NIT 2013

NATURAL INFORMATION TECHNOLOGIES

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ESCUELA UNIVERSITARIA DE INFORMÁTICA
UNIVERSIDAD POLITÉCNICA DE MADRID
CAMPUS SUR

NIT 2013

25th - 28th September 2013 (Sala de Grados – EUI)
Madrid, Spain

PROGRAM

Tuesday 24th

15:00 - 17:00   **Registration**

Wednesday 25th

Co-located with **Second International School on Biomolecular and Biocellular Computing (ISBBC'13)**

FIRST SESSION

9:00 – 9:30	Opening Session
9:30 – 11:00	Invited Speaker: Víctor Mitrana - Universidad Politécnica de Madrid (Spain). **Bio-operations over strings**
11:00 – 11:30	Coffee break
11:30– 13:00	Invited Speaker: José M. Sempere- Universidad Politécnica de Valencia (Spain) **Networks of Bio-inspired Processors**
13:00 – 14:00	Invited Speaker Fernando Arroyo and Sandra Gómez - Universidad Politécnica de Madrid (Spain) **New Variants of NEPs to Model the Functioning of Living Cell**
14:00 – 15:30	Lunch

SECOND SESSION

15:30– 16:30	Invited Speaker: Krassimir Markov - Institute of Mathematics and Informatics at BAS (Bulgaria) **Practical aspects of NL-addressing**
16:30 – 17:00	Paper Presentation: **"Experiments for NL-storing of small, middle-size and large datasets"**. *Krassimira Ivanova, Koen Vanhoof, Krassimir Markov, Vitalii Velychko*
17:00 – 18:00	Discussion ITHEA members

Thursday 26th

FIRST SESSION

Moderator: Luis Fernando de Mingo	
10:30 – 11:15	Invited Speaker: Miguel Ángel Martínez del Amor – Universidad de Sevilla (Spain) **Acceleration of P Systems Simulation with GPU Computing**
11:15 – 11:45	Coffee break
11:45 – 13:00	Paper's presentation
	• "Modeling of reasoning in intelligent decision support systems by integration of methods based on case-based reasoning and inductive notions formation" Eremeev A.P., Fomina M.V.
	• A System Approach to Solving Foresight Problems on the Basis of Delphi Method" , *Nataliya Pankratova, Lyudmila Malafeeva*
	• "MPLS Network Structural Synthesis with Application of Modified Genetic Algorithm" Yuriy Zaychenko, Helen Zaychenko
13:00 –14:00	Invited Speaker: Pedro Marijuan - Centro de Investigación Biomédica de Aragón – CIBA (Spain) **On the Natural Structures of Information Processing**
14:00 – 15:00	Lunch

SECOND SESSION

Moderator: Fernando Arroyo	
15:00-15:45	Invited Speaker: Angel Goñi - Centro Nacional de Biotecnología, CSIC (Spain) **Logic programming in cells**
15:45-16:30	Invited Speaker: Karl Javorszky **Essay on Order**
16:30 – 16:45	Coffe break
16:45 – 18:15	Paper's presentation
	• "A New method for the binary encoding and hardware implementation of metabolic pathways" Rafael Lahoz, C. Recio Rincon, P. Cordero, J. Castellanos
	• "About an Approach to Model Development of Man-computer Interaction", Arseniy Bakanov, Nina Bakanova, Tasho Tashev
	• "About Usage Possibility of Principles of Excitations Transmission by Nerve Fibers for Telecommunications". Galina Gayvoronska, Maxim Solomitsky
	• "Human and Telecommunication Technologies Life Cycles Comparison". Galina Gayvoronska, Illia Ganytskyi, Petr Yatsuk
18:15 -18:30	Closing Session

Friday 27th

9:00	**Trip to Toledo**

Invited Conferences Summary

Practical aspects of NL-addressing

Krassimir Markov – Institute of Mathematics and Informatics at BAS (Bulgaria)

NL-addressing is approach for building a kind of so called "post-relational databases".

In accordance with this the transition to non-relational data models is outlined in the paper.

