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GRANT APPLICATION

REGISTRATION NUMBER

Confidential

Commision of S.G.A.

Commission of S.G.A. for electroengineering and informatics

Title of the project

Intelligent Technologies for Knowledge Oriented Organizations

Key words

Knowledge, ontologies, information resources, text processing, neural networks

Duration of the project (m/y)

From	01	2007	to	12	2009
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Number of - researchers

10

- graduate students

1

SUMMARY OF THE FINANCIAL MEANS REQUESTED	1 st year	2 nd year	3 rd year
	(IN THOUSANDS OF SLOVAK CROWNS -SK)		
INVESTMENTS (equipment)	200	100	75
NON-IVESTMENT COSTS (travel expenses including conferences, energies, communications, minor material/ immaterial items, consumables, maintenance, services, sub-contracts)	695	625	625

PRINCIPAL INVESTIGATOR (surname, first name, title):

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List of scientific co-workers

HLUCHÝ, Ladislav, Ing., PhD.
 MOKRIŠ, Igor, prof. Ing. PhD.
 NGUYEN, T. Giang, Ing., PhD
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 FORGÁČ, Radoslav, Ing.
 GATIAL, Emil, Ing.
 ŠELENG, Martin, Mgr.
 TÓTH, Adrián, Ing.
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Signature of the

Date March 24, 2006.....

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Project summary

An important aspect in building knowledge economy is an ability of organizations to assess their knowledge capital. Technologies and knowledge are becoming a key factor in productivity growth. This is the reason why companies support knowledge management projects in their organizations and strive to use their knowledge management to the largest possible extent.

The objective of the project is to support companies heading towards the knowledge economy by extending existing and creating new models, algorithms, technologies and tools that can help organizations in their transition to a knowledge oriented corporation. Such transition should be preceded by an analysis and processing of information resources in organizations including documents, electronic communication and databases in an effect to manage and create availability and sharing of relevant information and knowledge.

The project focuses in particular on the areas of knowledge modeling, service oriented architectures, distributed knowledge bases, semantic annotation, knowledge mining, case based reasoning and statistical methods. Special attention is devoted to processing of information resources in the Slovak language, where techniques based on neural networks and ontologies will be used.

Scientific goals for the first period of this project

1. Analysis of suitable models, methods and algorithms to support knowledge processes and processing of information resources in an organization.
2. Design of methods and algorithms to support knowledge processes for knowledge management, support of service oriented architectures and creation of distributed knowledge bases based on ontologies.
3. Design of models for searching information from documents in the Slovak language considering its flexibility via neural networks.

Scientific goals for the second period of this project

1. Development of methods and algorithms suitable for support of knowledge processes in organizations on the basis of existing analyzed methods and algorithms from the field of knowledge management, web services, semantics, neural networks, case based reasoning, stochastic and statistic methods.
2. Development of models for searching documents by key words, phrases and context in the Slovak language considering its flexibility applying a hybrid approach on the basis of neural networks and document models based on ontology based document representation.
3. Implementation of models, methods and algorithms.
4. Development of supporting integration architecture based on the service oriented architecture principles.
5. Verification of models, methods and algorithms on selected testing domain.

International scientific co-operation

Institute of Informatics, Slovak Academy of Sciences in Bratislava closely cooperates with several European scientific institutions (Cyfronet, Krakow, Poland; Fraunhofer-Institut für Rechnerarchitektur und Softwaretechnik FIRST, Berlin, Germany; Universitaet Innsbruck, Institute for Computer Science, Innsbruck, Austria, CCLRC-Council for the Central Laboratory of the Research Councils, Chilton, England) in knowledge oriented technologies, especially in 5RP and 6RP IST projects, in which the institute participated in creating solutions for knowledge management, organizational memories and information resources processing. One of the ongoing programs is K-Wf Grid „Knowledge-based Workflow System for Grid Applications“ EU RTD IST FP6-511385

Description of the project (range - maximum 5 pages)

- a) *Present state of the subject*
- b) *Particular contribution expected*
- c) *Proposal of the ways to reach the project goals, including timetable*
- d) *Working group (comment on the choice of the research group)*
- e) *Description of applied methods and their explanation*



a) *Present state of the subject*

The world economy is moving towards the so called knowledge economy [1], while its important feature is capability of organizations to appreciate their knowledge capital. Technologies and knowledge are becoming the key factors in productivity growth. Currently research and development in the area of semantic web, knowledge and intelligent technologies is focusing attention on this field.

Knowledge Models, Modeling and Organizational Memories

Organizational memory is an explicit, disembodied and permanent representation of crucial knowledge and information in organizations. Such type of memory has to enable availability, sharing and reuse by organization members working on individual or collective tasks. Organizational memory development has to be preceded by design of an information and knowledge model. Part of this model then forms a structure and properties of organizational memory data. Knowledge is modeled using various techniques such as knowledge ontologies [26, 27], object oriented approaches or methodologies such as CommonKADS [2].

A significant aspect in the knowledge acquisition process is the use of knowledge modeling in order to structure acquired and evaluated knowledge that is consequently stored to be used in the future. Knowledge models are structured knowledge representations using symbols to represent knowledge sets and relations among them. Upon text processing, knowledge models are developed and knowledge tools are striving to identify fundamental objects. Basic knowledge objects are concepts, instances, processes (tasks, activities), attributes and values, rules and relations.

