

ITHEA International Scientific Society



ITA 2017

XX-th Joint International Scientific Events on Informatics

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XI-th International Summer School on Informatics

Summer Session: June 26 - July 14, 2017

*Hotel "GLORIA" in the resort "St. Constantine & St. Helena",
Varna, Bulgaria*



XI-th International Summer School on Informatics

Aims and Scope

The Summer School of informatics is devoted to discussion of current researches, applications and education regarding the basic directions of information technologies, and business informatics:

- **Theoretical Foundations of Informatics:** Conceptions, Modern approaches of Software Development, and Advanced Information Technologies;
- **Tools and Applications:** Tools for Information Modeling, Applied Systems for Information Service, Information Access Methods and Collaboration Tools, Information Security and Reliability, New customer engagement models enabled by Informatics Tools;
- **Informatics of/in Education (IE):** IE Conceptions, including relation to other/traditional fields of study, Computer Aided IE, Methodology of IE.

Steering Committee

Krassimir Markov (Bulgaria)
Elena Chebanyuk (Ukraine)
Abdel-Badeeh M. Salem (Egypt)
Lyudmila Kirichenko (Ukraine)
Koen Vanhoof (Belgium)
Juan Castellanos (Spain)

Levon Aslanyan (Armenia)
Luis Fernando de Mingo (Spain)
Olexii Voloshyn (Ukraine)
Lyudmila Lyadova (Russia)
Evgeny Eremin (Russia)
Stoyan Poryazov (Bulgaria)

Languages

The official languages of the Summer School are English and Russian.

ISSI Certificates

Lecturers of workshops will obtain *ISSI lecturer certificate*.

Listeners of workshops will obtain *ISSI training certificate* after successfully passing final tests.

**Workshop on General Information Theory**

Chair: Krassimir Markov, *Institute of Mathematics and Informatics, BAS; Institute of Information Theories and Applications, Sofia, Bulgaria*

Workshop on Artificial Intelligence

Chair: Abdel-Badeeh M. Salem, *Professor of Computer Science, Head of Medical Informatics and Knowledge Engineering Research Labs, Faculty of Computer and Information sciences, Ain Shams University, Abbasia, Cairo, Egypt.*

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Workshop on Software Engineering

Chair: Elena Chebanyuk, *National Aviation University, Kyiv, Ukraine*

The workshop is supported by: ITHEA Software Engineering Forum

http://idr.ithea.org/tiki-view_forum.php?forumId=1

Workshop on Fractal and Multifractal Analysis

Chair: Chair: Lyudmyla Kirichenko, *Kharkiv National University of Radioelectronics, Ukraine*

Doctoral consortium

Doctoral consortium proposes to PhD student opportunity to represent research results to ITHEA scientific council reviewers and discuss them in warm friendly atmosphere.

Also one may obtain constructive advices about fundamental research, relating to his/her PhD topic. It will allow to improve research ground to adopt it for collaboration of modern tools and environments variety.

To participate at doctoral consortium event, prepare a paper, reflecting main results of the PhD. It should be from 8 to 10 pages. ITHEA Rules for preparing paper manuscript are the same as preparing papers. Manuscript should be submitted 30 days before starting of ITA 2017. Then it will be resend to three council members, having experience both in fundamental research and acquainting with achievement in industry for detail acquaints. Then author has to present his work at ITA 2017 during 30 minutes. After this, the constructive notes from the reviewers will be discussed. After presenting and polishing, manuscript may be published in ITHEA International Journals.

The cost of doctoral consortium event for author is 60 euro to be paid directly at conference desk. After presenting scientific results author obtain ITHEA certificate about approbation of his work. ITHEA reviewers that participate at PhD consideration also obtain certificate for consideration of scientific work in International doctoral consortium.



