 4.1. Intelligent NL Processing

A Workbench for Document Processing <i>Karola Witschurke</i> .....	321
Experiments in Detection and Correction of Russian Malapropisms by Means of the WEB <i>Elena I. Bolshakova, Igor A. Bolshakov, Aleksey P. Kotlyarov</i> .....	328
Verbal Dialogue versus Written Dialogue <i>David Burns, Richard Fallon, Phil Lewis, Vladimir Lovitskii, Stuart Owen</i> .....	336
Конспектирование естественных языковых текстов <i>Виктор П. Гладун, Виталий Ю. Величко</i> .....	344
О задаче семантического индексирования тематических текстов <i>Надежда Мищенко, Наталья Щеголева</i> .....	347
Resolution of Functional Homonymy on the Basis of Contextual Rules for Russian Language <i>Olga Nevzorova, Julia Zin'kina, Nicolaj Pjatkin</i> .....	351
Information Processing in a Cognitive Model of NLP <i>Velina Slavova, Alona Soschen, Luke Immes</i> .....	355

#### 4.2. Application of AI Methods for Prediction and Diagnostics

Application of Artificial Intelligence Methods to Computer Design of Inorganic Compounds <i>Nadezhda N. Kiselyova</i> .....	364
К вопросу о развитии интерфейса «разработчик-заказчик» <i>Леонид Святогор</i> .....	371

#### 4.3. Planning and Sheduling

Two-machine Minimum-length Shop-Scheduling Problems with Uncertain Processing Times <i>Natalja Leshchenko, Yuri Sotskov</i> .....	375
Learning Technology in the Scheduling Algorithm Based on the Mixed Graph Model <i>Yuri Sotskov, Nadezhda Sotskova, Leonid V. Rudoi</i> .....	381

#### 4.4. Intelligent Technologies in Control

Автоматный метод решения систем линейных ограничений в области $\{0,1\}$ <i>Сергей Кривый, Людмила Матвеева, Виолета Гжывач</i> .....	389
Logical Models of Composite Dynamic Objects Control <i>Vitaly J. Velichko, Victor P. Gladun, Gleb S. Gladun, Anastasiya V. Godunova, Yuri L. Ivaskiv, Elna V. Postol, Grigorii V. Jakemenko</i> .....	395
The Information-analytical System for Diagnostics of Aircraft Navigation Units <i>Ilya Prokoshev, Vyacheslav Suminov</i> .....	400
Динамические системы в описании нелинейных рекурсивных регрессионных преобразователей <i>Микола Ф. Кириченко, Владимир С. Донченко, Денис П. Сербеев</i> .....	404
The Matrix Method of Determining the Fault Tolerance Degree of a Computer Network Topology <i>Sergey Krivoi, Miroslaw Hajder, Pawel Dymora, Miroslaw Mazurek</i> .....	412
Robot Control Using Inductive, Deductive and Case Based Reasoning <i>Agris Nikitenko</i> .....	418
Information Models for Robotics System with Intellectual Sensor and Self-organization <i>Valery Pisarenko, Ivan Varava, Julia Pisarenko, Viktoriya Prokopchuk</i> .....	427

#### 4.5. Intelligent Systems

Static and Dynamic Integrated Expert Systems: State of the Art, Problems and Trends <i>Galina Rybina, Victor Rybin</i> .....	433
Adaptive Routing and Multi-Agent Control for Information Flows in IP-Networks <i>Adil Timofeev</i> .....	442
The on-board Operative Advisory expert Systems for Anthropocentric Object <i>Boris E. Fedunov</i> .....	446
Оптимизация телекоммуникационных сетей с технологией ATM <i>Леонид Л. Гуляницкий, Андрей А. Баклан</i> .....	454
Testing AI in One Artificial World <i>Dimitar Dobrev</i> .....	461
Concurrent Algorithm for Filtering Impulse Noise on Satellite Images <i>Nguyen Thanh Phuong</i> .....	465

#### 4.6. Macro-economical Modelling

Сравнительный анализ четкого и нечеткого методов индуктивного моделирования (МГУА) в задачах макроэкономического прогнозирования <i>Юрий П. Зайченко</i> .....	473
Исследование нечеткой нейронной сети ANFIS в задачах макроэкономического прогнозирования <i>Юрий П. Зайченко, Фатма Севаев</i> .....	479
Математическая модель реструктуризации сложных технико-экономических структур <i>Май Корнийчук, Инна Совтус, Евгений Цареградский</i> .....	486