Within organizational memories, knowledge is understood as a varying mixture of framework experience of various values of contextual information and basic intuition. Such mixture provides environment and framework for evaluation and adding of new experience and information [28]. This type of memory has to enable availability, sharing and reuse by organization members working on individual or collective tasks. Current approaches for modeling and development of organizational memory knowledge are based on the principles of semantic web, i.e. a heterogeneous approach to distributed knowledge either in an organization or among organizations. Semantic web provides tools and languages for development and management of knowledge via ontologies which creates a framework for knowledge representation that searches the line between sufficient expressivity and complexity of such described model. Under ontology we understand an integrated set of information on certain activity or interest. Common ontology types used in the web environment contain taxonomy and a set of derivation rules. Application of derivation rules enables to derive new knowledge from known facts. Examples of existing organizational memories on the basis of semantic web are Kaon[14], Racer[16], Sesame[19], Swoop [8] and Pellet[25] allowing users simple management of knowledge represented in OWL , RDF and RDFS [26, 27] languages.

Distributed organizational memories play an important role in interconnection and communication among individual organizations in the knowledge economy and thus create new environment to support knowledge processes and processing of information resources. Explicit knowledge modeling via rules and scripts can simplify developmental environment for formation and processing of knowledge allowing thus simple creation and presentation of methods for knowledge discovery in organizations.

In a knowledge oriented system it is important to have dynamic, not static unchanging knowledge and to use them properly in relevant situations. Electronic communication makes this possible [29]: Every organization, without exception, will have an e-mail infrastructure before it reaches the stage of developing an organizational memory; E-mail communication in a modern organization is over 78% action-oriented, according to a recent study [30]. Organizations must converge to action, and communication is perhaps the foundation for most organizational action [31]; Managers, and knowledge workers of all kinds, interact with their e-mail systems on a daily basis; Managers are motivated to achieve successful communication.

When building a solution on top of email communication, an organization does not have to change the way of doing its business, when such a solution is installed and set up in an organization. Users simply receive emails in the same way as before, but with attached relevant knowledge to the problem which the email represents.

Information Resources in Organizations and their Processing

Appropriate information resources processing in an organization is the most important part in the process of introducing knowledge oriented technologies into organizations. The processing depends first of all on the type of information resource, the knowledge application model as well as on the problem, which the resource processing results should help to resolve. Fundamental information resources in organizations currently include documents, electronic communication and databases. Most of these resources are able to be transformed to text that can be followed by application of methods for text processing in an effect to acquire necessary information and knowledge.

Over the world information resource processing is the focus of many research institutions; however, this research is far from being finished. The English language processing is handled quite well, however in our conditions it is important to deal with information resource processing in the Slovak language that is still at the beginning. Another open challenge is appropriate use of electronic communication which does not have to serve solely as an information and knowledge resource but also for creation models of tasks, actors and resources within an organization.

Information retrieval from text documents that influences knowledge system development has a great importance nowadays. Therefore, the number of electronic documents is permanently growing. From the year 1950, when the electronic documents in digital libraries were placed, methods using the document representation by Boolean model were introduced [5]. This was the first attempt to create an information retrieval system. Then emerged further document representations (described below), which enabled creation of new more effective information retrieval systems. The neural networks were also applied in these systems [17, 18, 22, 24].

The information retrieval system from text documents in a natural language on the basis of user queries enables to retrieve relevant documents from the document collection. For the information retrieval system it is needed to define the query definition manner (words, pattern forms and structured queries [5], the document representation manner and the relevant document retrieval system. The documents may be represented by indexation, inverted index, semantic nets and ontology, on the basis of intelligent agents and semantic web [7, 26, 27] etc.

Information retrieval models can be divided into three main groups [5], namely boolean and fuzzy models [5, 4, 15], vector models [6, 12] and probabilistic models [3, 20]. Currently the information retrieval research inclines to document representation via ontologies [26, 27], in particular in the semantic web [7].

Recently the research field of information retrieval has begun using neural networks [11, 17, 24]. They are applied anywhere, where there are no strict data given (different modifications of words), which complicate the information retrieval from the text documents and where is a need to solve the classification or prediction problem of processed, stored and retrieved collection of documents. These are supervised [17, 24] and unsupervised [13, 18, 23] feed-forward neural networks, recurrent neural networks and hierarchical neural networks [22].

On the basis of foundations of given research field it can be mentioned that the neural networks have their place in the text document retrieval systems, because they create the prerequisites to simplify methods for the language analysis of the text and they provide effective tools to access the documents. They also found their place in hybrid approaches of representation and processing of the documents by neural networks and ontology [11, 22].

Every published method was used for the English language, where the words in the documents were processed by Porter's algorithm [21]. For the Slovak language such algorithm is very complicated, because the Slovak language is very flexible and inflexive endings. Papers discussing the problem of the information retrieval in the Slovak language were published [9], while they use a linguistic approach, which is too complicated. Therefore, to address the partial problems in the Slovak language analysis, the neural networks can be used.

Availability, Management and Sharing of Information Resources

In order to use information and knowledge in an organization properly, it is necessary to ensure availability of information for users as well as interconnection with existing systems. A way of interconnection with existing and external systems is the use of web services seeing intensive research in the area of their extension to semantic web services [38] and service oriented architectures [10]. This can consequently ensure sharing of necessary information and providing of services among organization departments as well as external organizations (suppliers and customers). The right use of information and knowledge must be backed by systems for sharing knowledge among system users (found for example in projects Pellucid; DECOR that prepared context sensitive knowledge form archived documents; or SmartGov the stored and provided knowledge in context [32]) on an organizational level as well as support of cooperation among them on the basis of e-Collaboration solutions [33] for instance in combination with solutions based on electronic communication enabling active knowledge presentation on the basis of the user context.

