

## Distance Learning for the Remote Branch of Siberian University

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**ABSTRACT:** *Involving of Russia into the Bologna Process requires a modern standard of higher education in regions with traditional economics. Last achievements in CD-ROM – technique enables to improve a quality of teaching using multimedia tools.*

*Some finished tools are described in the paper: multimedia manuals “Computer Automation of Manufacturing”, “Fundamentals of Robotics”, “Systems of Supervisory Control And Data Acquisition (SCADA)”, “Information Systems for Automation” with moving illustrations in Flash5®, working cells in virtual reality, labor works to simulate discrete systems by Petri nets, self-testing, hyperlinks, and illustrated glossary ; electronic visual aids “Robotics”, “Computer Automation”, “Technique of Automation”, “Sensorics” ; systems of computer testing with 50-60 questions and 4-6 possible answers on a question.*

*Using multimedia tools a student can form an individual sequence of studying, introduce own comments, and copy any materials in the text without a lecturer. A lecturer has a possibility to renew study materials according to state-of-the-art in his subject. This work was done being the part of the project “Education in Information Technologies of Manufacturing for the Kemerovo Region” that was included in the special state program “Joining of Science and Higher Education in Russia for 2002-2006”.*

### 1 INTRODUCTION

Last year Russia was the 42-th country that was involved in the Bologna process. Unified requirements to the quality of education in European universities, mobility of students during education, mutual recognition of certificates about educational standard require to improve a quality of education in Russian Universities.

Kemerovo industry region (Kuzbass) has 7% of employees with higher education whereas Russia has about 20% of such people. The first problem is how to increase the part of high - educated people in Kuzbass industry. Kuzbass State Technical University is the main university in the Kemerovo region, that has 7.5 thousand students on 7 faculties. There are 7 branches of this university in remote sites of the region. The second problem is how to improve a quality of higher education in the branches. Young people in such regions need a higher education especially. Daily the university's professors lose 4 - 8 hours in the way to reach branches and give lessons there.

On the other hand the branches have the special class-rooms with computers for teaching. Many students have PC's at home. Why not to create the multimedia teaching tools for distance learning in branches? It is about “case technology” of distance learning, because not all students have connection with Internet at home. The experience in creation and use of multimedia manuals, electronic visual aids, and computer testing is described in the following chapters.

## **2 SUPPORT OF ACTIVITY IN DISTANCE LEARNING**

Since 2002 our proposal “Education in Information Technologies of Manufacturing for the Kemerovo region” was included in the state program “Joining of Science and Higher Education in Russia for 2002-2006”. This program is aimed to improve a quality of higher education by involving of scientists to university’s teaching. About 160 Russian universities take part in the program. We proposed to introduce the modern methodology of discrete event simulation and animation in universities, create multimedia teaching tools in computer automation, organize the branch of university department in information technology on the base of academic institute to select and prepare talented students for scientific activity, cooperate with foreign universities. The special methodology of distance learning in Russia was approved last year (*METHODOLOGY OF DISTANCE LEARNING FOR EDUCATION IN RUSSIA*, 2003).

## **3 PREVIOUS EXPERIENCE**

Idea of computer teaching was initiated in 1993. The problem-oriented simulator of Petri nets was developed for Kemerovo State University to simulate a dynamics of flexible manufacturing in labor works. The interaction between robot workcells, manipulator robots, transport robots, and automated warehouses was simulated by movement of so called tokens through places and transitions of Petri net (MURATA, 1989). Then the system of computer access to labor works was the created. A student must select a right answer to 5 questions about a forthcoming labor work. If the given number of right answers is achieved, access to simulator is permitted. Working with the NATO-Grant CRG OTR 960628 “Simulation and Animation of Russian Coal Mines” (KONYUKH, 2001) we used the package Proof Animation® to to show interaction of equipment units in the electronic manual “Flexible Manufacturing Systems”. It was clear, usual printed manuals need a long preparation for edition and can not to be renewed annually.

## **4 MULTIMEDIA MANUALS**

Dream of any student is how to observe moving color figures, color photos and video directly in manual to accelerate an assimilation of study course. The first multimedia manual “Flexible Manufacturing Systems” was created in 2002 (KONYUKH, 2003). The special requirements were determined during this work:

- movement of any figure can be started by a user directly in the text;
- all sections of the manual must be left on a screen during studying of any section;
- student can introduce and keep own comment to any place of text ;
- lecturer can refresh any part of multimedia tool;
- multimedia teaching must be available for easy PC’s without using of a special software.

multimedia tool must consist of complete set of teaching information such as study program for distance learning, advice for individual work, manual with hyperlinks, animated figures, and videos, interactive labor works, set of tasks with appropriate advice, glossary with used terminology, soft musical accompaniment.

