

52. IWK

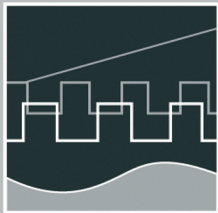
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FACULTY OF COMPUTER SCIENCE AND AUTOMATION



COMPUTER SCIENCE MEETS AUTOMATION

VOLUME II

Session 6 - Environmental Systems: Management and Optimisation

**Session 7 - New Methods and Technologies for Medicine and
Biology**

Session 8 - Embedded System Design and Application

Session 9 - Image Processing, Image Analysis and Computer Vision


Session 10 - Mobile Communications

Session 11 - Education in Computer Science and Automation

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Preface

Dear Participants,

Confronted with the ever-increasing complexity of technical processes and the growing demands on their efficiency, security and flexibility, the scientific world needs to establish new methods of engineering design and new methods of systems operation. The factors likely to affect the design of the smart systems of the future will doubtless include the following:

- As computational costs decrease, it will be possible to apply more complex algorithms, even in real time. These algorithms will take into account system nonlinearities or provide online optimisation of the system's performance.
- New fields of application will be addressed. Interest is now being expressed, beyond that in "classical" technical systems and processes, in environmental systems or medical and bioengineering applications.
- The boundaries between software and hardware design are being eroded. New design methods will include co-design of software and hardware and even of sensor and actuator components.
- Automation will not only replace human operators but will assist, support and supervise humans so that their work is safe and even more effective.
- Networked systems or swarms will be crucial, requiring improvement of the communication within them and study of how their behaviour can be made globally consistent.
- The issues of security and safety, not only during the operation of systems but also in the course of their design, will continue to increase in importance.

The title "Computer Science meets Automation", borne by the 52nd International Scientific Colloquium (IWK) at the Technische Universität Ilmenau, Germany, expresses the desire of scientists and engineers to rise to these challenges, cooperating closely on innovative methods in the two disciplines of computer science and automation.

The IWK has a long tradition going back as far as 1953. In the years before 1989, a major function of the colloquium was to bring together scientists from both sides of the Iron Curtain. Naturally, bonds were also deepened between the countries from the East. Today, the objective of the colloquium is still to bring researchers together. They come from the eastern and western member states of the European Union, and, indeed, from all over the world. All who wish to share their ideas on the points where "Computer Science meets Automation" are addressed by this colloquium at the Technische Universität Ilmenau.

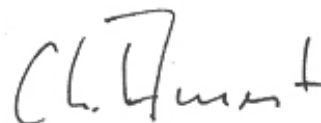
All the University's Faculties have joined forces to ensure that nothing is left out. Control engineering, information science, cybernetics, communication technology and systems engineering – for all of these and their applications (ranging from biological systems to heavy engineering), the issues are being covered.

Together with all the organizers I should like to thank you for your contributions to the conference, ensuring, as they do, a most interesting colloquium programme of an interdisciplinary nature.

I am looking forward to an inspiring colloquium. It promises to be a fine platform for you to present your research, to address new concepts and to meet colleagues in Ilmenau.



Professor Peter Scharff
Rector, TU Ilmenau



Professor Christoph Ament
Head of Organisation

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Innovational pedagogical technologies and the Information educational medium in the training of the specialists

Education in Computer Science and Automation

The model of the base of the informational-educational environment is created on the base of informational-communicative technologies, a system of the mutual action and its influence on the quality of the preparation of specialists and their informational culture are defined. The need for highly - educated specialists causes innovations in educational system, which is one of the main directions of human activity. That is why it's necessary to put modern information technologies /IT/ into practice today.

Today the information-educational environment occupies a very important place in many countries of the world. In important sense is a constant creative renovation, the development and the perfection of the personality during all life. The world civilization got a powerful instrument in the form of informational - communicative technologies /I.C.T./ with the development of I.C.T. the content of the education are changed greatly. The students and the pupils begin to use widely and actively the possibilities, given by I.C.T. It is expressed in the increase of the time for the independent work, it means that the education begins to be accessible to any person, in any place, in any time and on any speciality [1].

New conditions of the information-educational environment inevitably present new demands to the system of the professional education, and first of all to the quality of the education, new demands. Among them we have: the flexibility of the terms and the process of the education; elaboration and inculcation in the educational process of new pedagogical technologies, new educational systems, new educational plans and programmers on complex integral and scientific -capacious professions. All these requirements are realized in our college. Sometimes we have not enough money on it. But we have the main thing, it is the tendency of the development.

Today we have not only the change of the technological base of the functioning of the educational institutions, but also the change of their institutional essence. As a result today we see many innovational organizational forms of the institutions, which

all use the extended spectrum of new pedagogical methods, new economical and organizational- administrative mechanisms of their functioning [2].

The educational environment is based on the principles of the continuousity, publicity, personal orientation, development of managers on their position, pedagogues, pupils, pedagogics of the collaboration and the partnership. From the point of the main criterion of the estimation of the educational environment we consider the positive valuable attitude of the students.

Today we can notice real dignities of the professional education in the informational-educational environment;

- it gives a constant perfection of the professional knowledge, skills and abilities;
- raises the motivation of the professional activity;
- provides the possibility of the individualization of the education;
- lets realize the succession of professional educational programs of different chaines of the education system;
- gives the possibility to combine the work and the studies.

We believe, that such approach to the educational and pedagogical technologies gives us the harmonic development of the personality, develops the abilities of putting the tasks, modeling, optimization and taking the solutions in the conditions of the uncertainty among our young generation, all this is very important during the preparation of future specialists in different fields of science and technique.

The main particularities of the modern society are:

- constant variety of the scientific and technological process,
- requirement in the rapid work of large volumes of information.