The NL-addressing software realization was practically tested as a part of an instrumental system for automated construction of ontologies "ICON" ("Instrumental Complex for Ontology designatioN") which is under development in the Institute of Cybernetics "V.M.Glushkov" of NAS of Ukraine.

In this paper we briefly present ICON and its structure. Attention is paid to the storing of internal information resources of ICON realized on the base of NL-addressing and experimental programs WordArM and OntoArM.

ICON is still under developing and, during solving concrete problems, new functions based on NL-addressing and NL-ArM rise to be realized. For instance, such problems concern the operations with ontologies; work with very large ontological structures; etc.

"Acceleration of P systems simulations with GPU computing"

Miguel Ángel Martínez del Amor

The aim of the talk is to provide an overview on the acceleration of membrane systems (P systems, in short) simulators, making use of High Performance technologies such as GPU computing. The area of Membrane Computing, where this work is endorsed, will be shortly introduced. Moreover, the current parallel technologies to simulate membrane systems will be reviewed, together with an introduction to GPU computing. The parallel simulators already implemented using this technology will be presented. Finally, future work on this new research line will be discussed

"On the Natural Structures of Information Processing"

Pedro Marijuán

"Logic programming in cells"

Angel Goñi

The growing fiel of synthetic biology is concerned with the application of engineering principles, concepts and techniques to the modification and/or construction of biological systems. By using living technology as DNA blocks or molecular wires we can mimic the behaviour of electronic devices. Examples of this engineering, such as logic gates, clock signals, switches, multiplexers or half adders have been successfully built inside bacteria. Just as the pioneers of computer technology quickly incorporated the early transistor into larger circuits, researchers in synthetic biology merge this genetic devices to achieve distributed logic computations within a microbial consortia.

Karl Javorszky

Essay on Order

An essay is a short literary composition dealing with a subject analytically or speculatively; an attempt or Endeavour, effort; a test or trial" [1]. The essay presented here attempts to introduce to the International Conference on Natural Information Technologies a method of thinking that is rooted in the natural processing of information, as it happens in actual life.

Regular papers

C. Recio Rincón, P. Cordero, J. Castellanos, R. Lahoz-Beltra

A New Method for the Binary Encoding and Hardware Implementation of Metabolic Pahtways

In this paper we introduce a new method for the binary encoding of metabolic pathways. Our method assigns a 5-bit word to the functional groups of the molecules or metabolic intermediates, sorting the functional groups by its redox potential. We illustrate our approach modeling two very well known metabolic pathways, glycolysis and the Krebs cycle, showing how sugars and other glycolytic molecules could be modeled as binary matrices as well as LED dot matrices. The method enables the design of 'metabolic hardware' which may be useful in the study of the optimization of metabolic pathways as well as in the area of molecular and natural computing.

Alexander Eremeev, Marina Fomina

Modeling of Reasoning in Intelligent Decision Support Systems by Integration of Methods Based on Case-Based Reasoning and Inductive Notions Formation

Modeling of reasoning in intelligent systems on the example of intelligent decision support system of real time by means of integration of methods based on case-based reasoning (accumulated experience) and inductive notion formation in the presence of noisy data are considered.

Nataliya Pankratova, Lyudmila Malafeeva

A System Approach to Solving Foresight Problems on the Basis of Delphi Method

Based on the experience of solving problems of foresight, it should be noted that the multi-factor, multi-parameter, heterogeneous and weakly structured information of the researched subject areas used at different stages of the process of foresight, leads to difficulties related to the presentation of knowledge, the construction of the survey forms, results processing and coordinated control foresight process as a whole. In order to effectively implement the process of scenario analysis it is expedient in on-line mode to develop automated tools for knowledge extraction, coordinated distribution of data flow of its processing, means in-depth analysis of the studied subject areas, taking into account all the necessary factors for the studied problem. In this article, with that said, the technique of building the information model of knowledge within a single system approach

Yuriy Zaychenko, Helen Zaychenko

MPLS Network Structural Synthesis with Application of Modified Genetic Algorithm

The problem of MPLS networks structural synthesis is considered. The various modifications of Genetic Algorithms (GA) are investigated for this problem solution which differs in implementation of crossover and mutation procedures. The most adequate version of GA was elaborated and its investigations were carried out. The application to suggested GA for real problem of topological optimization of MPLS network is presented. Keywords: MPLS network, Genetic algorithms, structure synthesis.