To animate static illustrations we tested the software Proof Animation®, SolidWorks®, 3D Studio®, and MacromediaFlash®. The last one was selected because it requires a minimum memory and can be used for distance learning via Internet.

Since 2001 the multimedia manuals “Fundamentals of Robotics”, “Computer Automation of Manufacturing”, “Systems of Supervisory Control And Data Acquisition (SCADA)”, and “Information Systems for Automation” were created and used for teaching. As an example, the initial page of multimedia manual “Computer Automation of Manufacturing” is shown on the Figure 1.

Using our multimedia manuals a student can form the individual sequence of education and select a time for the studying of a subject.



Figure1 - Initial page of the multimedia manual “Computer Automation of Manufacturing”

## 5 ELECTRONIC VISUAL AIDS “ROBOTICS”, “COMPUTER AUTOMATION”, “TECHNIQUE OF AUTOMATION”, “SENSORICS”

Expensiveness, variety, rapid renewal, and complexity of technical devices make it unreasonable to use any real devices for teaching. That is why, we have selected je 150- 250 color photos from the last issues of specialized literature (after the permission of editors), scanned it, and placed on CD-ROM according to the program of study course. For every illustration the name and short comment were written. All illustrations were made in both MS PowerPoint (to edit by teacher) and HTML-format (to show for students). As an example, the photo from the electronic visual aid “Computer Automation” is shown on the Figure 2. Electronic visual aids are used to show devices of automation for students in the Kuzbass State Technical University and his branch in Prokopjevsk.

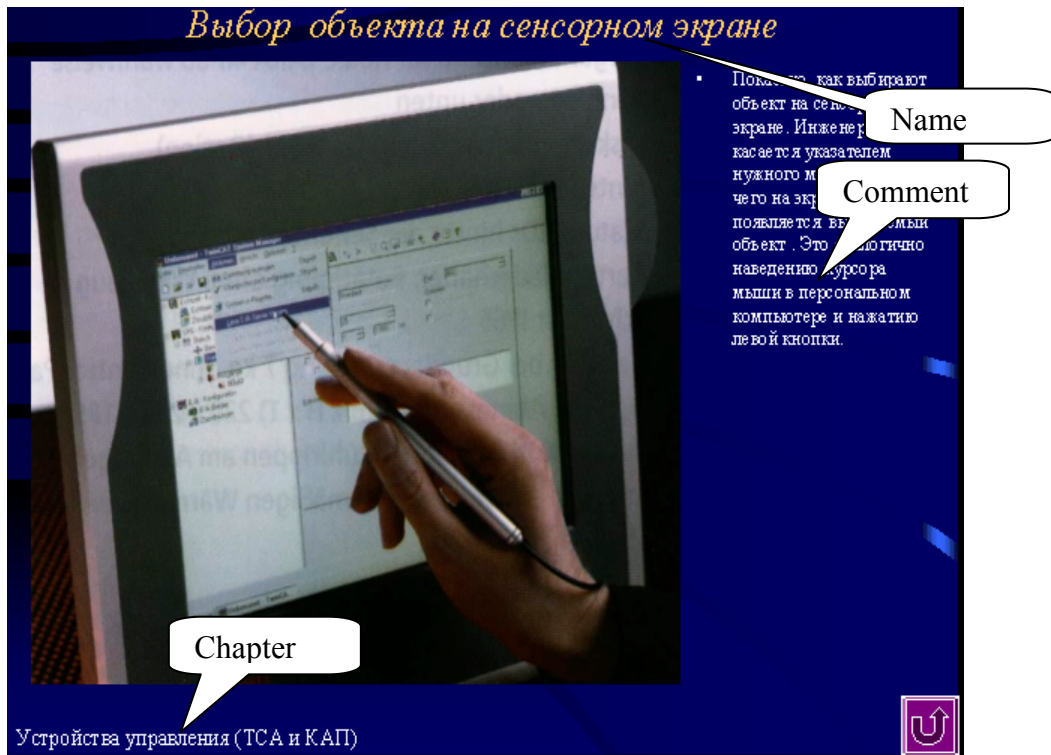


Figure 2 - The photo of sensor screen for the visual aid “Computer Automation”

## 6 SYSTEM OF COMPUTER TESTING

The system consists of the unified software in Delphi, that enables to import the questions and possible answers in MSWord-format for any study course (Figure 3).

