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TECHNOLOGY OF SATELLITE AND MOBILE COMMUNICATION IN MODERN DISTANCE EDUCATION

Viktor Bondarenko

Abstract: *This paper describes the use of technology of satellite and mobile communication for quality improving of modern distance education.*

Keywords: *satellite communication, mobile telephones, training, education.*

ACM Classification Keywords: *H.4.3. Communications Applications*

Introduction

The intensive development of communication systems opens new perspective opportunities for the remote training. The satellite and mobile communication systems are most interesting directions of communication systems, which can be effectively used in the field of the remote training.

The satellite Internet is a unique means of access to the educational Internet-resources in places, where are inconvenient the connection to the Internet through switched telephone channels, dedicated channel or using ADSL-technologies. The satellite channel provides the same fast and reliable data transfer, as well as a dedicated channel.

Such satellite channel enables to receive large volume of the educational information including multimedia manuals, average volume of which is measured in hundreds Megabyte. Because of high-speed access in the Internet, it is possible to see, to listen lectures, and to conduct training in real time mode if the teacher is working with the WEB-camera.

The satellite TV, which is realized on that equipment as the satellite Internet, allows stable and qualitatively to see the educational television programs. Such TV not depends on a territorial location of the television centers and ground transponders.

The means of mobile communication allow to use GPRS (General Packet Radio Service) and EDGE (Enhanced Data for Global Evolution) technology of the data batch transfer [Bondarenko, 2006], due to them it is possible the communication and information exchange between students and teachers practically from any place not only country, but also all continent.

Taking into account above-stated, the specified communication facilities present large interest for the formation of a new technology, which can improve of education quality thanks to more effective contact of students with teachers.

This technology is applied to all forms of training, but in particular, to correspondence and remote forms, because such students have not stable contact with teachers, because, as usually, they are located on large distances from an educational institution. However, the stable contacts of students with the teachers determine quality of received education.

The article is devoted to this problem, where is presented the technology of training. This technology is based on the use of satellite and mobile communication systems. The described technology is implemented at the Bank Faculty of the Kiev National Economic University.

General principles of the satellite and mobile communication use in educational process

The technology of the use of the asymmetric satellite Internet in educational process is shown in Fig.1. A student install the complete set of equipment for the satellite communication (the satellite dish, the converter, the DVB-card), with which student can receive all entering data from the Internet, for example, access to educational sites, files, E-mail, consultation in the on-line mode. The student's query for receiving of necessary information is sent on the server with the help of another Internet-channel. Usually such Internet channel is the mobile telephone, which works on GPRS-technology if the access to cheaper means of the data transfer is absent. Alternatively, it is possible to use the Internet-channel based on the dial-up modem use, if the student can use stationary telephone communication channels. The satellite antenna and stationary or mobile telephone can work in pair, not creating any difficulties, as volume of the outgoing information is usually small (dialogue in forums, ICQ, E-mail).

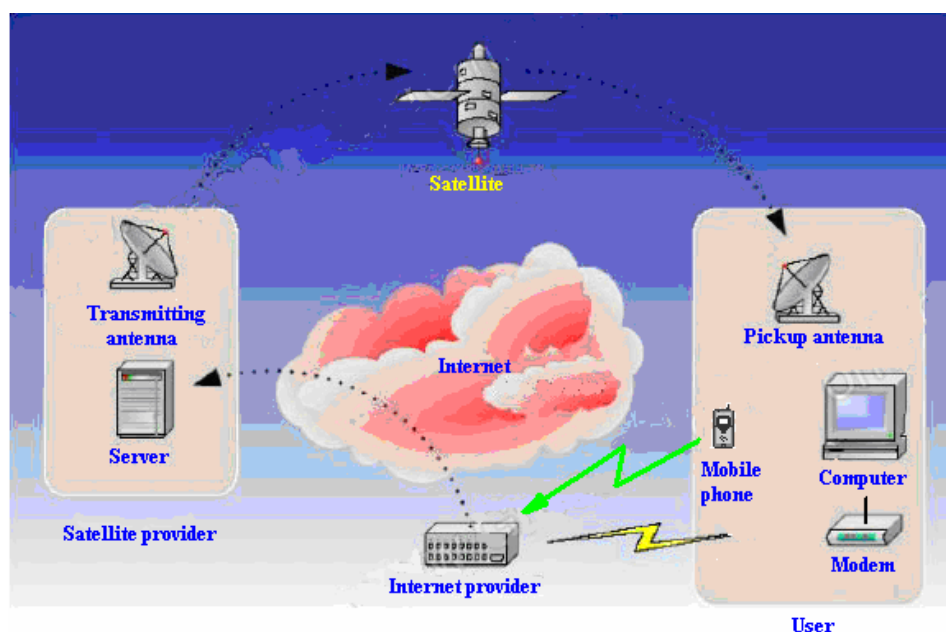The satellite «NSS-6» resource is used for organization of satellite communication channels.

Fig.1. Technology of the use of the asymmetric satellite Internet in educational process.

It is possible to describe information flows in the system as follows: the user (teacher, student) has a complete set of the equipment for reception of signals from the geostationary satellite and some ground connection with the Internet. When the student asks about any information in the Internet, his query is directed to the Internet provider or mobile communication operator. The information, which was asked by student, is sent to him not directly and at first, it goes to the satellite provider. The satellite provider directs this information on the satellite, and already satellite relays this information to the user. The user receives the information with the help of the satellite antenna and the DVB-card inserted in PCI slot of the computer. The satellite access to the Internet uses the DVB-standards and technologies, which are used for modern digital TV. This explains an opportunity of using of the same equipment for satellite access in the Internet and for the viewing of the digital satellite television programs and listening of qualitative digital broadcasting, which also can be used in the educational purposes.

