



Tempus



PROCEEDINGS of Workshops on Computer Science Education

TEMPUS Project CD-JEP 16160/2001

"Innovation of Computer Science Curriculum in Higher Education"



Tempus





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Tempus Joint European Project (JEP)

PROCEEDINGS

of Workshops

on Computer Science Education

TEMPUS Project CD-JEP 16160/2001
"Innovation of Computer Science Curriculum in Higher Education"

Contractor institution



CSUD

Computer Science Department,
University of Dortmund, Germany

Coordinating institution:



FEEN

Faculty of Electronic Engineering,
University of Nis, Serbia and Montenegro

Other participating institutions:



TEIA

Τ.Ε.Ι. Αθηνών

Technological Education Institution
of Athens, Greece



FNSMS

Faculty of Natural Sciences and Mathematics,
University of St. Cyril and Methodius,
Skopje, FYR Macedonia



FSMN

Faculty of Sciences and Mathematics,
University of Nis, Serbia and Montenegro

TEMPUS Project CD-JEP 16160/2001 "Innovation of Computer Science Curriculum in Higher Education"

PROCEEDINGS of Workshops on Computer Science Education

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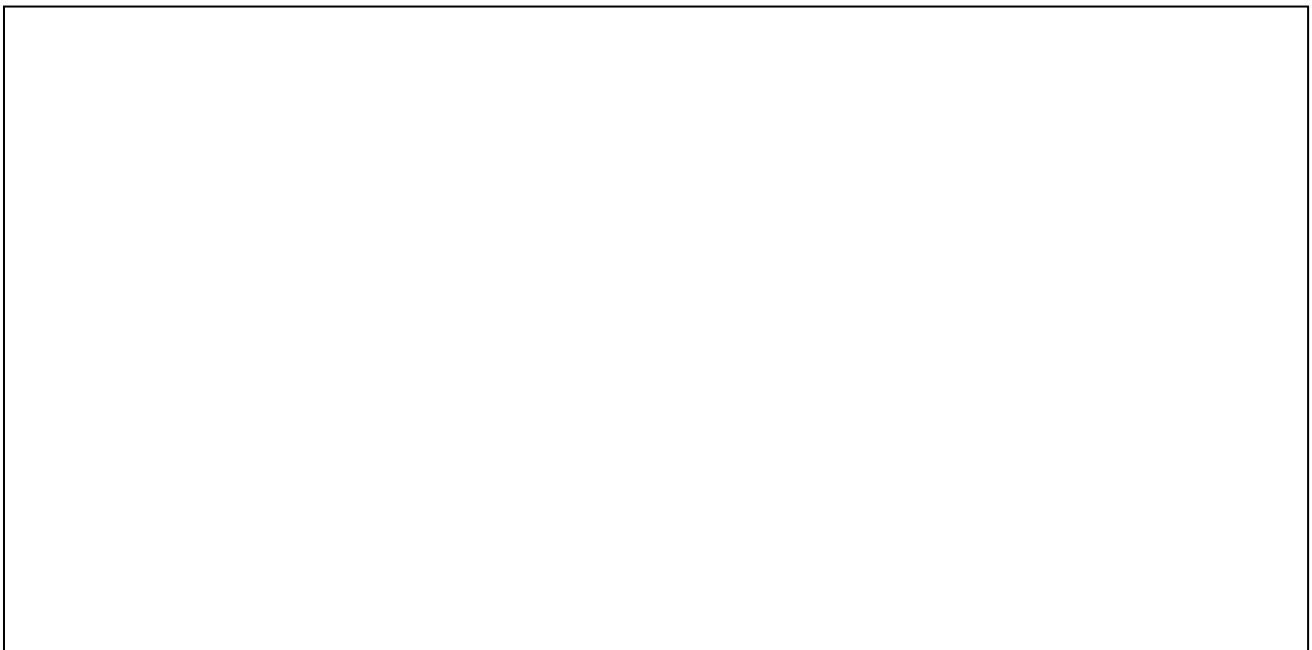
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- **Katerina Georgouli** from Technical Educational Institution of Athens,
- **Ivan Milentijević** from Faculty of Electronic Engineering, University of Niš,
- **Marjan Gušev** from Faculty of Natural Sciences and Mathematics, University of St. Cyril and Methodius, Skopje,
- **Miroslav Ćirić** from Faculty of Sciences and Mathematics, University of Niš,

because they were main motivators and organizers of academic work at their home institutions.