Another significant part is knowledge and information maintenance in an organizational memory. The knowledge maintenance is tied with presentation of formalized knowledge to users. A knowledge maintenance interface can be built on approaches based on object trees (ontology editors such as Protégé [34] or OilEd). This approach is mostly understandable to experts who understand the ontology. Other methods can be graph-based since most representations of formalized knowledge such as DAML, OWL [26] or RDF [27] use a graph structure. Examples are UML, Ontoviz Tab [35] in the Protégé editor or Cartoo Technologies [36] products. For knowledge maintenance interfaces also solutions based on XSL [37] transformation can be used. The knowledge maintenance should also support user feedback. Mechanisms such as reviewing, evaluating, voting or ranking on presented knowledge need to be incorporated.

References:

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b) Particular contribution expected

Knowledge Modeling, Models and Organizational Memories

In distributed knowledge bases we will direct attention first of all to research and development of distributed methods for storing and management of knowledge. The objective will be creation of distributed environment on the basis of peer-to-peer networks allowing simple, scalable access and easy connection for organization users as well as inter-organizational interconnection. Explicit knowledge modeling via rules and scripts will simplify the development environment for knowledge creation and processing and thus enabling simple creation and presentation of methods for knowledge management in organizations.

Ontological models supporting document and electronic communication classification and processing are expected to be introduced.

Information Resources in Organizations and their Processing

Expected contribution is the use of models and algorithms of neural networks and their adaptation to the Slovak language. It is possible to link representation of queries and documents in Slovak on the basis of document models represented by neural networks with domain representation of document collection via ontology; and to design powerful document retrieval algorithms using key words, phrases and context in the Slovak language considering its flexibility and inflexive endings by means of hybrid approaches on the basis of neural networks and document models based on domain representation using ontologies.

Information resources will be also processed by semantic annotation, while the focus will be on research of ontological metadata of information resources within designed ontological models. This should enable better categorization and information resources and knowledge context retrieval.

Availability, Management and Sharing of Information Resources

The subject of the research will be prospects and approaches in sharing information and knowledge retrieved by processing information resources via semantic web services and service oriented architectures as well as cooperation and knowledge sharing among users on the basis of user context and information resources context, where we anticipate results in active semi-automatic retrieval of relevant information and knowledge through the designed model and context processing algorithms.

Further contribution should be research in the field of knowledge maintenance and knowledge models and related research in the area of formalized knowledge visualization for experts and common users. This embraces development of approaches for evaluation and maintenance of knowledge by common users including voting or ranking on information and knowledge relevance.

c) Proposal of the ways to reach the project goals, including timetable

The project solution will be divided into two periods reflecting designed objectives.

The first period is devoted to an analysis of models, methods and algorithms for information resource processing and support of knowledge processes in organizations. The analysis will be followed by the design of appropriated models, methods and algorithms.

The second period will give models, the methods and algorithms a more specific character that will result in implementation. Methods, algorithms and models will be integrated in the designed architecture; this should ensure their coordination and work over common information resources as well as a consistent approach to final information and knowledge. The models, algorithms and methods will be tested and evaluated on chosen application domains.

Timetable is divided to 36 months as shown in the table:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Period 1																																				
1 Analysis																																				
2 Alg & Mth Design																																				
3 Models Design																																				
Period 2																																				
1 Mth & Alg Devel																																				
2 Models Devel																																				
3 Implementation																																				
4 Architecture																																				
5 Testing & Eval																																				

d) Working group (comment on the choice of the research group)

RNDr. Michal Laclavík, PhD. - focuses on knowledge modeling, ontologies, semantic annotation and text and electronic communication processing via semantic technologies

Ing. Ladislav Hluchý, PhD. - his principal research interests are the semantic web and semantic grid; and knowledge oriented technologies

prof. Ing. Igor Mokriš, CSc. – his research topic is neural networks. Recently he has been dealing with information retrieval from text documents through neural networks, while supervising a doctoral student in this field.

Ing. Giang Nguyen, PhD. - text processing, knowledge presentation via knowledge modeling

Ing. Zoltán Balogh - deals with knowledge technologies such as case based reasoning, semantic web services, service oriented architectures and similarity measures in ontologies

Ing. Marián Babík – his research areas are semantic web services, service oriented architectures and distributed knowledge bases and memories.

Ing. Radoslav Forgáč – Dealing with neural networks, he has submitted a doctoral thesis in this subject.

Ing. Emil Gatíal – conducts research in visualization and administration of knowledge and knowledge ontologies

Mgr. Martin Šeleng – carries out research in XML technologies and their interconnection to ontology and semantics as well as in stochastic and statistic modeling and statistic evaluation of information and knowledge relevance.

Ing. Adrián Tóth – his research interest is knowledge technologies, semantic web services and service oriented architectures.

Ing. Lenka Skovajsová – is a doctoral student, and her research topic is information retrieval from text document in a natural language.

e) Description of applied methods and their explanation

The work within the project will include design and analysis of neural network models for information retrieval from text documents. In this area the vector models were applied most frequently, because they can be implemented in the neural networks structure. From these kinds of models, the vector space model was applied mainly. It was used for the information retrieval from the text document collection by spreading activation neural networks. A great drawback of this system in a large document collection can be a large dimension of keyword-document matrix, which was seen in the structure complexity of neural network, mainly in the number of neurons in the layers of the neural networks.

It seems that this information retrieval method from large collections of data could be based on the latent semantic indexing model and on the models based on the principal component analysis and independent component analysis, which have the best prerequisite for the dimension reduction of the document space. It can be expected that the dimension reduction of the document space damages the addressing of an access to documents and by this manner disrupt the affectivity of the information retrieval algorithm. That is the reason why one needs to find suitable hybrid representation of documents. It enables their sorting and storing into domain databases of documents and also suitable representation to dimension reduction of information retrieval space.