Arseniy Bakanov, Nina Bakanova, Tasho Tashev

About an Approach to Model Development of Man-computer Interaction

In this paper are presented the results of investigations concerning development of methodic for extraction of expert knowledge in the process of man-computer interaction with intellectual information system. During the investigations a model is developed describing the interaction process with the intellectual information system, the process of criteria formation for evaluation of the alternatives also the process of decision making. One of the problems concerning the model developed herein is extraction of original heuristics applied by the experts in the process of decision making.

Galina Gayvoronska, Illia Ganytskyi, Petr Yatsuk

Human and Telecommunication Technologies Life Cycles Comparison

Main stages of human life cycle are described. The human and telecommunication technologies life cycles comparison is done. The general approach to the consideration of telecommunication technologies life cycle is shown. Also the paper shows that the overall picture of telecommunication technology development can be obtained only with an integrated approach to the issue. Only a combination of methodological, statistical approach and development of the standardization process will provide effective assessment, required by companies for development the industry.

Galina Gayvoronska, Maxim Solomitsky

About Usage Possibility of Principles of Excitations Transmission by Nerve Fibers for Telecommunications

Analysis of physiological properties of the nerve fibers, associated with their specialized function – excitation transmission, is done. Possibility in principle of the same principles' usage in the communication channels is established. It is shown that characteristics of nerve fibers as communication channels are comparable to characteristics of existing wire transmission media of information in telecommunications. Prospectivity of research of excitations transmission principles as the basis for implementation of communication channels is established.

Krassimira Ivanova, Koen Vanhoof, Krassimir Markov, Vitalii Velychko

Experiments for NL-storing of small, middle-size and large datasets

Several experiments aimed to show the possibilities of NL-addressing to be used for NL-storing of small, middle-size and large datasets are presented.

Presentation of experiments begins with analyzing the easiest case: NL-storing dictionaries. After that, NL-storing of thesauruses is analyzed. An experiment with WordNet thesaurus and program WordArM based on NL-addressing is discussed. Special attention is given to NL-storing ontologies.

Results from series of experiments for estimating the storing time of NL-addressing for middle-size and large RDF-datasets are outlined. Experiments are provided with both real and artificial datasets. Experimental results are systematized in corresponded tables and visualizations by histograms are given in the paper.

From experimental data and visualizations we concluded that the NL-access time: (1) Depends on number of elements in a dataset's instances, which have to be stored on the disk; (2) Not depends on number of instances in the dataset. The second is very important for multi-processing because it means linear reverse dependence on number of processors.

Toledo, Spain

Toledo is a municipality located in central Spain, 70 km south of Madrid. It is the capital of the province of Toledo and the autonomous community of Castile–La Mancha. It was declared a World Heritage Site by UNESCO in 1986 for its extensive cultural and monumental heritage and historical co-existence of Christian, Muslim and Jewish cultures.

Toledo is known as the "Imperial City" for having been the main venue of the court of Charles I, and as the "City of the Three Cultures", having been influenced by a historical co-existence of Christians, Jews and Muslims. In 1085, the city fell to Afonso VI of Castile as the first major city in the Christian Reconquista. Toledo has a history in the production of bladed weapons, which are now popular souvenirs of the city.

People who were born or have lived in Toledo include Al-Zarqali, Garcilaso de la Vega, Eleanor of Toledo, Alfonso X and El Greco. It was also the place of important historic events such as the Visigothic Councils of Toledo. As of 2012, the city has a population of 84,019 and an area of 232.1 km2 (89.6 sq mi).

History

Having been populated since the Bronze Age, Toledo (Toletum in Latin) grew in importance during Roman times, being a main commercial and administrative centre in the Roman province of Carthaginensis. After the fall of the Roman Empire, Toledo served as the capital city of Visigothic Spain, beginning with Liuvigild (Leovigild), till the Moors conquered the Iberian peninsula in the early years of 8th century (711-719).