They contributed a lot in successful organization of Workshops and Symposium motivating the colleagues to participate and working together with young teaching staff.

At the end we want to thank to all participants for active works during the two years period of our joint project.

Prof. Dr Claudio Moraga
Contractor of CD-JEP 16160/2001

Prof. Dr Mile Stojčev
Coordinator of CD-JEP 16160/2001

January 2004

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MESSAGE OF THE CENTRAL MANAGEMENT TEAM

During the end of the twentieth century and at the beginning of the new one there have been dramatic changes in delivering computer science (CS) education, both in terms of what is taught, how it is taught, and how engineering programs are accredited. The rapid evolution of the computer industry challenges academic curricula to keep pace in providing students with a modern technology based education. Their experiences in school should provide them with the productive tools as well as to challenge the existing methodologies in discovering more efficient techniques. Teaching CS cannot be just a matter of training engineers to design chips or to create efficient programs. It must also provide students with a solid grounding in fundamental concepts to prepare them for a career that may span four decades or more a rapidly changing industry.

Everyone agrees with the fact that "the undergraduate curriculum should teach only the fundamentals". But what are the fundamentals? As we have already noticed CS is changing. Here are some examples of new fundamentals:

- a) Emerging technologies, particularly the Internet, will have a more profound impact on our education in the near future;
- b) A tremendous increase in the use of computer simulation, that can replace most hardware-based laboratory courses is evident;
- c) Web-based teaching, distance learning, "electronic book", and interactive learning "environments" will play increasingly significant roles in shaping what we teach, how we teach, and how students learn. It seems that the traditional classroom style will not survive;
- d) Information technology will be embedded in virtually every engineered products and process in the near future, etc.

The challenge is that we cannot just add these new fundamentals to a curriculum that is already full. We have to look critically at the current cherished fundamentals and either displace them or find ways to cover them much more rapidly.

This PROCEEDINGS describe the impact of the previously mentioned new fundamentals on undergraduate CS engineering courses at all four participant academic institutions of our joint project Tempus CD_JEP-16160-2001/04, during the first two years of this project. It is mainly reserved for a discussion of the transformations that CS education is undergoing as we move into a new century. The transformations can be delineated in two broad categories: changes of the content of curricula, and changes of the approaches in presentation teaching material.

During the past two-years period of active works in our joint project, six Workshops and one Symposium, mainly dedicated to innovations of computer science curriculum and involvement of computer tools intended to help teaching staff and students in the learning-teaching process, were held. In total, 72 papers were presented, and 164 participants from 15 different academic institutions take active parts during the preparation of the material and numerous discussions related to presentation of the achieved results of our joint project. Only 35 papers passed the referee

procedure for publication in this special issue PROCEEDINGS. The contributed papers were divided into six sessions, on innovations curriculum, lab practicing, teaching tools, Internet technologies, Mathematics in computer science, and selected topics.

Let us introduce a brief review of sessions.

There are 14 papers in Session 1, referred to as **Innovations in Computer Science Curriculum**, pp 3-62. In general, the contributed papers cover proposals, methodologies, and other aspects related to efficient organization of different courses in computer science (CS) education.

In “Computer Architecture Courses in Informatics Departments”, D. Kehagias proposes three courses that should represent the core of computer architecture in the CS curriculum.

M. Tomic and V. Milicevic in “Social Networking in the University Education Process” present their first experience with adopting social networking approach to the University education process.

T. Alevizos and C. Skourlas in “Database Curricula in Higher Informatics Education“ concentrate on a framework for comparative analysis of Database Curricula in Higher Informatics Education.

V. Ajanovski in “Databases Course on the WebCT Platform 2002” gives a lot of details concerning organization of the course in databases involved at FNMS.

R. Stanković in “An Approach to the Reorganization of Teaching at the Faculty of Electronic Engineering” gives basic elements of a proposal for the reorganization of teaching at FEEN and points how improvements of training and learning can be achieved.

C. Moraga in “Proposal for a first Course on Computational Intelligence using public domain software” gives a proposal for a course in CI and points to some experiences in using public domain tools as a teaching support.