In distributed organizational bases, the design will concentrate on semantic web standards such as RDF/RDFS, OWL, successfully applied in several application domains. The project will strive to analyze and extend ontologies and methodology of their development in terms of distributed systems. Moreover, the project will analyze semantic peer-to-peer technologies and their setting in the organization environment. Within explicit knowledge modeling applying rules and scripts, standards for rule description will be maintained. These include SWRL, RuleML etc.; and common script languages Python, PHP, Perl and Ruby.

Documents and electronic documentation will be processed with the semantic text annotation in an effect to enable defining a document and communication context to be compared to a user context and to provide relevant information and knowledge on the basis of found coincidence between these contexts described with the ontological model to be designed by methodologies such as CommonKADS.

The ontological approach can be applied in domain representation of a large document collection that would distribute document representation space to smaller domain areas, homogeneously focused on given document areas, simplifying thus a structure of neural networks performing algorithms for document retrieval and access by means of key words, phrases on natural language contexts.

Results of algorithms which will run on applied and new developed models will be evaluated using statistic and stochastic methods. This will help us to see whether the results meet the expectations.

Surname, first name, title LACLAVÍK, Michal, RNDr., PhD.	Highest degree & year	PhD 2006	Age	29
Institution and address (street, postal code, city) Institute of Informatics, Slovak Academy of Sciences, Dubravska cesta 9 84507 Bratislava Slovakia				
Selection of 5 most important works of the principal investigator (whole period). Please quote the total number of citations / number of citations for the last five years with each work.				
<ol style="list-style-type: none"> 1. BALOGH Z., LACLAVÍK M., HLUCHÝ L.: Multi Agent System for Negotiation and Decision Support. In: Proc. of 4-th International Scientific Conference Electronic Computers & Informatics'2000, Košice - Herľany, Slovakia, 2000, pp.264-270. ISBN 80-88922-25-9. (4) 2. NGUYEN G.T., DANG T.T., HLUCHÝ L., LACLAVÍK M., BALOGH Z. and BUDINSKA I.: Agent Platform Evaluation and Comparison., II-SAS, Pellucid EU 5FP IST-2001-34519 RTD, Technical report Jun 2002, Bratislava, Slovakia (12) 3. LACLAVÍK M., BALOGH Z., HLUCHÝ L.: Secure Agent Architecture for Wireless Devices. In: Proc. of the IASTED International Conference APPLIED INFORMATICS, International Symposium on Software Engineering, Databases, and Applications, February 2002 Innsbruck, ACTA Press, Anaheim, Calgary, Zurich, 2001, pp. 254-257, ISSN 1027-2666, ISBN 0-88986-322-9. (1) 4. LACLAVÍK M., BALOGH Z., HLUCHÝ L., NGUYEN G.T., BUDINSKA I., DANG T.T.: Pellucid Agent Architecture for Administration Based Processes. In: Proc. of International Conference on Intelligent Agents, Web Technology and Internet Commerce, Vienna, February 12-14, 2003, pp. 577-584, ISBN 1740880692 5. LACLAVÍK M., BALOGH Z., HLUCHÝ L., SLOTA R., KRAWCZYK K. and DZIEWIERZ M.: Distributed Knowledge Management based on Software Agents and Ontology. In: Proc. of 5-th Intl. Conf. on Parallel Processing and Applied Mathematics PPAM'2003, R.Wyrzykowski et.al. eds., 2004, LNCS 3019, Springer-Verlag, pp. 694-699, ISSN 0302-9743, ISBN 3-540-21946-3. September 2003, Czestochowa, Poland. (2) 				
Selection of 5 most important works of the principal investigator in the last 5 years – quote the survey of the citations of the most frequently cited work from this selection in Appendix 1.				
<ol style="list-style-type: none"> 1. LACLAVÍK M., BALOGH Z., HLUCHÝ L.: Secure Agent Architecture for Wireless Devices. In: Proc. of the IASTED International Conference APPLIED INFORMATICS, International Symposium on Software Engineering, Databases, and Applications, February 2002 Innsbruck, ACTA Press, Anaheim, Calgary, Zurich, 2001, pp. 254-257, ISSN 1027-2666, ISBN 0-88986-322-9. (1) 2. LACLAVÍK M., BALOGH Z., HLUCHÝ L., NGUYEN G.T., BUDINSKA I., DANG T.T.: Pellucid Agent Architecture for Administration Based Processes. In: Proc. of International Conference on Intelligent Agents, Web Technology and Internet Commerce, Vienna, February 12-14, 2003, pp. 577-584, ISBN 1740880692 3. LACLAVÍK M., BALOGH Z., HLUCHÝ L., SLOTA R., KRAWCZYK K. and DZIEWIERZ M.: Distributed Knowledge Management based on Software Agents and Ontology. In: Proc. of 5-th Intl. Conf. on Parallel Processing and Applied Mathematics PPAM'2003, R.Wyrzykowski et.al. eds., 2004, LNCS 3019, Springer-Verlag, pp. 694-699, ISSN 0302-9743, ISBN 3-540-21946-3. September 2003, Czestochowa, Poland. (2) 4. BALOGH Z., LACLAVÍK M., HLUCHÝ L., BUDINSKÁ I., KRAWCZYK K.: REMARK - Reusable Agent-Based Experience Management and Recommender Framework In: Proc.of International Conference on Computational Science, Part III, LNCS 3038, Springer-Verlag, 2004, pp. 599-606, ISSN 0302-9743, ISBN 3-540-22116-6, June 6-9, Krakow, Poland. (1) 5. LACLAVIK M., GATIAL E., BALOGH Z., HABALA O., NGUYEN G., HLUCHY L.: Experience Management Based on Text Notes (EMBT) In: Proc. of eChallenges 2005 Conference, 19 - 21 October 2005, Ljubljana, Slovenia, Innovation and the Knowledge Economy, Volume 2, Part 1: Issues, Applications, Case Studies; Edited by Paul Cunningham and Miriam Cunningham; IOS Press, pp.261-268. ISSN 1574-1230, ISBN 1-58603-563-0 				