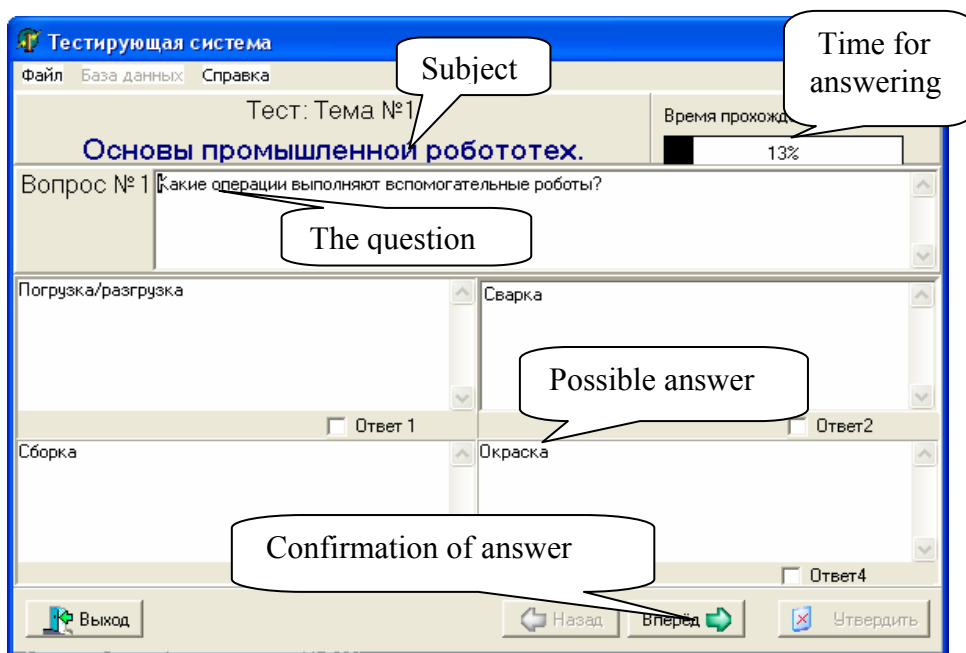


Figure 3 - Computer testing in “Fundamentals of Industrial Robotics”

The system features by the personal registration of students, random sequences of questions and possible answers, limited duration of answering, storage of results for a lecturer. A lecturer can change a duration of answering and the part of right answers for positive result. Since 2003 this system has been used

successfully for examination of students in the Kuzbass State Technical University and his branch in Prokopjevsk. About 80% of students passed an examination without any stresses.

## **7 EXPERIENCE OF DISTANCE LEARNING**

The created multimedia tools are used for distance learning since 2000. Using “case technology” of distance learning students study the materials anytime during a semester, get explanations from remote educator via Internet, introduce own comments in study materials, and check their knowledge anytime. As our experience shows, such way improves a quality of teaching especially for remote branches of university. The next steps are: renew of study materials with the help of advanced students; home examination of students; placement of study materials for branches on university portal.

However, the following problems need to be decided for multimedia teaching tools:

- defense against non-permitted rewriting of CD-ROMs;
- reservation of authority;
- recognition of multimedia tools as published works.

## **8 POTENTIALITY OF DISTANCE LEARNING BY MULTIMEDIA TEACHING**

Using of multimedia teaching enables us to refresh study materials according to state-of-the-art, show color photos, videos and animated figures, form the individual sequence of education, copy any teaching materials for unlimited number of students. Creation of multimedia teaching tool is much harder as the one of printed manual, but using of such tools for teaching enables to introduce a distance learning, form an individual sequence of studying, add a suggested material by own comments during studying, renew teaching materials. Such opportunities were inaccessible for traditional education.

The next step is development of Internet-technologies for education, such as university’s Web-portal for distance learning with ranged educational sources, schedule of classes, e-mailing between an educator and students, video-conferences, and interactive games for education. The main advantage is improvement and broadening of higher education without additional educators in Siberia.

## **9 CONCLUSIONS**

By comparison with printed teaching materials the multimedia teaching enables:

- to refresh teaching materials according to last advances in technologies;
- to introduce animated figures, color photos, and video with audio comment;
- to use virtual reality, training tools, and simulators without a real equipment;
- to use an individual sequence of education with own comments inside a teaching tool;
- to copy teaching tool for distance learning, universities branches, and external students quickly.

As our experience shows, using multimedia teaching we can solve topical problems of high education in Russia, such as shortage of high-qualified lecturers and printed manuals in universities, long distance between university and its branches, current renewal of manuals, and attractive presentation of study materials.

Since 1993 our multimedia teaching tools in modern computer automation are used in Kemerovo State University and Kuzbass State Technical University. Advanced students create some parts of multimedia tools during their degree works. Such activity enables them not only to create an useful teaching tool but also to study a subject much better.

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