C. Moraga and R. Stanković in “Spectral Logic Design” give a motivation of introducing an elective course devoted to spectral techniques in CS at university level.

In “The Changing Model of Teaching and Learning Multimedia”, E.Rossiou and G. Pantziou describe the way how a multimedia course is implemented at the TEI of Athens and point to intentions how to evaluate the course.

M. Janceski and M. Kon-Popovska in “Distance Education Teaching and Tutoring” concentrate on the increasing need for awareness of relevant and high quality distance teaching and tutoring.

K. Georgouli in “Towards Adaptive Web-Based Learning Systems” introduces adaptability in web-based systems based on the research in the domain of Adaptive Hypermedia.

P. Belsis, I. Chalaris, A. Malatras and I. Drakopoulos in “Supporting the Learning Process Through Knowledge Based Systems” discuss about effects and potential advantages of applying Knowledge Based Systems as a means of supporting the learning process and present the architecture of a developed prototype.

G. Armenski and M. Gusev in “Using eTesting methods in CS education” report the results from a study on using electronic testing tools for assessment of student knowledge in few university courses for CS education.

In “Parallel and Pipelining Compiler Techniques for ILP Course”, J. Markovski and M. Gusev concentrate to innovation in laboratory practicing for ILP course curricula.

Lj.Antovski, J.Markovski and M. Gusev in “Designing Simple Logic Circuits” explain the motivation of involving VHDL in the syllabus and lab practicing for digital circuits design.

The **Lab Practicing** session, pp 65-86, consists of three different kinds and levels of lab practicing organization, and one paper addressing how the computer laboratory should be used.

M. Stojčev, T. Stanković and P. Krtolica in “Lab Practicing in Studying the Assembly Languages and Computer Architecture” present a set of lab exercises used in teaching the assembly languages of MIPS processor and Intel 80x86 family of processors.

In “Computer Laboratory Practicing at the Faculty of Natural Science and Mathematics in Nis”, V. Veličković and M. Milošević give a state of the art of technical equipment in the computer laboratories at the FSMN.

B. Jakimovski, A. Misev and M. Gusev in “Microcontroller Lab Practicing” give details concerning I/O assembler programming as a part of practical exercises in the course of Microprocessors and Microcomputers. Development of several software products, like device drivers and simulators, is described.

In “Computer Networks Lab Practicing with the NS simulator”, B. Stojcevska, A. Misev and M. Gusev give an overview of lab practicing exercises for generic computer networks course curricula.

Teaching Tools session, pp 89-120, consists of six papers. Four papers deal with creation and using simulators, one with using intelligent tutoring systems, and one with using dynamic clustering system as an educational infrastructure.

In “Supporting Students Learning Databases: Experiences Using Two Intelligent Tutoring Systems”, A. Mitrović, S. Djordjević-Kajan and L. Stoimenov present the main features of two intelligent tutoring systems. Both systems, SQL-Tutor that teaches SQL and NORMIT that teaches data normalization were used in a database course in FEEN.

D. Kehagias, M. Grivas, G. Meletiou, G. Pantziou, B. Sakellarios, D. Sterpis and D. Ximerakis in “A Low-Cost Dynamic Clustering System for Education and Research” describe the implementation of dynamic clustering system consisting of a Beowulf class cluster and a Network of Workstation class cluster.

In “Grid Communication Simulator”, B. Jakimovski and M. Gusev discuss how their Grid Simulator can be used for teaching the students the different algorithms in implementing collective communications for Parallel Processing course.

In “Simulators for ILP Course”, A. Misev and M. Gusev present how several different simulators can be used in order to help students learn concepts of advanced Instruction Level of Parallelism course.

O. Vojinović, I. Milentijević, D. Genov and A. Radulović in “SimArch: Presentation Tool for Computer Architectures” concentrate on involving new alternative platform for creating and delivering presentations that successfully combines positive issues of both general and special-purpose presentation tools.

In “Logic Circuit Design Visualization in Computer Architecture Course”, J. Markovski and M. Gusev present a simple logic simulator for performing lab exercises in basic logic circuit design.

The **Internet Technologies in Education** session, pp 123-145, contains six papers that promise to improve learning using Internet.