SURVEY OF THE CITATIONS

BALOGH Z., LACLAVÍK M., HLUCHÝ L.: Multi Agent System for Negotiation and Decision Support. In: Proc. of 4-th International Scientific Conference Electronic Computers & Informatics'2000, Košice - Herľany, Slovakia, 2000, pp.264-270. ISBN 80-88922-25-9. (4)

was cited in

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- L Loss, CE Gesser, MVD Silva: Uma Abordagem de Negociação para Inclusão de Novos Parceiros em uma Empresa Virtual. google-scholar: das.ufsc.br
- L Loss, CE Gesser: Protocolos Para Negociação Entre Agentes. google-scholar: das.ufsc.br

SCIENTIFIC CO-WORKERS

Surname, first name, title HLUCHÝ Ladislav Ing. PhD.	Highest degree & year PhD 1986	Age 53
Institution and address (street, postal code, city) Institute of Informatics, Slovak Academy of Sciences, Dubravska cesta 9 84507 Bratislava Slovakia		
Selection of 5 most important works of the co-worker in the last 5 years		
<ol style="list-style-type: none"> 1. LACLAVÍK M., BALOGH Z., HLUCHÝ L.: Secure Agent Architecture for Wireless Devices. In: Proc. of the IASTED International Conference APPLIED INFORMATICS, International Symposium on Software Engineering, Databases, and Applications, February 2002 Innsbruck, ACTA Press, Anaheim, Calgary, Zurich, 2001, pp. 254-257, ISSN 1027-2666, ISBN 0-88986-322-9. (1) 2. LACLAVÍK M., BALOGH Z., HLUCHÝ L., NGUYEN G.T., BUDINSKA I., DANG T.T.: Pellucid Agent Architecture for Administration Based Processes. In: Proc. of International Conference on Intelligent Agents, Web Technology and Internet Commerce, Vienna, February 12-14, 2003, pp. 577-584, ISBN 1740880692 3. LACLAVÍK M., BALOGH Z., HLUCHÝ L., SLOTA R., KRAWCZYK K. and DZIEWIERZ M.: Distributed Knowledge Management based on Software Agents and Ontology. In: Proc. of 5-th Intl. Conf. on Parallel Processing and Applied Mathematics PPAM'2003, R.Wyrzykowski et.al. eds., 2004, LNCS 3019, Springer-Verlag, pp. 694-699, ISSN 0302-9743, ISBN 3-540-21946-3. September 2003, Czestochowa, Poland. (2) 4. BALOGH Z., LACLAVÍK M., HLUCHÝ L., BUDINSKÁ I., KRAWCZYK K.: REMARK - Reusable Agent-Based Experience Management and Recommender Framework In: Proc.of International Conference on Computational Science, Part III, LNCS 3038, Springer-Verlag, 2004, pp. 599-606, ISSN 0302-9743, ISBN 3-540-22116-6, June 6-9, Krakow, Poland. (1) 5. LACLAVIK M., GATIAL E., BALOGH Z., HABALA O., NGUYEN G., HLUCHY L.: Experience Management Based on Text Notes (EMBT) In: Proc. of eChallenges 2005 Conference, 19 - 21 October 2005, Ljubljana, Slovenia, Innovation and the Knowledge Economy, Volume 2, Part 1: Issues, Applications, Case Studies; Edited by Paul Cunningham and Miriam Cunningham; IOS Press, pp.261-268. ISSN 1574-1230, ISBN 1-58603-563-0 		

SCIENTIFIC CO-WORKERS

Surname, first name, title Mokriš, Igor, prof., Ing., PhD.	Highest degree & year Prof. 1997	Age 58
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Selection of 5 most important works of the co-worker in the last 5 years		
<ol style="list-style-type: none"> 1. Mokriš, I. - Skovajsová, L.: Neural Network Model of System for Information Retrieval from Text Documents in Slovak Language. Acta Electrotechnica et Informatica, No.3, Vol.5, ISSN 1335-8243, 2005, pp. 36-41. 2. Budinská, I. – Frankovič, B. – Hluchý, L. – Mokriš, I.: Multi-Agent System Approach to Collaborative Organizational Learning. Proc. of ICETA 2005 - 4th International Conference on Emerging e-Learning Technologies and Applications, Košice, Slovakia, ISBN 80-8086-016-6, 2005, pp. 125-129. 3. Mokriš, I. – Forgáč, R.: Decreasing the Feature Space Dimension by Kohonen Self – Organizing Maps. 2nd Slovakian – Hungarian Joint Symposium on Applied Machine Intelligence, Herľany, Slovakia, 2004, ISBN 963 7154 23 X, pp. 153 – 164. 4. Forgáč,R. – Mokriš,I.: Umelé neurónové siete na redukciiu dimenzie priestoru príznakov a klasifikáciu. [Vedecká monografia]. ISBN 80-8055-743-8, UMB Banská Bystrica, 2002, 94 s. 5. Forgáč,R. – Mokriš,I.: New Approach to Astimation of Pulse Coupled Neural Network Parameters in Image Recognition Process. Intelligent Technologies – Theory and Applications. ISBN-1-58603-256-9, IOS Press, Amsterdam, Berlin, Oxford, Tokyo, Washington, DC, 2002, pp. 304 – 308. 		