ISSI preliminary program

23.06.17 - 25.06.17 Arrivals

<i>Date</i>	<i>Day</i>	<i>Theme of lecture and invited lecturer</i>	<i>Abstract</i>
26.06.17	Monday	Advances in General Information Theory <i>Krassimir Markov,</i> <i>ITHEA Institute of Information Theories and Applications,</i> <i>Institute of Mathematics and Informatics at BAS, Bulgaria</i>	Page 6
27.06.17	Tuesday	Fractal and Multifractal time series analysis: basic principles and practical application <i>Lyudmyla Kirichenko,</i> <i>Doctor of Sciences, Professor of the Department of Applied Mathematics (D.Sc, Prof.)</i> <i>Kharkiv National University of Radio Electronics, Ukraine</i>	Page 7
28.06.17	Wednesday	Recurrence plots: basic principles and practical application <i>Lyudmyla Kirichenko,</i> <i>Doctor of Sciences, Professor of the Department of Applied Mathematics (D.Sc, Prof.)</i> <i>Kharkiv National University of Radio Electronics, Ukraine</i>	Page 8
29.06.17	Thursday	ITHEA EVENING	
29.06.17	Friday	Web-Based Ontology for Expert Systems <i>Abdel-Badeeh M. Salem,</i> <i>Professor of Computer Science, Head of Medical Informatics and Knowledge Engineering Research Labs, Faculty of Computer and Information sciences, Ain Shams University. Abbasia, Cairo, Egypt</i>	Page 9
01.07.17	Saturday	Knowledge Computing and Engineering in Biomedical Informatics and Healthcare <i>Abdel-Badeeh M. Salem,</i> <i>Professor of Computer Science, Head of Medical Informatics and Knowledge Engineering Research Labs, Faculty of Computer and Information sciences, Ain Shams University. Abbasia, Cairo, Egypt</i>	Page 9



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<i>Date</i>	<i>Day</i>	<i>Theme of lecture and invited lecturer</i>	<i>Abstract</i>
02.07.17	Sunday	<p>Exploiting Artificial Intelligence Technology in Education and Learning</p> <p><i>Abdel-Badeeh M. Salem,</i> <i>Professor of Computer Science, Head of Medical Informatics and Knowledge Engineering Research Labs, Faculty of Computer and Information sciences, Ain Shams University. Abbasia, Cairo, Egypt</i></p>	Page 10
03.07.17	Monday	<p>Principles of Designing Distributed ASP.NET Applications Based on MVC (Model-View-Controller) Architectural Pattern</p> <p><i>Elena Chebanyuk,</i> <i>PhD, Assoc. Prof. of Software Engineering Department, National Aviation University, Kyiv, Ukraine</i></p>	Page 12
04.07.17 05.07.17	Tuesday Wednesday	Doctoral Consortium	Page 3
06.07.17 12.07.17	Thursday Sunday	<p>Master class: Benefits of Game Development in AGILE Approach using Unity3D</p> <p><i>Elena Chebanyuk,</i> <i>PhD, Assoc. Prof. of Software Engineering Department, National Aviation University, Kyiv, Ukraine</i></p>	Page 11
13.07.17 - 14.07.17		Departures	



ISSI Lectures Abstracts

Workshop on General Information Theory

Chair: Krassimir Markov, Institute of Mathematics and Informatics, BAS,
Institute of Information Theories and Applications, Sofia, Bulgaria

Lecture: Advances in General Information Theory

Abstract: *There exist several common theoretical information paradigms in the Information Sciences. May be, the most popular is the approach based on the generalization of the Shannon's Information Theory [Shannon, 1949; Lu, 1999]. Another approach is the attempt to be synthesized in a common structure the existing mathematical theories, which are applicable for explanation of the information phenomena [Cooman et al, 1995]. Besides of this, we need to point the diligence of the many researchers to give formal or not formal definitions of the concept "information". At the end, there exist some works that claim for theoretical generality and aspire to be a new approach in the Information Science, but theirs authors should clear up what they really talk about.*

The development of GIT had started in the period 1977-1980. The first publication, which represents some elements of GIT, was published in 1984. The fundamental notion of the GIT is the concept "Information". All other concepts are defined based on this definition. In 1988, the not formal definition of the concept of Information was published. It became as a fundamental definition for the General Information Theory.

The presented in this workshop General Information Theory (GIT) is based only on primary consideration of the world as variety of entities, which are formed by relationships between entities that form lower levels. GIT is built by three specialized theories: Theory of Information, Theory of Infos, and Theory of Inforaction.

**Workshop on Fractal and Multifractal Analysis**

Chair: Chair: Lyudmyla Kirichenko,
Doctor of Sciences, Professor of the Department of Applied Mathematics (D.Sc, Prof.)
Kharkiv National University of Radio Electronics, Ukraine

Lecture: Fractal and Multifractal time series analysis: basic principles and practical application

Abstract: In recent decades it has been found that many information, biological, physical and technological processes have a complex fractal structure. Now fractal analysis is used for modeling, analysis and control of complex systems in various fields of science and technology. In lecture, we consider the basic notions and properties of self-similar and multifractal stochastic processes and time series. We discuss the estimation methods of fractal characteristics. We show the practical application of fractal analysis: the correction of medical diagnosis using EEG and ECG records, the forecasting of financial crises, the prevention of computer network overload etc.