In “Tele-Teaching, Future or Reality?”, R. Stanković, D. Janković, M. Radmanović and C. Moraga discuss the basic aspects of tele-teaching and point to the impact of teaching technology development to contemporary educational methods.

B. Jakimovski and V. Ajanovski in “Wireless Campus Portal” present unique standard functions of the campus-wide information system. The pilot applications from the portal are implemented using the WAP and SMS technology.

In “Application of Web Portal in Education”, D. Rančić, B. Dimitrijević, S. Kostadinović and I. Milentijević describe the possibilities and system architecture of web portal usage during education process at FEEN.

I. Petković in “Web Component for Online Course Management as Support of Educational Process” concentrates on description of web component which effectively supports education process.

In “Educational Tools as Web Services”, M. Stanković and M. Rajković present one possible solution for creating educational tools based on web services. The tool is used for creating of a Online Web Laboratory.

N. Ackovska and S. Bozinovski in “Distance Learning Robotics” point out to the potential of usage web-based robot control in forming a virtual classroom.

Mathematics in Computer Science session, pp 149-158, consists of two papers.

In “Discrete Mathematics in Computer Science Education at Faculty of Electronic Engineering Nis”, I. Milovanovic, B. Randjelovic and E. Milovanovic present some interesting details that deal with the content of Discrete mathematics course for students of CS at FEEN.

S. Markovski, V. Dimitrova, M. Mihova and V. Ristovska in “The Mathematical Software Packages – New Teaching Information Technologies of Mathematics for Computer Sciences” show how standard mathematical software packages like Mathematica, Matlab, Maple, MathCAD can be effectively used for teaching mathematics.

The PROCEEDINGS ends with a **Selected Topics** session, pp 161-180, which consists of four papers.

In “LATEX Tools for Web Publishing, Screen Presentations, and Electronic Examinations”, M. Ciric presents the possibilities of usage the software package TEX in preparation of high-quality PDF documents for web publishing, screen presentations and electronic exercises and examinations.

S. Georgievska in “Synchronization in Multithreaded Java Programs” concentrates on practical aspects of synchronization in multithreaded Java programs. Definitions of processes, cooperating processes and threads are given, and Java threads are briefly explained.

In “Contemporary DRAM Memories and Optimization of their Usage”, N. Milenkovic and V. Stankovic give a short survey some of the most popular types of contemporary DRAM memories, and explain some techniques for optimal use of them. The capabilities of DRAM memory simulator used in lab exercises are discussed, too.

In "New Methodology and Evaluation System", M. Gusev presents possibilities of the realized system intended to evaluate students' participation during the complete semester and also evaluate more objectively the obtained knowledge and skills.

If you teach some course in Computer Science, we hope that you peruse these papers, and you will find very interesting topics, approaches and solutions for efficient organization of teaching process and lab practicing concerning your course.

What is more important, you can contact the authors for ideas and tools that you can use in your course.

If this PROCEEDINGS can facilitate wider dissemination of the proposed ideas, methodologies, and concepts, then it has done its job in advancing the state of computer engineering education.

On behalf of Central Management Team (CD-JEP 16160/2001),

Mile Stojčev

Claudio Moraga

Ivan Milentijević

S1.1. Computer Architecture Courses in Informatics Departments

D. Kehagias

Abstract - Fundamental developments in computer science over the past decade have made it necessary to restructure the computer science (Informatics) curriculum. In this paper I propose three courses to represent the subject of computer architecture in the computer science (Informatics) curriculum.

S1.2. Social Networking in the University Education Process

Milorad Totic, Valentina M. Milicevic

Abstract - In this paper, we present our first experience with adopting social computing approach to the University education process. We claim that social computing based approach is the right way for University education process to meet new challenges by adopting weakly managed (collaborative) process for innovation, creativity and learning. First experimental results, obtained on the developed system prototype, support these claims.

S1.3. Database Curricula in Higher Informatics Education

T. Alevizos, C. Skourlas

Abstract – A framework for comparative analysis of Database Curricula in Higher Informatics Education is presented. This framework includes an overview of the course (title, type, semester, prerequisites, credits, etc.), aims and objectives, course contents, class requirements – grading, and recommended bibliography. Database Curricula of three different Departments of Technological Institutes in Greece were collected. We focused on the two older Departments of Informatics and a new Department of Industrial Informatics. The programs of Departments we present are conforming to the ACM/IEEE Computing Curricula 2001 (CC 2001)[1]. Beyond the core knowledge, each of the departments has incorporated the electives considered useful to its students depending on how it evaluates the market demand.