Puerta del Sol

Remains of Roman circus at Toledo

Under the Caliphate of Cordoba, Toledo was the center of numerous insurrections dating from 761 to 857. The Banu Qasi gained nominal control of the city until 920 and in 932 Abd-ar-Rahman III captured the city following an extensive siege. Toledo experienced a period known as La Convivencia, i.e. the co-existence of Jews, Christians, and Muslims. Under Arab rule, Toledo was called Tulaytulah. After the fall of the Caliphate, Toledo was the capital city of one of the richest Taifas of Al-Andalus. Its population was overwhelmingly Muladi, and, because of its central location in the Iberian Peninsula, Toledo took a central position in the struggles between the Muslim and Christian rulers of northern Spain. The conquest of Toledo by Alfonso VI of Castile in 1085 marked the first time a major city in Al-Andalus had fallen to Christian forces; it served to sharpen the religious aspect of the Christian reconquest.

On May 25, 1085, Alfonso VI of Castile took Toledo and established direct personal control over the Moorish city from which he had been exacting tribute, ending the medieval Taifa's Kingdom

of Toledo. This was the first concrete step taken by the combined kingdom of Leon-Castile in the Reconquista by Christian forces. After Castilian conquest, Toledo continued to be a major cultural centre; its Arab libraries were not pillaged, and a tag-team translation centre was established in which books in Arabic or Hebrew would be translated into Spanish by Muslim and Jewish scholars, and from Spanish into Latin by Castilian scholars, thus letting long-lost knowledge spread through Christian Europe again. For some time during the 16th century, Toledo served as the capital city of Castile, and the city flourished. However, soon enough the Spanish court was moved, first to Valladolid and then to Madrid, thus letting the city's importance dwindle until the late 20th century, when it became the capital of the autonomous community of Castile–La Mancha. Nevertheless, the economic decline of the city helped to preserve its cultural and architectural heritage. Today, because of this rich heritage, Toledo is one of Spain's foremost cities, receiving thousands of visitors yearly.

Toledo's Alcázar (Arabicized Latin word for palace-castle) became renowned in the 19th and 20th centuries as a military academy. At the outbreak of the Spanish Civil War in 1936 its garrison was famously besieged by Republican forces.

Climate

Toledo has a semi-arid climate (Köppen: BSk) with the same Mediterranean characteristics as found across most of Spain. Winters are mild while summers are hot and dry. Precipitation is low and mainly concentrated in winter and early spring. The highest temperature ever recorded in Toledo was 43.1°C (109.58 °F) on 10 August 2012; the lowest was −9.1 °C (15.6 °F) on 27 January 2005.

Economy

The metal-working industry has historically been Toledo's economic base, with a great tradition in the manufacturing of swords and knives and a significant production of razor blades, medical devices and electrical products. Soap and toothpaste industries, flour milling, glass and ceramics have also been important.

Zocodover square after the famous Corpus Christi festivities

The Museum Santa Cruz

According to the Statistical Institute of Castilla-La Mancha, in 2007 the distribution of employment by sectors of occupation was as follows: 86.5% of the population engaged in the services, 6.6% in construction, 5.4% in industry and 1.5% in agriculture and livestock.

The manufacture of swords in the city of Toledo goes back to Roman times, but it was under Moorish rule and during the Reconquista that Toledo and its guild of sword-makers played a key role. Between the 15th and 17th centuries the Toledo sword-making industry enjoyed a great boom, to the point where its products came to be regarded as the best in Europe. Swords and daggers were made by individual craftsmen, although the sword-makers guild oversaw their

quality. In the late 17th and early 18th century production began to decline, prompting the creation of the Royal Arms Factory in 1761 by order of King Carlos III. The Royal Factory brought together all the sword-makers guilds of the city and it was located in the former mint. In 1777, recognizing the need to expand the space, Carlos III commissioned the architect Sabatini to construct a new building on the outskirts of the city. This was the beginning of several phases of expansion. Its importance was such that it eventually developed into a city within the city of Toledo.

In the 20th century, the production of knives and swords for the army was reduced to cavalry weapons only, and after the Spanish Civil War, to the supply of swords to the officers and NCOs of the various military units. Following the closure of the factory in the 1980s, the building was renovated to house the campus of the Technological University of Castilla-La Mancha in Toledo.

