

**Annotations of the scientific works for participation in the contest
for the academic position of “Associate Professor”
by field of higher education 4. Natural sciences, mathematics and
informatics, professional direction 4.6. Informatics and Computer Science
(Information technologies on the Internet),
announced in the State Gazette no. 39 of 2.05.2023
of Assistant professor Hristo Toshkov Hristov, PhD
Department of Computer Technologies
FMI of PU “Paisii Hilendarski”**

Fourteen (14) scientific publications, two (2) requests for useful models, one (1) book chapter and one (1) book are presented for participation in current contest (see List of scientific papers for participation in the contest).

PUBLICATIONS

1. H. Hristov, A. Ignatov, „Automated Management of Network Infrastructure“ (in Bulgarian), *Mathematics and informatics*, vol. 62, no. 6, pp. 602-615, 2019. ISSN 1314 – 8532 (Online), ISSN 1310 – 2230 (Print). Available: <https://mathinfo.azbuki.bg/matematics/matharticles2016-4/godishno-sadarzhanie-na-sp-matematika-i-informatika-2019-g/> (Web of Science®).

This article discusses network management automation problem. Difficulties encountered while expanding network infrastructure are addressed. An analysis of the path to automation in network management is given. A process classification for network automation is proposed. A brief survey of the most popular network management tools is presented. A comparison between these and a custom tool contributed by the authors is made. The custom tool is used in “Information Services” Plc for network management.

2. H. Hristov, S. Cheresarov, S. Chonkov and K. Tsvetanov, "Information Security in the Design of Web-Based Software Systems," *2020 International Conference Automatics and Informatics (ICAI)*, Varna, Bulgaria, 2020, pp. 1-6, doi: 10.1109/icai50593.2020.9311305, Electronic ISBN: 978-1-7281-9308-3, Print on Demand (PoD) ISBN: 978-1-7281-9309-0. **Presented:** *2020 International Conference Automatics and Informatics*, 1-3 October 2020, Varna, Bulgaria, 2020, Available: <https://ieeexplore.ieee.org/document/9311305>, (IEEE Xplore®, Scopus®)

This article explores trends and practices in the development, integration, maintenance and operation of web based systems. From this point of view, issues with the information security of web applications are analyzed. Attention is drawn to the fact that information security is a

phenomenon in which the greater the degree of automation of the software process, the greater number of solutions for the information security problems are concentrated in the functionality of the software. We are highlighting the advantages of modular localization in the implementation of modular web-based software systems. Even though there are various studies in this area, there are no commonly accepted solutions and guidelines for solving the problem. The article attempts to fill up this gap by proposing possible guidelines. As a result of analyzing trends in the information security applied to the web-based software systems, a forecast has been made for an increase in the regulatory requirements for software development, the need for an increased general knowledge in the society for the safe and secure use of software applications, as well as the growth in demand for highly specialized information security professionals. Modern practices are introduced for providing information security in software webbased systems through authentication and authorization modules. As a result of the studies and the analysis, guidelines are proposed for the development of a method that will provide information security.

3. H. Hristov, N. Chochev, Qualitative Research of Conference Online Learning for Web Design Students (in Bulgarian), *Mathematics and informatics*, vol. 64, no. 2, pp. 207-221, 2021, ISSN 1314 – 8532 (Online), ISSN 1310 – 2230 (Print). <https://doi.org/10.53656/math2021-2-7-kac> (**Web of Science®**)

The topic of the present research is analysis of conference online learning using qualitative methods. The learning is carried out in the subject of „Web Design“. Teaching includes an online conference platform, web sources, digital cloud services, etc. Several key differences between the distant learning and conference online learning, used in regular education are pointed out. In the paper are discussed some basic characteristics of qualitative methods and conference online learning.