SCIENTIFIC CO-WORKERS

Surname, first name, title NGUYEN T. Giang, Ing., PhD.	Highest degree & year	PhD 2003	Age	33
Institution and address (street, postal code, city) Institute of Informatics, Slovak Academy of Sciences, Dubravska cesta 9 84507 Bratislava Slovakia				
Selection of 5 most important works of the co-worker in the last 5 years				
1. Dang T.T, Hluchy L., Nguyen G.T., Budinska I., Laclavik M., Balogh Z.: "Knowledge Management and Data Classification in Pellucid", Intelligent Information Systems - New Trends in Intelligent Information Processing and Web Mining - IIS 2003, pp. 563-568, Springer-Verlag, Advances in Soft Computing, ISBN 3-540-00843-8, ISSN 16-15-3871. June 2003, Zakopane, Poland				
2. Nguyen G.T., Tran V.D., Kotocova M.: "Application Recovery in Parallel Programming Environment", Recent Advances in Parallel Virtual Machine and Message Passing Interface, 9th European PVM/MPI Users' Group Meeting 2002, pp. 234-242, Springer-Verlag, LNCS 2474, ISBN 3-540-44296-0, ISSN 0302-9743, SCI-Expanded Journal. September-October 2002, Linz, Austria.				
3. Nguyen G.T., Hluchy L., Tran V.D., Kotocova M.: "DDG Task Recovery for Cluster Computing", Parallel Processing and Applied Mathematics PPAM'2001, pp. 369-376, Springer-Verlag, LNCS 2328, ISBN 3-540-43792-4, ISSN 0302-9743, SCI-Expanded Journal. September 2001, Naleczow, Poland.				
4. Nguyen G.T., Tran V.D., Kotocova M.: "Integrating Fault-Tolerant Features into TOPAS Parallel Programming Environment for Distributed Computing", International Conference on Parallel Computing in Electrical Engineering - PARELEC'2002, pp. 157-162, IEEE Computer Society, ISBN 0-7695-1730-7. September 2002, Warsaw, Poland				
5. Laclavik M., Balogh Z., Hluchy L., Nguyen G.T., Budinska I., Dang T.T.: "Pellucid Agent Architecture for Administration Based Processes", IAWTIC 2003, pp. 577-584, ISBN 1740880692, CD-ROM. February 2003, Vienna, Austria				

SCIENTIFIC CO-WORKERS

Surname, first name, title BALOGH, Zoltán, Ing.	Highest degree & year	MSc 1999	Age	29
Institution and address (street, postal code, city) Institute of Informatics, Slovak Academy of Sciences, Dubravska cesta 9 84507 Bratislava Slovakia				
Selection of 5 most important works of the co-worker in the last 5 years				
1. BALOGH Z., LACLAVÍK M., HLUCHÝ L.: Multi Agent System for Negotiation and Decision Support. In: Proc. of 4-th International Scientific Conference Electronic Computers & Informatics'2000, Košice - Herľany, Slovakia, 2000, pp.264-270. ISBN 80-88922-25-9. (4)				
2. BALOGH Z., GATIAL E., LACLAVÍK M., HLUCHÝ L.: Refinement of case retrieval for instance-based Grid service performance prediction through semantic description of input data. In: J.Paralic, J.Dvorsky, M.Kratky (Eds.): Znalosti 2006, Proceedings of 5th annual conference. VŠB-Techická universita Ostrava, Fakulta elektrotechniky a informatiky, 2006, pp.151-158. February 2006, Hradec Kralove, Czech Republic. ISBN 80-248-1001-8.				
3. BALOGH Z., GATIAL E., LACLAVIK M., MALISKA M., HLUCHY L.: Knowledge-based Runtime Prediction of Stateful Web Services for Optimal Workflow Construction. Proc. of 6-th Intl. Conf. on Parallel Processing and Applied Mathematics PPAM'2005, R.Wyrzykowski et.al. eds., 2005, LNCS xxxx, Springer-Verlag, pp. xxx-xxx, ISSN 0302-9743, ISBN x-xxx. Poznan, Poland.				
4. BALOGH Z., LACLAVÍK M., HLUCHÝ L., BUDINSKÁ I., KRAWCZYK K.: REMARK - Reusable Agent-Based Experience Management and Recommender Framework In: Proc.of International Conference on Computational Science, Part III, LNCS 3038, Springer-Verlag, 2004, pp. 599-606, ISSN 0302-9743, ISBN 3-540-22116-6, June 6-9, Krakow, Poland.				
5. KRAWCZYK K., MAJEWSKA M., DZIEWIERZ M., SLOTA R., BALOGH Z., KITOWSKI J., LAMBERT S.: Reuse of Organisational Experience harnessing Software Agents In: Proc. of International Conference on Computational Science, Part III, LNCS 3038, Springer-Verlag, 2004, pp. 583-590, ISSN 0302-9743, ISBN 3-540-22116-6. June 6-9, Cracow, Poland.				