Lecture general topics:

1. Basic notions and properties of self-similar and multifractal stochastic processes.
2. Definition of self-similarity for time series;
3. Definition and meaning of the Hurst exponent;
4. Difference between self-similar and multifractal stochastic processes;
5. Estimation of the Hurst exponent from time series;
6. Estimation of the multifractal characteristics from time series;
7. Cases of practical application of fractal analysis.

Lecture keywords: *Self-Similar and Multifractal Time Series, Fractal Analysis, Hurst Exponent, Generalized Hurst Exponent, Application of Fractal Analysis*



Lecture: Recurrence plots: basic principles and practical application

The construction of recurrent plots is a relatively new method of investigating the complexity of system dynamics. Recurrent analysis is based on recurrence (repeatability of states), which is a fundamental property of dissipative systems. This method of analysis, based on the representation of the properties of processes in the form of geometric structures, is a tool for detecting hidden dependencies in observable time series. In lection, we consider the reconstruction of dynamic system phase trajectory from one realization. We discuss the methods of recurrent plots construction and visualization. We consider typical recurrent plots of deterministic and stochastic processes. We show some cases of practical application of recurrent analysis for recognition and classification of system states.

Lecture general topics:

1. Packard-Takens procedure for reconstructing the phase trajectory of a dynamic system;
2. basic notions and properties of recurrent plots;
3. parameters selection for constructing of recurrence plot;
4. analysis of the topology of recurrent plots;
5. complexity measures of recurrent plot structure;
6. cases of practical application of recurrent analysis.

Lecture keywords: *Recurrent Plot, Recurrent Analysis, Measure of Complexity of Time Series, Packard-Takens Procedure.*

**Workshop on Artificial Intelligence**

Chair: Abdel-Badeeh M. Salem, Professor of Computer Science, Head of Medical Informatics and Knowledge Engineering Research Labs, Faculty of Computer and Information sciences, Ain Shams University, Abbasia, Cairo, Egypt.

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Lecture: Knowledge Computing and Engineering in Biomedical Informatics and Healthcare

Abstract: The field of knowledge computing (KC) has become the most challenging area in the last several years. KC deals with the development of intelligent computing and knowledge-based systems in which knowledge and reasoning play pivotal role. KC consists of three main areas, namely: Document Engineering (DE), Knowledge Engineering (KE), and Reasoning Techniques (RT). KE includes; knowledge acquisition, expert systems, ontologies, knowledge-based systems, knowledge compilation, shells and tools, methodologies, modeling, knowledge management, knowledge discovery, and knowledge representation techniques. The aim of this talk is to make an overview of some of KC techniques and approaches and their applications in biomedical informatics and healthcare. The talk presents the following techniques and applications: (a) case-based reasoning approach for cancer and heart diagnosis, (b) ontological engineering for breast cancer knowledge management, and (c) mining patient data using rough sets theory to determine thrombosis disease.

Lecture: Web-Based Ontology for Expert Systems

Abstract: Expert system (ES) is an intelligent system incorporating a knowledge base and inference mechanism. It is a highly specialized piece of intelligent software that attempts to duplicate the function of an expert in some field of expertise. Expert systems were originally developed to solve ill-defined problems and well-defined problems that are not efficiently solved with algorithmic approaches. The ES acts as a smart advisor or consultant in the domain of interest, capturing the heuristic knowledge of one or more experts. Its strength lies in its ability to be put to practical use when an expert is not available. From the artificial intelligence (AI) point of view, expert systems paradigm include the following areas of research: (a) knowledge-representation and management techniques, (b) knowledge modeling, (c) intelligent tools, programming languages and shells, (d) inference techniques, (e) reasoning methodologies, (f) machine learning, and (g) user interface technologies.

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On the other side, ontological engineering is one of the very efficient approaches for knowledge management. Ontology is the foundation of describing a domain of interest and it consists in a collection of terms organized in a hierarchical structure that shape the reality. The main objective of using ontologies is to share knowledge between computers or computers and human. Most of the usages of ontologies in the field of AI are related to development of intelligent systems and knowledge based systems. These types of ontologies include a small number of concepts and their main objective is to facilitate reasoning tasks. This talk presents the developing of web-based ontology for expert systems paradigm. The developed ontology was encoded in OWL-DL format using the Protege-OWL editing environment.