4. E. Hadzhikolev, S. Hadzhikoleva, **H. Hristov**, E. Yonchev & V. Tsvetkov, Modeling of Pedagogical Patterns in an E-learning System. *International Journal of Emerging Technologies in Learning (IJET)*, vol. 16, no. 24, pp. 205–219, 2021, <https://doi.org/10.3991/ijet.v16i24.26775>, eISSN: 1863-0383, (**Web of Science®**, **Scopus®** data as of December 2021 Q1, **SJR 0.61**) Available: <https://online-journals.org/index.php/ijet/article/view/26775/10531>

The article proposes a model of educational objects, suitable for software implementation, which we call pedagogical pattern instances, or for short - instances. One instance combines specific learning content with additional features. Learning content can have different “views” that present knowledge in different ways, for example, through text files of presentations, audio or video content, interactive content, etc. Logical categories of characteristics and activities form the “aspects” of the instance, such as methodology, adaptivity, assessment, etc. The proposed pattern instance model is flexible. It can be expanded with new features and adapted to specific goals and designs. The paper also outlines a conceptual framework of an e-learning software system using the presented model of a pattern instance.

5. H. Hristov, R. Cherneva, “Recognition of problematic educational situations in computer modeling training”, *Mathematics and informatics*, vol. 65, no. 3, pp. 247-258, 2022, ISSN 1314 – 8532 (Online), ISSN 1310 – 2230 (Print), Available: https://azbuki.bg/wp-content/uploads/2022/06/Matematika_03_Hristo-Hristov.pdf , (**Web of Science®**)

The article presents the results of the training in Computer Modeling in the third and fourth grades. Through the methods of participatory observation, interviews, discussions, surveys, and content analysis, data was collected, analyzed and systematized by teachers, principals, parents, university methodologists and IT administrators for problematic educational situations arising from technical reasons. An identification system was developed for their establishment. It is used to assess and measure changes in the complexity of the learning process and the workload of the teachers in the Computer Modeling subject in the event of problematic educational situations. In conclusion, guidelines for overcoming and resolving the identified unforeseen situations are provided.

6. H. Hristov, E. Yonchev, V. Tsvetkov, “Modelling of pedagogical patterns through e-Learning objects”, *Information Technologies and Learning Tools*, 2022, Vol 89, No3, ISSN: 2076-8184. DOI: 10.33407/itlt.v89i3.4859. Available: <https://journal.iitta.gov.ua/index.php/itlt/article/view/4859> (**Web of Science®**)

Software platforms for e-learning support various options for presenting educational content. One of the ways to organize and structure it is via so-called pedagogical patterns. They are a method for describing and sharing knowledge and practical experience. Pedagogical patterns are used to describe pedagogical situations that occur repeatedly in the learning process. In the context of e-learning systems, there are various approaches to digitalization of pedagogical patterns. The purpose of the paper is to show how to build instances of pedagogical patterns using e-learning pedagogical objects, which can be easily and conveniently used as models in an adaptive e-learning environment. An e-learning pedagogical object is an abstract concept that can be presented in the concrete form of an e-learning object, an e-learning methodological object, an e-learning object for monitoring and diagnostics or an e-learning object with learning outcomes. These objects are building blocks for constructing instances of pedagogical patterns. This paper thoroughly discusses the issue of creating instances of pedagogical patterns of the four types of e-learning pedagogical objects. The instance of a pedagogical pattern is meant to serve to create subsections of educational topics. The instances of the patterns built of e-learning objects are learning units that are used depending on the context of a particular pedagogical situation. The e-learning pedagogical objects and the pedagogical pattern instances are intended to be applied in an adaptive e-learning environment as teaching aids. Their theoretical models are applied in Moodle LMS in line with the tendency for software to assist and replace some of the teacher functions, while the teacher’s role is raised to a higher organizational, pedagogical and methodological level. Three instances of pedagogical patterns have been created through e-learning pedagogical objects: “Early Feedback”, “Feedback Sandwich” and “Consistent Metaphor” in LMS Moodle, which have been tested in the training course “Modeling of training courses in Moodle” during the autumn trimester of the academic year 2021/2022 at

the Faculty of Mathematics and Informatics of Paisii Hilendarski University of Plovdiv, Bulgaria.