SCIENTIFIC CO-WORKERS

Surname, first name, title BABÍK, Marián, Ing.	Highest degree & year	MSc 2001	Age	27
Institution and address (street, postal code, city) Institute of Informatics, Slovak Academy of Sciences, Dubravska cesta 9 84507 Bratislava Slovakia				
Selection of 5 most important works of the co-worker in the last 5 years				
<ol style="list-style-type: none"> 1. Babik M., Hluchy L.: A broker based architecture for automated discovery and invocation of services. In: Proc. of 6-th Intl. Conf. on Parallel Processing and Applied Mathematics PPAM'2005, R.Wyrzykowski et.al. eds., 2005, Springer-Verlag, ISSN 0302-9743, Poznan, Poland. (0) 2. Antos, J., Babik, M., Chan, A.W., Chen, Y.C., Hatakeyama, K, Hou, S, Hsieh, T.L., Lysak, L., Mandrichenko, I.V., Robson, A., Siket, M., Stelzer, B., Syu, J., Teng, P.K., Timm, S.C., Tomura, T., Vataga, E., Wolbers, S.A., and Yeh, P.: Data production models for the CDF experiment, IEEE Computer Society, In Proceedings of The 8th International Conference on High Performance Computing in Asia Pacific Region 2005, http://www.ict.ac.cn/hpcasia2005/, Beijing, Nov 30, 2005. (0) 3. Babik M., Hluchy L.: A Scalable Distributed Ontology Repository In: L.Popelínský, M.Krátký (Eds.): Znalosti 2005, Proceedings, VŠB-Techická universita Ostrava, Fakulta elektrotechniky a informatiky, 2005, pp.8-17. ISBN 80-248-0755-6. February 2005, Vysoke Tatry, Slovakia (0) 4. Babik M., Hluchy L.: Towards a Scalable Grid Ontology Repository. In: Bubak, M., Turala, M., Wiatr, K. (editors): Proceedings of the Cracow Grid Workshop '04, Cracow, December 2004, pp. 101-108, published by CYFRONET AGH, Poland, April 2005. ISBN 83-915141-4-5 (0) 5. Babik, M., Habala, O., Hluchy, L.: Towards Semantic Services Grid in Flood-Forecasting Simulations, In: L.Popelínský, M.Krátký (Eds.): Znalosti 2006, Proceedings, VŠB-Techická universita Ostrava, Fakulta elektrotechniky a informatiky, 2006, pp.48-59. ISBN 80-248-1001-8, February 2006, Hradec Kralove, Czech Republic 				

SCIENTIFIC CO-WORKERS

Surname, first name, title Forgáč, Radoslav, Ing.	Highest degree & year	MSc. 1993	Age	36
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Selection of 5 most important works of the co-worker in the last 5 years				
<ol style="list-style-type: none"> 1. Forgáč,R. – Mokriš,I.: Umelé neurónové siete na redukciiu dimenzie priestoru príznakov a klasifikáciu. [Vedecká monografia]. ISBN 80-8055-743-8, UMB Banská Bystrica, 2002, 94 p. 2. Forgáč, R. - Mokriš, I.: Parameter Influence of Pulse Coupled Neural Network for Image Recognition. Journal of Applied Computer Science, ISSN 1507-0360, Technical University Press, Lodž, Vol. 9, No. 2, 2001, pp. 31 – 44. 3. Forgáč,R. – Mokriš,I.: New Approach to Astimation of Pulse Coupled Neural Network Parameters in Image Recognition Process. Intelligent Technologies – Theory and Applications. ISBN-1-58603-256-9, IOS Press, Amsterdam, Berlin, Oxford, Tokyo, Washington, DC, 2002, pp. 304 – 308. 4. Mokriš, I. – Forgáč, R.: Decreasing the Feature Space Dimension by Kohonen Self – Organizing Maps. 2nd Slovakian – Hungarian Joint Symposium on Applied Machine Intelligence, Herľany, Slovakia, 2004, ISBN 963 7154 23 X, pp. 153 – 164. 5. Forgáč, R. – Mokriš, I.: Formal Representation of Images by Pulse Coupled Neural Networks. 3rd Slovakian – Hungarian Joint Symposium on Applied Machine Intelligence, Herľany, Slovakia, ISBN 963-7154-35-3, 2005, pp. 107 – 114. 				

SCIENTIFIC CO-WORKERS

Surname, first name, title GATIAL Emil, Ing.	Highest degree & year	MSc. 2001	Age	27
Institution and address (street, postal code, city) Institute of Informatics, Slovak Academy of Sciences, Dubravska cesta 9 84507 Bratislava, Slovakia				
Selection of 5 most important works of the co-worker in the last 5 years				
1. LACLAVIK M., GATIAL E., BALOGH Z., HABALA O., NGUYEN G., HLUCHY L.: Semantic Annotation based on Regular Expressions. In: Proceedings of ITAT 2005 Information Technologies - Applications and Theory, Peter Vojtas (Ed.), Prirodovedecka fakulta Univerzity Pavla Jozefa Safarika v Kosiciach, 2005, pp.305-306. Slovakia, September 2005. ISBN 80-7097-609-8. (1)				
2. GATIAL E., BALOGH Z., NGUYEN G., LACLAVIK M., HLUCHY L.: Performance Analysis of Knowledge-based Recommender System for Formalized Experience Reuse. Proc. of 8th Intl. Conf. informatics, SSAKI Bratislava, 2005, pp. 151-154. ISBN 80-969-243-3-8.				
3. GATIAL E., BALOGH Z., LACLAVIK M., CIGLAN M., HLUCHY L.: Focused Web Crawling Mechanism based on Page Relevance. In: Proceedings of ITAT 2005 Information Technologies - Applications and Theory, Peter Vojtas (Ed.), Prirodovedecka fakulta Univerzity Pavla Jozefa Safarika v Kosiciach, 2005, pp.41-46. Slovakia, September 2005. ISBN 80-7097-609-8. (1)				
4. BALOGH Z., GATIAL E., LACLAVIK M., NGUYEN G.T., HLUCHY L.: Capture, Discovery and Reuse of Knowledge in REMARK. In: ICETA 2004. 3rd International Conference on Emerging Telecommunications Technologies and Applications. Košice ELFA, 2004, pp.89-93. ISBN 80-89066-85-2.				
5. NGUYEN G.T., LACLAVIK M., BALOGH Z., GATIAL E., HLUCHY L., DANG T.T, BUDINSKA I.: Pellucid - Platform for Organisational Public Employees. In: ICETA 2004. 3rd International Conference on Emerging Telecommunications Technologies and Applications. Košice ELFA, 2004, pp.16-18. ISBN 80-89066-85-2.				