Culture

The old city is located on a mountaintop with a 150 degree view, surrounded on three sides by a bend in the Tagus River, and contains many historical sites, including the Alcázar, the cathedral (the primate church of Spain), and the Zocodover, a central market place.

From the 4th century to the 16th century about thirty synods were held at Toledo. The earliest, directed against Priscillian, assembled in 400. At the synod of 589 the Visigothic King Reccared declared his conversion from Arianism to Catholicism; the synod of 633 decreed uniformity of catholic liturgy throughout the Visigothic kingdom and took stringent measures against baptized Jews who had relapsed into their former faith. Other councils forbade circumcision, Jewish rites and observance of the Sabbath and festivals. Throughout the seventh century, Jews were flogged, executed, had their property confiscated, were subjected to ruinous taxes, forbidden to trade and, at times, dragged to the baptismal font. The council of 681 assured to the archbishop of Toledo the primacy of Spain. At Guadamur, very close to Toledo, was dug in 1858 the Treasure of Guarrazar, the best example of Visigothic art in Spain.

Toledo Puente Alcantara

Alcazar of Toledo - Toledo, Spain

As nearly one hundred early canons of Toledo found a place in the Decretum Gratiani, they exerted an important influence on the development of ecclesiastical law. The synod of 1565–1566 concerned itself with the execution of the decrees of the Council of Trent; and the last council held at Toledo, 1582–1583, was guided in detail by Philip II.

Toledo was famed for religious tolerance and had large communities of Muslims and Jews until they were expelled from Spain in 1492 (Jews) and 1502 (Mudejars). Today's city contains the religious monuments the Synagogue of Santa María la Blanca, the Synagogue of El Transito, Mosque of Cristo de la Luz and the church of San Sebastián dating from before the expulsion, still maintained in good condition. Among Ladino-speaking Sephardi Jews, in their various diasporas, the family name Toledano is still prevalent—indicating an ancestry traced back to this city (the name is also attested among non-Jews in various Spanish-speaking countries).

In the 13th century, Toledo was a major cultural center under the guidance of Alfonso X, called "El Sabio" ("the Wise") for his love of learning. The Toledo School of Translators, that had commenced under Archbishop Raymond of Toledo, continued to bring vast stores of knowledge to Europe by rendering great academic and philosophical works in Arabic into Latin. The Palacio de Galiana, built in the Mudéjar style, is one of the monuments that remain from that period.

The Cathedral of Toledo (Catedral de Toledo) was built between 1226–1493 and modeled after the Bourges Cathedral, though it also combines some characteristics of the Mudéjar style. It is remarkable for its incorporation of light and features the Baroque altar called El Transparente, several stories high, with fantastic figures of stucco, paintings, bronze castings, and multiple colors of marble, a masterpiece of medieval mixed media by Narciso Tomé topped by the daily effect for just a few minutes of a shaft of light from which this feature of the cathedral derives its name. Two notable bridges secured access to Toledo across the Tajo, the Alcántara bridge and the later built San Martín bridge.

The Monasterio de San Juan de los Reyes is a Franciscan monastery, built 1477-1504, in a remarkable combination of Gothic-Spanish-Flemish style with Mudéjar ornamentation.

Toledo was home to El Greco for the latter part of his life, and is the subject of some of his most famous paintings, including The Burial of the Count of Orgaz, exhibited in the Church of Santo Tomé.

When Philip II moved the royal court from Toledo to Madrid in 1561, the old city went into a slow decline from which it never recovered.

Gastronomy

Toledo's cuisine is grouped with that of Castile–La Mancha, well-set in its traditions and closely linked to hunting and grazing. A good number of recipes are the result of a combination of Moorish and Christian influences.

Some of its specialties include lamb roast or stew, cochifrito, alubias con perdiz (beans with partridge) and perdiz estofoda (partridge stew), carcamusa, migas, gachas manchegas, and tortilla a la magra. Two of the city's most famous food productions are Manchego cheese and marzipan, which has a Protected Geographical Indication (mazapán de Toledo).