7. H. Hristov & S. Stavrev, Generations of human-computer interactions: evolution, tendencies and perspectives, *Journal of Physics: Conference Series*, Volume 2339, (2022), 012009, doi:10.1088/1742-6596/2339/1/012009. **Presented:** *International Conference on Electronics, Engineering Physics and Earth Science 2022 (EEPES 2022)* 21/06/2022 - 24/06/2022 Varna, Bulgaria. Available: <https://iopscience.iop.org/article/10.1088/1742-6596/2339/1/012009/pdf>, (**Scopus®** data as of September **2022 Q4**, **SJR 0,21**)

In this paper, we present the usability evolution of human-computer interactions. In addition, we group the various user interfaces of human-computer interaction into two generations with three classes each. The most user interfaces for human-computer interaction are assigned into a class depending on objective criteria scores, such as technical literacy level, level of natural interactions, user learning curve and UI's ability to adapt. In addition, current tendencies for HCI are presented and future perspectives are discussed. Finally, we summarize the achieved results and draw conclusions.

8. H. Hristov, S. Enkov, M. Bliznakov, A. Uzunov, Method for Designing Accessible Web Content in The Web Space of "Paisii Hilenarski" Plovdiv University. *International Journal of Emerging Technologies in Learning (iJET)*, vol. 17, no. 21, pp. 184-196, 2022. eISSN: 1863-0383, DOI: <https://doi.org/10.3991/ijet.v17i21.34307>, Available: <https://online-journals.org/index.php/i-jet/article/view/34307>, (**Web of Science®**, **Scopus®** data as of March **2022 Q1**, **SJR 0.61**)

The article addresses the problem of accessibility of dynamic web content that is created when developing web pages and services. It discusses basic issues about the accessibility of digital objects and web page content. The aim of the article is to present a method for designing accessibility in the creation of dynamic web content in websites of Paisii Hilendarski Plovdiv University. The developed method is presented through the life cycle of its model, which is applied in parallel with the implementation of a software process in the renewal of the web infrastructure of the university. The method is built on standards, principles, guidelines, accessibility criteria, and techniques for creating and validating web content of the Web Accessibility Initiative. The main standards to which the method adheres are the Web Content Accessibility Guidelines and the Technical Specifications for Accessible Rich Internet Applications. It has been tested in the design and implementation of part of the web content of the web infrastructure of the university created after 2020, which is accessible through the main domain <https://uni-plovdiv.bg> and many of its sub-domains.

9. S. Cheresharov, **H. Hristov**, V. Tabakova-Komsalova, V. Naneva, Hierarchical Learning Management System for the Insurance Industry, *International Journal of Emerging Technologies in Learning (iJET)*, vol. 17 no. 21. pp. 123-134, 2022. eISSN: 1863-0383 DOI: <https://doi.org/10.3991/ijet.v17i21.33595>, Available: <https://online-journals.org/index.php/i-jet/article/view/33595>, (**Web of Science®**, **Scopus®** data as of March **2021 Q1**, **SJR 0.61**)

This paper describes a model of a Hierarchical Learning Management System (HLMS) for the insurance industry. The problem is that LMSs are widely used, but not suitable for each educational environment and domain. The existing LMSs are with the general purpose and do not reflect the specific needs of different domains. The proposed LMS is a specific hierarchic system specially created for the insurance industry. The model uses a hierarchic approach to share, organize and present the learning content. It allows for building an LMS specific for the insurance industry which is reliable, efficient, fast, and easy to use by the insurance professionals.

10. H. Hristov, T. Glushkova, S. Cheresarov and M. Stoeva, A Model for Designing Accessible Color and Contrast for Users with Visual Deficiency and Color Blindness, *2022 IEEE 11th International Conference on Intelligent Systems (IS)*, Warsaw, Poland, 2022, pp. 1-7, doi: 10.1109/IS57118.2022.10019637., Electronic ISBN:978-1-6654-5656-2, Print on Demand(PoD) ISBN:978-1-6654-9276-8; Electronic ISSN: 2767-9802, Print on Demand(PoD) ISSN: 2832-4145. **Presented:** *2022 IEEE 11th International Conference on Intelligent Systems (IS)*, Warsaw, Poland, 12-14 October 2022 Available: <https://ieeexplore.ieee.org/document/10019637> (IEEE Xplore®, Scopus®)

The present work investigates the problem of creating accessible web content for users with reduced vision and color blindness. The aim of the work is to present a model for the design and evaluation of web content with accessible color and contrast for visually impaired people. Such a model was built as part of the process of updating the web pages of Plovdiv University. It consists of the components: selection of web elements; accessibility standards and criteria; verification and validation tools; design and implementation technologies; identification of situations of dynamic change of web content; accessibility development artifacts; application approach. Its function is to reveal the perspective in gathering requirements and compiling a color and contrast specification.