Lecture: Exploiting Artificial Intelligence Technology in Education and Learning

Abstract: The field of artificial intelligence in education (AIE) has become the most challenging area in the last several years. It includes the disciplines; cognitive and social psychology, computer science, empirical psychology, software and knowledge engineering. The goal of the AIE is to deliver knowledge-based systems which can be used in real teaching, learning and training situations. AI gives these systems added computing capability, allowing them to exhibit more intelligent behavior. Many types of these systems are in existence today and are applies to different domains and tasks. This lecture discusses the use of AI technologies in intelligent tutoring systems (ITS) and e-learning. Particularly, the lecture presents three AI methodologies, namely; case-based reasoning, data mining and knowledge discovery, and ontological engineering from e-Learning perspective. In addition, the lecture presents some examples of the developed systems by the author and his colleagues at Artificial Intelligence and Knowledge Engineering Research Labs,

**Workshop on Software Engineering**

Chair: Elena Chebanyuk, PhD, Assoc. Prof. of Software Engineering Department, National Aviation University, Kyiv, Ukraine

The workshop is supported by: ITHEA Software Engineering Forum
http://idr.ithea.org/tiki-view_forum.php?forumId=1

Master class: Benefits of Game Development in AGILE Approach using Unity3D

Abstract: Master class is devoted to peculiarities of game development process using Unity 3D in AGILE approach.

Firstly, peculiarities of requirement analysis are shown. UML diagrams can't cover all aspects of game scenarios. Tutorial illustrates role and good practices for composing of concept documents and approaches for quickly prototyping games using Unity. Also tricks for raising effectiveness of designing scenes that are based on graphical pipeline rendering, are shown. Game prototyping procedure and concept document allows specifying requirements exactly.

Then, some peculiarities in software designing process should be considered. Unity is designed in component-oriented architectural style. Some architectural solutions, that are better deal with Unity architecture, will be shown in this tutorial.

Thus, in turn, there are some peculiarities in software development, such as scripts interacting, accessing of data and GameObjects. Also successful and quick game development process is based on technologies of existing assets and packages reuse.

Reverse engineering procedures performed to acquaint with third-party project functionality and packages are discussed. Some approaches to define Unity packages and export them from third-party software for adoption to developed project are proposed. Also tutorial touches some peculiarities of software components reuse in cross-platform development.

Master class summary:

- peculiarities of requirement analysis in game development;
- peculiarities of game designing;
- peculiarities of software reuse procedure and software packages creation and distribution in game development.

Keywords: Concept Document, Mobile Application, Game Prototyping Approaches, Asset, Asset Store, Component-Oriented Architectural Style, Prototype Desing Pattern, Flyweight Desing Pattern, State Design Pattern, Reverse Engineering; Game camera, Collisions, Events, Unity Asset, Unity Package, 3D Project, Game Physics, MonoBehavior, Sprite Animation.



Lecture: Principles of Designing Distributed ASP.NET Applications Based on MVC (Model-View-Controller) Architectural Pattern

***Abstract:** Lecture is devoted to principles of distributed web application creation using approaches of front-end and back-end designing.*

Techniques of designing single page application, based on reusing existing web templates and user interface components composition, are considered.

Approaches for supporting back-end functionality that are based on web-services are discussed. General architecture of applications that are grounded on Service Oriented Architecture (SOA) is considered. Role of SOA standards and components is discussed. Principles of web-services publishing testing, and reusing are considered.

Lecture summary

1. Architectural patterns for distributed web-application designing (MVC, MVP, MVVM).
2. Role of Model, View, and Controllers.
3. Principles of front end designing for distributed web-application
 - components of framework for web-components supporting for single page applications.
4. Means for designing *.html pages and web forms (with RAZOR and HTML5 support)
 - mechanisms of reusing user interface elements from third party resources;
 - composing elements for designing web pages;
 - mechanisms of Bootstrap templates import.
5. Approaches to models designing.
6. Approaches to processing user input by controller.
7. Data transition between model and view.
8. Components of Service Oriented Architecture architectural style
 - standards of Service Oriented Architecture;
 - main tasks of service bus (service identification, service registration; interconnection between bus and web application);
 - mechanisms of data transferring between services.
9. Mechanisms of creating and testing web-services
 - publishing web-services;
 - peculiarities of web-service functionality reuse.

***Keywords** Service Oriented Architecture (SOA), front End, BootStrap, Controller, MVC, Model, View, Controller, User Interface, JQuery, CSS style, Back End, Web-Service, Simple Object Access Protocol (SOAP), Internet Informational Server (IIS), Service Reference, Single Page Application, Web Form, Model First, Code first, Web-Browser, Microservice.*