SCIENTIFIC CO-WORKERS

Surname, first name, title ŠELENG, Martin, Mgr.	Highest degree & year	MSc. 1999	Age	29
Institution and address (street, postal code, city) Institute of Informatics, Slovak Academy of Sciences, Dubravska cesta 9 84507 Bratislava Slovakia				
Selection of 5 most important works of the co-worker in the last 5 years				
1. Šeleng, M., Fecenko, J.: Quantitative Analysis of Forms of Reinsurance in Non-Life Insurance, Quantitative Methods in Economy and Business - Methodology and Practice in the New Millennium, Bratislava 18. - 20. september 2002., s. 549 – 556, ISBN 80-225-1589-22. Šeleng, M., Mucha, V.: Using Normal Distribution to Approximate Distribution of Total Number of Claims for Specific Portfolio of Insurance				
2. Agreements, Nitra 11. jún 2002, s. 223 - 228, ISBN 80-8069-040-53. Mucha, V., Šeleng, M.: Analysis of some of the Continuous Distributions Used to Describe insurance Claim Amounts in Non-Life Insurance, Nitra 4. jún 2003, s. 198 – 203, ISBN 80-8069-203-3				
3. 4. Šeleng, M., Mucha, V.: Analysis of Some of the Continuous Distributions with more Parameters which are Used to Describe insurance Claim Amounts in Non-Life Insurance, , Tatranská Štrba 21. jún 2003, s. 198 – 203, ISBN 80-225-1589-2				
4. Šeleng M., Mucha V.: Drawing Graphs of a Function of Two Variables in Microsoft Excel Using Microsoft Visual Basic for Applications, Nitra 26. máj 2004, ISBN 80-8069-370-6				
5. Horáková, G., Mucha, V., Šeleng, M.: Using a Approximation of Individual Risk Model with Collective Risk Model in Insurance Practice, Vedecký časopis Ekonomika a informatika č. 1, Bratislava 2003, s. 5 – 14, ISSN 1336-3514				
6. Fecenko, J., Šeleng, M.: Some Aspects of XL Reinsurance, Bratislava 11. 11 2005, s. 12 – 24, ISBN 80-225-2106-X				

SCIENTIFIC CO-WORKERS

Surname, first name, title TÓTH, Adrián, Ing.	Highest degree & year	MSc. 2002	Age	27
Institution and address (street, postal code, city) Institute of Informatics, Slovak Academy of Sciences, Dubravska cesta 9 84507 Bratislava Slovakia				
Selection of 5 most important works of the co-worker in the last 5 years				
1. ADRIÁN TÓTH: Interaktívne evolučné výpočty pri spracovaní vizuálnej informácie, <i>Zborník: Kognice a umelý život IV, Hradec nad Moravicí, ISBN 80-7248-232-7, pp. 489-496, 2004</i>				
2. PETER KOSTELNÍK, ADRIÁN TÓTH: Learning and Using Concepts in Multi-Robot Scenario, <i>Proceedings of 8-th International Conference on Cognitive and Neural systems, Boston, USA, 2004</i>				
3. PETER KOSTELNIK, ADRIAN TOTH, Individual Knowledge and the Knowledge Transfer in Mult-Robot Team, <i>Proceedings of 9-th International Conference on Cognitive and Neural Systems, Boston, MA, USA, 2005</i>				
4. PETER KOSTELNIK, ADRIAN TOTH, Individualne znalosti a ich prenos v time mobilnych robotov, <i>Znalosti 2005, Stara lesna, 2005</i>				

Graduate students involved in the project (for each of them list selected works, if any and different from those listed by the project leader or scientific co-workers):

Skovajsová Lenka, Ing., PhD student, Institute of Informatics, Slovak Academy of Sciences, Dúbravská cesta 9, 84507 Bratislava
1. Mokriš, I. - Skovajsová, L.: Neural Network Model of System for Information Retrieval from Text Documents in Slovak Language. <i>Acta Electrotechnica et Informatica</i> , No.3, Vol.5, ISSN 1335-8243, 2005, pp. 36-41.
2. Mokriš, I. – Skovajsová, L.: Development of Neural Network Information Retrieval System from Text Documents. 3rd Slovakian – Hungarian Joint Symposium on Applied Machine Intelligence, Herľany, Slovakia, ISBN 963-7154-35-3, 2005, pp. 123 – 131.
3. Mokriš, I. – Skovajsová, L.: A Survey of Methods for Information Retrieval from Text Documents in National Language by Neural Networks. <i>Proc. of Conf. „Informatics in Universities and Practice“</i> , ISBN 80-8084-038-5, Katolique University in Ružomberok, Sept. 12. – 14. 2005, pp. 31-36, (CD-ROM – in Slovak).
4. Mokriš, I. – Skovajsová, L.: Development of Vector Space Model for Document Collection by Neural Networks. <i>Proc. of Conf. „Communication and Information Technologies 2005“</i> , ISBN 80-8040-269-8, Tatranské Zruby 23. – 25.11.2005, pp. 99-102, (in Slovak).
5. Mokriš, I. - Skovajsová, L.: Possibilities of Utilization of Neural Networks for Information Retrieval in National Language. <i>Proc. of Conf. „Informatics and Information Technologies 2004“</i> , ISBN 80-8033-017-7, FPV UMB Banská Bystrica, 2004, pp. 79-84, (in Slovak).