### Section 5. Mathematical Foundations of AI

#### 5.1. Algorithms

Raising Efficiency of Combinatorial Algorithms by Randomized Parallelization <i>Arkadij D. Zakrevskij</i> .....	491
Specifying Agent Interaction Protocols with Parallel Control Algorithms <i>Dmitry Cheremisinov, Liudmila Cheremisinova</i> .....	496
Об одной модификации TSS-алгоритма <i>Руслан А. Багрий</i> .....	504
The Development of Parallel Resolution Algorithms Using the Graph Representation <i>Andrey Averin, Vadim Vagin</i> .....	509
Магнитная гидродинамика жидкости и динамика упругих тел: моделирование в среде Mathematica <i>Ю.Г. Лега, В.В. Мельник, Т.И. Бурцева, А.Н. Пануша</i> .....	517
Some Approaches to Distributed Encoding of Sequences <i>Artem Sokolov, Dmitri Rachkovskij</i> .....	522

#### 5.2. Modal Logic

Representing the Closed World Assumption in Modal Logic <i>Frank M. Brown</i> .....	529
Representing Skeptical Logics in Modal Logic <i>Frank M. Brown</i> .....	537
Automatic Fixed-point Deduction Systems for Five Different Propositional NonMonotonic Logics <i>Frank M. Brown</i> .....	545
Nonmonotonic Systems Based on Smallest and Minimal Worlds Represented in World Logic, Modal Logic, and Second Order Logic <i>Frank M. Brown</i> .....	553
Z Priorian Modal Second Order Logic <i>Frank M. Brown</i> .....	560

## Section 6. Neural and Growing Networks

### 6.1. Neural Network Applications

Parallel Markovian Approach to the Problem of Cloud Mask Extraction <i>Natalia Kussul, Andriy Shelestov, Nguyen Thanh Phuong, Michael Korbakov, Alexey Kravchenko</i> .....	567
Идентификация нейросетевой модели поведения пользователей компьютерных систем <i>Н. Куссуль, С. Скакун</i> .....	570
Jamming Cancellation Based on a Stable LSP Solution <i>Elena Revunova, Dmitri Rachkovskij</i> .....	578
Graph Representation of Modular Neural Networks <i>Michael Kussul, Alla Galinskaya</i> .....	584
Гетерогенные полиномиальные нейронные сети для распознавания образов и диагностики состояний <i>Адиль В. Тимофеев</i> .....	591
Neuronal Networks for Modelling of Large Social Systems. Approaches for Mentality, Anticipating and Multivaluedness Accounting. <i>Alexander Makarenko</i> .....	600

### 6.2. Neural Network Models

Представление нейронных сетей динамическими системами <i>Владимир С. Донченко, Денис П. Сербеев</i> .....	605
Generalization by Computation Through Memory <i>Petro Goryuch</i> .....	608
Neural Network Based Approach for Developing the Enterprise Strategy <i>Todorka Kovacheva, Daniela Toshkova</i> .....	616
Neuro-Fuzzy Kolmogorov's Network with a Hybrid Learning Algorithm <i>Yevgeniy Bodyanskiy, Yevgen Gorshkov, Vitaliy Kolodyazhniy</i> .....	622
Нейросетевая классификация земного покрова на основании спектральных измерений <i>Алла Лавренюк, Лилия Гнибеда, Екатерина Яровая</i> .....	627

## Section 7. Philosophy and Methodology of Informatics

### 7.1. Knowledge Market

The Staple Commodities of the Knowledge Market <i>Krassimir Markov, Krassimira Ivanova, Iliya Mitov</i> .....	631
Basic Interactions between Members of the Knowledge Market <i>Krassimira Ivanova, Natalia Ivanova, Andrey Danilov, Iliya Mitov, Krassimir Markov</i> .....	638

### 7.2. Information Theories

Ценность информации <i>Андрей Данилов</i> .....	649
The Main Question of the Informatics, 100 Years after its Poseing <i>Stoyan Poryazov</i> .....	655
Objects, Functions and Signs <i>Stoyan Poryazov</i> .....	656

### 7.3. The Intangible World

Approaching the Noosphere of Intangible – Esoteric from Materialistic Viewpoint <i>Vitaliy Lozovskiy</i> .....	657
Informatics, Psychology, Spiritual Life <i>Larissa A. Kuzemina</i> .....	669
Information Support of Passionaries <i>Alexander Ya. Kuzemin</i> .....	670

Index of Authors .....	675
------------------------	-----