11. H. Hristov, S. Cheresarov, V. Valkanov and A. Ignatov, "IPTV Monitoring via GPM3 for A1 and Vivacom," *2022 IEEE 11th International Conference on Intelligent Systems (IS)*, Warsaw, Poland, 2022, pp. 1-6, doi: 10.1109/IS57118.2022.10019660., Electronic ISBN: 978-1-6654-5656-2, Print on Demand(PoD), ISBN: 978-1-6654-9276-8; Electronic ISSN: 2767-9802, Print on Demand(PoD) ISSN: 2832-4145. **Presented:** *2022 IEEE 11th International Conference on Intelligent Systems (IS)*, Warsaw, Poland, 12-14 October 2022 Available: <https://ieeexplore.ieee.org/document/10019637> (IEEE Xplore®, Scopus®)

In this paper we will explore the functionality, planning and development of our software application called General Program Monitoring – version 3 for monitoring Internet Protocol Television. The goal of this paper is to present in theory and in practice the concept of the application. The software application is used to monitor devices of users who are customers of the Bulgarian national operators A1 and Vivacom. To achieve this goal, the discussion included hardware, network and software problems, limitations and means of overcoming specific problems, software architecture, aspects of planning and programming software

solutions, the process of the application's performance is presented via a finite-state machine for tracking the condition of the work cycle of monitoring et al. In conclusion a sample scenario is described for working with the application.

12. H. Hristov, G. Stoitsov, M. Bliznakov, S. Minchev. (2023). An Approach to Validating the Accessibility of Dynamic Web Pages. *TEM Journal*, 12(1), 233-240., ISSN: 2217-8309 (Print). eISSN: 2217-8333 (Online). Available: https://www.temjournal.com/content/121/TEMJournalFebruary2023_233_240.pdf (**Web of Science®**, **Scopus®** data as of March 2023: **Q3, SJR 0.25**)

The purpose of the publication is to present a web page validation approach that is part of a method for designing accessible web content. The validation approach is built on standards, principles, guidelines, success criteria and techniques for web content validation. The main standards to which the approach adheres are Web Content Accessibility Guidelines and Technical Specifications for Accessible Rich Internet Applications. The publication discusses the understanding of dynamic web content, dynamic web content design and implementation method and web content validation approach.

13. Lefterov, D., Hristov, Hr., Enkov, S., A model-based approach to enhancing web accessibility for individuals with special education needs. *International Journal on Information Technologies and Security*, vol. 15, no 2, pp. 15-26, 2023, DOI: <https://doi.org/10.59035/RXVF3370>, ISSN 1313-8251. Available: <https://ijits-bg.com/sites/default/files/archive/2023%28vol.15%29/No2/contents/2023-N2-02.pdf> , (**Web of Science®**)

An important aspect in software development nowadays is digital opportunities for meeting the needs of disadvantaged affected people with Special Education Needs (SEN). In this article, we consider the problem of identifying and improving the accessibility of web platforms designed for users who have SEN. To achieve this goal, a model was created and implemented in the web platform sopbg.org. The specialized website, which is maintained and developed by the authors of the publication, unites a community of several thousand users with SEN. The intensive consumption of the platform provided the authors with the opportunity to make a number of improvements to the applied model, some of which should be considered.