It is obviously, that the necessity in the high level of the preparation of future specialists in the institution gives the conditions for the innovations in the educational system - in one of the main directions of man's activity. That's why it is necessary to create modern IT during this period. Till recently the creation of the IT in the educational sphere had any big innovations. The changes in the technology of the education are not only technical necessities, but it is also the answer on the definite social question. Modern students use the newest carriers of the information's very intensively: TV, PC, E-mail, Internet. Computer technologies are means, which allow to make wider a creative potential; knowledge's appear in a new field; a new view of well known facts and visions appear in order to find the necessary material it's necessary:

- to understand the notions clearly,
- to determine the subject domain, when it is impossible to make asking for the information.

In the process of using the Internet the students receive the qualities:

- autonomy in making decision,
- ability of thinking,
- for the collaboration,
- the capability of giving knowledge's to other people,
- mobility and others.

There is a good connection in MSHRC:

- of the educational-computer center of the college with global telecommunication systems of Internet,
- the students have the possibility:
 - to visit the reading hall of the college,
 - to get acquaintance with new magazines, journals, encyclopedias,
 - to see a system of catalogues, the lists of new documents.
- "to visit" the different libraries of the world - this everything influences at the good study of many topics.

However, different sociological studies show us, that the students are interested in electronic carries of the information very much, in comparison with the traditional paper carries - books, magazines, journals.

In our college we have elaborated ourselves:

- applied programs,
- individual laboratory - practical tasks, which allow us to use the modern informational technologies during the studies of some subjects. The uninterrupted study and using of the computer technique in all the courses in chain are examined in the educational plans:
 - Applied computer science - Computer technology and programming - Information technologies.

In order to use better it in the educational subjects there is a special course in our college which is called "Information technologies" as a basic course for all specialities, including the specification. We have elaborated the packet of practical tasks on the example MS IE, where the students study:

- the necessary parameters and the standart Interface MS IE,
- hypermedia and multimedia of the technology,
- work of different Web-sites.

We pay a great attention to our studies to the computer modulation - the most important component of the educational technology. Excel, Power Point are used in the quality of means. All the documents are made by means of text editor Word. By means of the spreadsheet Excel we make a count of a middle point of studies, the making of diagrams, the sorting of the facts etc. The using of the electronic presentation Power Point allows to create a special booklet, to advertising booklet, to prepare a business plan, the presentation about college.

It is necessary to notice that the proposed practical tasks increase:

- interest of the students to study course,
- allow to produce a creative and individual approaching during the execution some tasks.

While comparing with the lecture on any subject the lecture on any subject the course "Information technologies" :

- more democratic,
- allow to embrace a great quantity of students.

All the teachers known that:

- the students are not always very attentive at the lectures,
- not all of them have time to make notes,
- many of the students cannot hear very well,
- sometimes the student is afraid that he does not understand the material.

The studios on "IT" allow us to make the lectures individual and such studies can regulate the process of getting knowledge's. One can choose an individual rhythm taking into consideration the degree of preparation, the specification of understanding and the needs of each student. We believe, that when we work on an interactive regime every student is able:

- to do the mistakes every time without any shame, when he did not understand some question;
- to work with a rhythm given only for himself;
- to organize a self control;
- to come back to the most difficult questions;
- to lose the situation again, that allows him to find those questions, which he did not understand enough;
- to eliminate the blanks in knowledges;
- to do the some task many times, to ask the some material some times;
- to look through the results of the tests and to analyze them.

In the process of the study of the "IT" course the students make the conclusion about the necessity of having good and profound knowledge's when understanding and using the new types of IT in different fields of the professional activity.

At the 4th course our students use the computer technique at the level of the professional user, therefore the introducing the new IT in the educational process helps our students to become more qualified users of new technologies.

When using the computer technologies appears:

- problems of the communicative competition,
- real danger of the transferring of the technical using with the computer towards the relations with the people appears.

We shall notice, that the emotional moments of the acting disappear during the showing the material of studies:

- mimicry, gestures, intonation.

Therefore it is impossible to expel the teacher from the educational process.

The application of the modern IT during the preparation of the students will allow them to adopt themselves easily to the changeable demands of the technical progress.

Computer technologies and the Internet first of all are not the technical means of the educational, but it is a new technology. Therefore in modern conditions the preparation of the professional engineers-teachers, economist, managers etc. cannot be enough successful without using the informational resources and the possibilities of Internet.

Everybody in the world understands, that a new informational culture appears among us. Today the field of the application of modern IT is so great that it is very difficult to find the branch of knowledges where it is impossible to use them with a success of course. A very important place here belongs to the teacher. But it is necessary for this:

- new approaching,
- to refuse from the old schemes of the organization of the educational process,
- to be always ready to learn new fields of knowledge's.

Such approach to the education gives us:

- harmonically development of the personality,
- contribute the possibility to get knowledge's among the students, to develop the putting new tasks, of the modulation, the adoption of the solutions in the conditions of the uncertainty, it is all necessary during the preparation of future specialists [3].

References:

- [1] Ruchaevskaia E.G. Information technologies in the process of the interaction of the student with the educational environment in Minsk State High Radio-engineering College// The personal-orient education of the professional education: content - forms - problems: Collection of the materials, /Ministry of the education of the republic of Belarus. MSHRC; edited by the professor N.A.Tsyrelchuk.-Minsk, 2005. -244 p.
- [2] Ruchaevskaia E.G. Modern information technologies and the education in the high college// Informatization of the educational process: automatization of the direction, technologies, education from the distance: Collection of the materials, /Ministry of the education of the republic of Belarus. MSHRC; edited by the professor N.A.Tsyrelchuk.-Minsk, 2006. -412 p.
- [3] Pivovarova M.A. Advantages and the lacks of the use of the information technologies. - Minsk, "Secondary professional education", 2006 N2.

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