S1.4. Databases Course on the WebCT Platform 2002

V. Ajanovski

Abstract – The active role the Internet has played, put the knowledge of databases – their design, implementation, management, accessing, data retrieval and manipulation, as a top priority in every software engineers portfolio. In order to have a good toolbox of database systems and applications' hands-on knowledge, the database course was restructured and its' volume was almost doubled, from 4 to 7 classes per week, with a dynamic and interactive teacher-project-student orientation. The course in databases, as taught at the Institute of Informatics in Skopje, is a blend theoretical parts explaining traditional methodology and techniques and cutting-edge-technology laboratory work, giving the students a full immersion in an almost real-world scenario involving all aspects of day-to-day use of databases.

S1.5. An Approach to the Reorganization of Teaching at the Faculty of Electronic Engineering

R. Stanković

Abstract - This article presents basic elements of a proposal for the reorganization of teaching at the Faculty of Electronic Engineering, University of Niš, Serbia, aiming to achieve improvements in efficiency of training and learning, and increasing the level of knowledge as the final outcome. It presents the author's point of view about this problem, discussed at several Department and Faculty meetings, and Tempus workshops in Athens, Greece, April 2003, and Niš, June 2003.

S1.6. Proposal for a first Course on Computational Intelligence using public domain software

C. Moraga

Abstract. In this paper a proposal for a first course on Computational Intelligence is presented. Some experiences in using public domain tools as a teaching support in this field will be reported. Both performance aspects and user friendliness will be considered. Reference addresses to retrieve or obtain this kind of tools will be given.

S1.7. Spectral Logic Design

C. Moraga, R. Stanković

Abstract - The name "Spectral Techniques" denotes presently an area comprising the theory and applications of Fourier and other orthogonal transforms as well as arithmetic transforms for discrete functions, in the area of digital signal processing and particularly in the area of binary and multiple-valued logic design. Experiences and results of the last 20 years are strong enough to motivate the introduction of "Spectral Logic Design" at least as an elective course in Computer Science at the University level. The present paper discusses the content of a possible such course.

S1.8. The Changing Model of Teaching and Learning Multimedia

E. Rossiou, G. Pantziou

Abstract -- The information revolution, our changing views on the way we teach, and demands on graduates from the workplace all work together to form a new approach to teaching in higher education. The multimedia teaching and learning model is changing in the Laboratory of the "Multimedia Technology" course in the Department of Informatics in TEI of Athens, Greece. The 15 weeks course 'faces' the shift in teaching and learning model across the spectrum of higher education. In the new teaching and learning methodology the teacher becomes guide, students become more independent and work collaboratively, communication and resources are accessible via the Internet and multimedia resources are delivered over the network for flexible access.

S1.9. Distance Education Teaching and Tutoring

M. Janceski , M. Kon-Popovska,

Abstract – The main purpose of this paper to stress the increasing need for awareness of relevant and high quality distance teaching and tutoring, and to describe various aspects, learning variables and instructional technologies. It includes a brief review of different modes of distance education existence as well as key players' roles in distance education and their basic functions. Differences between distance teaching and traditional one are described. An outline of distance teaching and tutoring is also presented.

S1.10. Towards Adaptive Web-Based Learning Systems

Katerina Georgouli

Abstract - The purpose of this paper is to introduce adaptability in Web-based learning systems based on the research in the domain of Adaptive Hypermedia (AH). We present a selection of hypermedia structures that could be used to represent educational knowledge for adaptive presentation and navigation. It is not our intention that these structures be exhaustive, more that they provide enough richness to support adaptivity in instructional and pedagogical level. The structures are represented using the Adaptive Hypermedia Model (AHM) and are based on Brusilovsky's taxonomy for adaptation.