14. Iv. Velcheva, Hr. Hristov, Teaching of Web Design and Programming as a Role-Playing Team Building Game. *International Journal of Information and Education Technology*, vol. 13, no. 5, May 2023. ISSN: 2010-3689 (Online). Available: <http://www.ijiet.org/vol13/IJiet-V13N5-1874.pdf> (**Scopus®** data as of June 2023: **Q3, SJR 0,24**)

The paper examines a form of training whose aim is to teach technologies for designing and styling responsive web page views and implementing web site events by students in an

academic environment. In this form of training a role-play, taken by the practice of a software company is simulated. Data collection and evaluation of the results was carried out through qualitative methods of participant observation, survey, interview, and quantitative comparative analysis. The article analyzes in details the role-playing games, training content, stages of implementation and other aspects of the organization of experimental form of training in Web Design and Web Programming. Teaching, as a simulated role-playing game, is performed during six school hours, in two consecutive weeks and consists of four stages. In the role play, students apply knowledge and teamwork skills in HTML, CSS, JavaScript, jQuery etc. Each team is made up of five students with roles of manager, web designer, graphics designer, web stylist and web developer. The teams' organization is based on work products adaptation of the Rational Unified Process Methodology. The end product of the role-playing game is the development of a website by the team, while its final result for the learning process is the knowledge and skills acquired during formal training by the teacher, and the informal training that took place between the students during their teamwork.

15. Hr. Hristov, Application for registration of a utility model, "Model of a management and control system of a piezo crystal generator", Accession number to the patent office: BG/U/2023/5737, Date of application: 04.05.2023

16. Hr. Hristov, Em. Chobanov, Application for registration of a utility model, "Model of a device for obtaining electrical energy by means of a piezo crystal", Accession number to the patent office: BG/U/2023/5682, Date of application: 02.03.2023

Application for a utility model [15] refers to a system for software control and management of a piezo crystal generator, and application for a utility model [16] refers to a device for obtaining electrical energy by means of a piezo crystal. A utility model [15] and a utility model [16] are interrelated and refer to each other. In [15] a model of a software system for controlling a piezo crystal generator is described, and in [16] a model of the device of a piezo crystal generator is described. The main task of a utility model [15] of a control and control system of a piezo crystal generator is to set the piezo crystal generator in the mode of maximum efficiency, while at the same time giving complete information about the settings and mode of operation. This information is available through the use of a wireless communication network and infrastructure using modern communication protocols, preferably a standard set of TCP/IP protocols, through which direct control of the piezo crystal generator is possible. The tasks of a utility model [16] are to convert flowing water into electrical energy and automatically collect statistical data for processing. In the proposed model [16], at least one piezocrystal is periodically subjected to pressure that deforms it, as a result of which the piezocrystal is polarized and generates electricity. The electricity is transported to the electrical grid, information sensors, CPU or to a consumer of electrical energy.

17. A. Kostadinov, **Hr. Hristov**, A Model of Communication System with Vending Machines, *In: Research Highlights in Science and Technology* vol 2, (ed. M. Irene), 2023, B P international, UK, London, ISBN: 978-81-19217-59-5 (Print), e-ISBN: 978-81-19217-67-0

(eBook), DOI: <https://doi.org/10.9734/bpi/rhst/v2/5446E>, <https://stm.bookpi.org/RHST-V2/article/view/10609>

The paper presents a model of a communication system between a vending machine, an end user and a service administrator. The designed model consists of a multimedia module, a control module and a communication module. The function of the multimedia module is to provide information about availability, prices, procedures for ordering products from the vending machine, etc. The system is managed by software that is installed on a server, a user device and a control unit. The communications used are made up of an infrastructure allowing two or more devices to exchange information two-way through the Internet. Overall, the model purposes to progress user experience and operational competence of vending machines over and done with a well designed communication system.

18. H., Hristov, Guide to Designing and Styling Web Pages with CSS Grid System, University Publishing House "Paisiy Hilendarski", 2023, first edition, 108 pages, ISBN: 978-619-202-855-8

The tutorial covers the basics of web design and styling web pages with the CSS GRID Layout System. CSS Grid Layout is a web page design system. Its CSS Grid Layout Module 1 specification states that CSS Grid Layout is a two-dimensional grid-based system built and optimized for user interface design. This CSS system is flexible, and among the existing approaches to design views, it is the richest in design possibilities. The guide is divided into two parts: "Part I - Theory of Designing with CSS Grid Layout System" and "Part II - Practice with Examples".

Signature:

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15.07.2023

Plovdiv