S1.11. Supporting the Learning Process Through Knowledge Based Systems

P. Belsis, I. Chalaris, A. Malatras, I. Drakopoulos

Abstract - Supporting the learning process through technology means has been the primary aim for many activities. Knowledge Based systems have always been a challenging field of research and have been applied to different areas. In this paper we deploy our arguments about the effects and potential advantages of applying Knowledge Based Systems as a means of supporting the learning process, and we present the architecture of a developed prototype, which aims to support the learning process through Knowledge Management techniques utilization.

S1.12. Using eTesting methods in CS education

Goce S. Armenski, Marjan Gusev

Abstract - This paper reports results from a study on using electronic testing tool for assessment of student knowledge in few university courses for CS education. The study was basically concerned with the effectiveness of using electronic testing tool for assessment purposes. The effectiveness was analyzed through cost savings and improvement of quality of the assessment process, viewed from both perspectives: the teacher perspective, and the student perspective. Data gathering took place over six semesters after which questionnaire was completed by the students through which their experiences and reactions were evaluated. Analysis of data about effectiveness viewed from teachers perspective was gathered through informal interviews with faculty members that administer and create computer-based tests.

S1.13. Parallel and Pipelining Compiler Techniques for ILP Course

J. Markovski, M. Gusev

Abstract – The topic of this paper is innovation in laboratory practicing for ILP course curricula. In order to fulfill the gap of new incoming technology VLIW processors we introduced several lab practice exercises. The students learned VLIW concepts and topics with practical examples and obtained skills for deep analysis of programs and methods to exploit maximum performance out of possible VLIW processors. They learned how to program such processors to exploit maximum parallelism and face the VLIW challenge for maximum efficiency in programs. Statistical data is presented to show how the new way of teaching affects the learning process of the students and their average score.

S1.14. Designing Simple Logic Circuits

Lj. Antovski, J. Markovski, M. Gusev

Abstract – The basic Computer Architecture course is scheduled in second semester in Computer Science Studies. About 180 students enroll each year in the basic computer architecture course. For first time in 2002/2003 we introduced VHDL in the syllabus and lab practicing for simple logic design. The results of these innovations are improved students' interest, improved success and average score in total knowledge. Although we found very difficult to realize this lab practicing with 180 students we found a great success in obtained knowledge and skills.

S2.1. Lab Practicing in Studying the Assembly Languages and Computer Architecture

M. Stojčev, T. Stanković and P. Krtolica

Abstract – In this paper, there is a review of the set of lab exercises used in teaching the assembly languages of MIPS processor and Intel 80x86 family of processors. These exercises are already introduced at Faculty of Electronic Engineering in Niš, University of Niš, and should be introduced at Faculty of Science and Mathematics in Niš, University of Niš.

S2.2. Computer Laboratory Practicing at the Faculty of Natural Science and Mathematics in Nis

V. Veličković, M. Milošević

Abstract – In this paper, we give a state of art of the technical equipment in the computer laboratories at the Faculty of Science and Mathematics in Niš. Furthermore, an overview is given of the departments at the faculty with a special emphasis on the use of the computer laboratories for teaching.

S2.3. Microcontroller Lab Practicing

B. Jakimovski, A. Misev, M. Gusev

Abstract – I/O assembler programming is a part of practical exercises in the course Microprocessors and Microcomputers. Previous years our students used several external devices connected on the ISA bus for performing different lab exercises. Since there was only one such device per each lab exercise there were difficulties in using the device on the practical classes. Hence we developed several software products like

device drivers and simulators. A Virtual Device Driver for Windows NT/2000/XP was developed capable of connecting to a Virtual Device representing the I/O device and enabling the students to run their programs on every computer in the laboratory.

S2.4. Computer Networks Lab Practicing with the NS simulator

B. Stojcevska, A. Misev, M. Gusev

Abstract – In this paper we overview lab practicing exercises for generic computer networks course curricula. We will also present statistical data that shows how the new way of teaching affects the students' skills and knowledge obtained, and also their average grades and score.

S3.2. A Low-Cost Dynamic Clustering System for Education and Research

D. Kehagias, M. Grivas, G. Meletiou, G. Pantziou, B. Sakellarios,
D. Sterpis and D. Ximerakis

Abstract - In this paper we describe the implementation of a dynamic clustering system consisting of a Beowulf class cluster and a NoW. This system will be used by the Department of Informatics of the TEI of Athens as an educational and research infrastructure .

S3.3. Grid Communication Simulator

B. Jakimovski, M. Gusev

Abstract – Grid computing enables the composition of widely distributed resources for tackling large computational problems. The introduction of large distribution and large scale introduces problems not previously encountered. The solution of these problems lays in development of new programming models capable of efficient development of efficient applications. MPI is a very widely used standard for implementing parallel computational problems. MPICH is an implementation of the MPI standard that enables distributed usage of MPI. The performance consideration of MPI programs lies in efficiently implemented communications. The collective communications in the MPI standard represent the possibility for implementing better performance communications. In this paper we discuss how our Grid Simulator can be used for teaching the students the different algorithms in implementing collective communications for introductory Parallel Processing course.

S3.4. Simulators for ILP Course

A. Misev, M. Gusev

Abstract – In this paper we present several simulators used to help students learn concepts of ILP (Instruction Level of Parallelism). The simulators cover wide area of concepts such as internal logic organization, datapath, control, memory behavior, register renaming, branch prediction, and overall out of order execution. Special dedicated simulators cover details in internal organization like Tomasulo approach and scoreboard for organization of reservation stations. All simulators are visual with techniques showing dynamic dataflow in internal organization of contemporary ILP processor. This innovative approach in laboratory exercises is used for advanced ILP course.

S3.5. SimArch: Presentation Tool for Computer Architectures

Oliver M. Vojinović, Ivan Z. Milentijević, Dejan Genov, Aleksandar Radulović

Abstract – New alternative platform for creating and delivering presentations that successfully combines positive issues of both general and special-purpose presentation tools, is proposed in this paper. Proposed platform introduces the concept of dynamic usage of data providers during the presentation and creating slide templates instead of slide creation. Originally developed presentation tool SimArch that implements almost all key features from the new platform is described. SimArch is designed for teaching purposes and devoted to description and visualization of computer architectures. Crucial novelties in SimArch related to involving of slide templates, behavior cases and selection of examples, are demonstrated on examples based on MIPS architecture subsets.

S3.6. Logic Circuit Design Visualization in Computer Architecture Course

J. Markovski, M. Gusev

Abstract – In this paper we present a simple logic simulator suitable for performing laboratory exercises in basic logic circuit design. The proposed simulator supports multiple platforms and is highly portable since it is programmed in Java and uses XML files as input. It has simple user interface and supports both timed and step-by-step simulation. Thus, it is suitable both for teaching and real-time simulation and simple logic circuit design. We use this simulator as introduction in more professional logic circuit design, where other tools are available.

S4.1. Tele-Teaching, Future or Reality?

R. Stanković, D. Janković, M. Radmanović and C. Moraga

Abstract - This paper discusses basic aspects of tele-teaching and impact of teaching technology development to contemporary educational methods. Tele-teaching is viewed as a solution for several problems in education, including lack of experienced teaching staff, economically approved number of listeners for a course, assurance of the level of quality of teaching, etc. Emphasized are technical and economical demands in introducing and exploiting such systems.

S4.2. Wireless Campus Portal

B. Jakimovski¹, V. Ajanovski²

Abstract – The Wireless Campus Portal unites standard functions of the campus-wide information system and presents the results to potential mobile users. The portal should work in a highly personalized manner enabling mobile users to choose the information they need and the way they see it. The portal should provide facilities for user intervention within the functions of the information system. The pilot applications from the portal are implemented using the WAP and SMS technology. The portal relies on the developed SMPP Dispatch Server.

S4.3. Application of Web Portal in Education

Dejan D. Rančić, Bratislav I. Dimitrijević, Srđan S. Kostadinović, Ivan Z. Milentijević

Abstract – This paper describes web portal usage during education process at Faculty of Electronic Engineering in Niš. The project has begun as a form of assignment for Software Engineering course, but

later it was expanded for the usage in other courses. This project has found considerable usage in lectures as a tool of teacher-student interaction via Internet.

S4.4. Web Component for Online Course Management as Support of Educational Process

I. Petković

Abstract – Web sites have evolved to the stage where they represent the global infrastructure for delivering information and services. A need for easy and fast online content management has arisen, especially for large companies and organizations like universities and faculties are. In this paper a Web component which supports education is presented. Using the system of user privileges built into this component, all information relevant to the courses can be managed. This can help students in retrieving the latest information, but also downloading various files (lectures, tutorials, and other documents) posted for the courses. On the other hand, the proposed service provides easy online administration of the course contents. All component's services are independent and easy to integrate with the existing Web application and its services.

S4.5. Educational Tools as Web Services

M. Stanković, M. Rajković

Abstract: The World Wide Web is one of the most commonly used solutions for creating distributed educational applications. Although the model has many advantages, its main drawback is impossibility of application to application communication. This paper explains how this problem is solved by introducing the Web service technology. Basic architecture layers of the technology are described, and an example of an educational application based on Web services is presented.

S4.6. Distance Learning Robotics

N. Ackovska, S. Bozinovski

Abstract - This paper presents a result of an effort of designing a virtual classroom that will enable conversation in the classroom as well as a robot control over the Internet. The design of the virtual classroom includes two components: a chat-room server (Espernet network) and a robot server (Probotics). Some examples of moving a robot through the corridors in a building of South Carolina State University, USA, from a building of Institute of Informatics, University of Skopje in Macedonia are also presented. The experiments that we carried out show that there are emerging potentials of using web based robot control for educational purposes. Furthermore, the web based control of robots can be extended to other useful applications.

S5.1. Discrete Mathematics in Computer Science Education at Faculty of Electronic Engineering Nis

I. Milovanovic, B. Randjelovic and E. Milovanovic

Abstract – This paper presents Discrete mathematics course for students of computer science (CS) at the

Faculty of Electronic Engineering of Nis (FEEN). We describe selected topics of discrete mathematics that constitute this curriculum.

S5.2. The Mathematical Software Packages – New Teaching Information Technologies of Mathematics for Computer Sciences

S. Markovski¹, V. Dimitrova², M. Mihova³, V. Ristovska⁴

Abstract – The mathematical software packages open the possibilities of their usage as a new information technology for teaching mathematics. The development of the mathematical courses under the new IT is still in progress. The experience of teaching mathematics by Mathematica at the Institute of Informatics, the Faculty of Natural Sciences and Mathematics in Skopje, is presented.

S6. 1. L A T E X Tools for Web Publishing, Screen Presentations, and Electronic Examinations

Miroslav Ciric

Abstract: T E X is generally considered to be the best way to typeset complex mathematical formulas, but, especially in the form of L A T E X and other template packages, is now also being used for many other typesetting tasks. The purpose of this paper is to present the usage of T E X in preparation of high-quality PDF documents for web publishing, screen presentations and electronic exercises and examinations.

S6.2. Synchronization in Multithreaded Java Programs

S. Georgievska

Abstract – In this paper practical synchronization in multithreaded Java programs is shown. Definitions of processes, cooperating processes and threads are given and Java threads are briefly introduced. Synchronization of the producer-consumer scenario in Java threads using monitors is shown in details. Student results practicing synchronization in the Basics of Operating systems course are mentioned, too.

S6.3. Contemporary DRAM Memories and Optimization of their Usage

N. Milenkovic, V. Stankovic

Abstract – Dynamic RAM (DRAM) memories have been a primary choice for implementing main memories for many years. Performances of contemporary DRAM memories have improved in the last years not only by progress of technology, but with architectural innovations also. The operation of DRAM memories became complex by introducing numerous capabilities, and for achieving maximal performances from them optimization of their use must be made. This qualifies them as a candidate for study in course on Computer organization, which is taken by all students in Computer science department on Faculty of electronic engineering in Niš. In this paper we briefly survey some of the most popular types of contemporary DRAM memories, and explain some techniques for optimal use of them. Our students can examine the results of these optimization techniques by simulation in laboratory.

S6.4. New Methodology and Evaluation System

Marjan Gusev

Abstract –Traditional and conventional systems for high education did not enabled improvement of the learning process in the high education area. In the computer studies we implemented a new methodology by using new information and communication technology capabilities. The ethodology did not changed only the interaction with the students it was used to enable new paradigms, such as establishing a system for homework assignments with more then 150 students, interactive learning possibilities while lecturing, easy assessment for several courses and great number of students. This paper reports results from using such methodology. We show that the results of these innovations are improved learning results, level and degree of obtained knowledge and skills, students' interest, improved success and average score in total knowledge.

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