The basic means of educational process technology

The basic means of the educational process support are educational portals, in which are included such means of training: multimedia courses, simulators, tests. Let us consider briefly each element of the specified set.

Educational portals. The most important components of educational process are educational portals. For example, the educational portal *educator.narod.ru* for support of the Computer Science training. One of such portals *victorbondarenko.euro.ru*, which supports the student's preparation on the discipline «Bases of the

Electrical Engineers and Electronics», is shown in Fig. 2. It is possible to receive from this portal lectures, multimedia courses, simulators, tests, tasks for self-preparation, tasks for laboratory works performance, examples, tests for self-checking knowledge, instructions, materials for the review and discussions.

It is possible to communicate with the teacher, using the guest book of the portal. The E-mail is used for active communication of students with the teacher. The student can write to the teacher the letter using the address *victorbondarenko@euro.ru*. He can receive the answer with an explanation of problems, which have arisen during the task performance. After receiving the task, the student prepares for realization of laboratory works, carries out them on the laboratory stands and further he forms results. In case of necessity, the student can write materials for the common review and discussions.

The developed materials the student places on Web-server, sending them with the help of the FTP-protocol. Communicating with the Web-server, the teacher carries out consideration and analysis of the students works, forms the database of tasks processing results, which were executed by the students, carries out correction of a didactical material, which is on the server, carries out the tests construction and updating.

During check of the tasks, the teacher uses the database for preservation of the tasks check results. This database automatically calculates a total estimation of the student with the help of the formula, which is given by the teacher.

Multimedia courses. The modern means of computer engineering allow considerably to raise a level of efficiency of the manuals, because the author can include in the manuals besides the text and figures a sound, animation, functioning program systems, the algorithms of the work with the manuals can be inserted too.

Fig. 2. A general view of the educational portal victorbondarenko.euro.ru

Due to such means, the information perception by students essentially improves, because of that training is more effective.

Some manuals were created on the base of methodology, which was offered in [Bondarenko, 2005-1]. The first of such manuals was developed the multimedia course on the discipline «Computer Science».

This course occupies 135 Mbytes of a disk space and includes the loading module, which is loaded automatically

after the disk mount. The course allows with the help of the convenient menu to select two themes of the multimedia course - « Web-pages Designing» (duration is 60 minutes) and « Work with system Excel » (duration is 120 minutes). The dense format MP3 was used for preservation of a sound. Further the menu has the item «The Test Word-Excel» for a call of the test for check of the Windows, Word, Excel knowledge, and then the menu item «Simulator Excel», which load the simulator for receiving of skills of the mathematical tasks decision in the system Excel.

The test tasks are called from the menu item «Test tasks». These tasks are intended for the independent decision. Besides, the menu has item «About the project», which contains the short information on system installation, and the author's information.

The multimedia course has such structure on each of two themes. The theme is divided on fragments. The student has an opportunity to pass a fragment, which he already has learned. If the fragment is not learned after the first study, the student has an opportunity to repeat it so much time, how many is necessary. Each fragment includes the theoretical information, which is accompanied by an illustrative material and sound explanation. Then, the student has an opportunity to execute practical tasks. For this purpose, the necessary system (Internet Explorer or Excel) is automatically loaded and the example of the tasks solution is shown on subjects of a fragment. Further, it is offered to the student to execute the similar task independently.
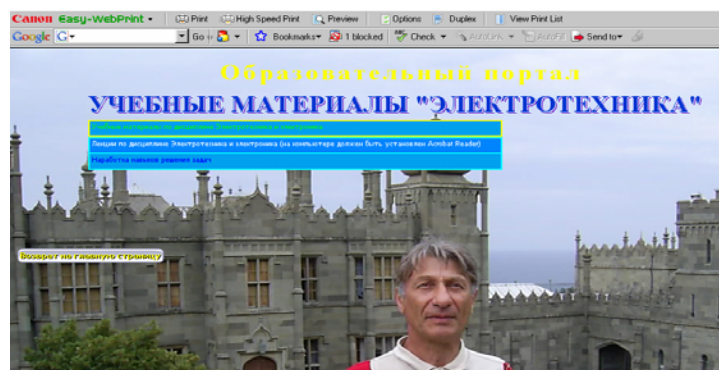
There is an opportunity to repeat each theme from a beginning after passage of all fragments of a theme. If it is not need, it is possible to performance of laboratory work. It is carried out one laboratory work on the theme "Web-pages designing" and two laboratory works on the theme "Work with system Excel". The course contains examples of laboratory works, and examples of the reports designed to them. Besides, some tens tasks are given on each laboratory work, so that each student of group would receive the individual task.

Simulators. Simulators are next important technological elements, which are used in training [Bondarenko, 2005-2]. Let us consider in more detail work of the concrete simulator, which is used during study of the Computer Science course. The simulator is intended for a receiving such skills in system Excel: the calculation of mathematical expressions, the work with matrixes, the forecasting, the solution of the linear algebraic equations systems, the solution of the nonlinear equations and the solution of optimization problems.

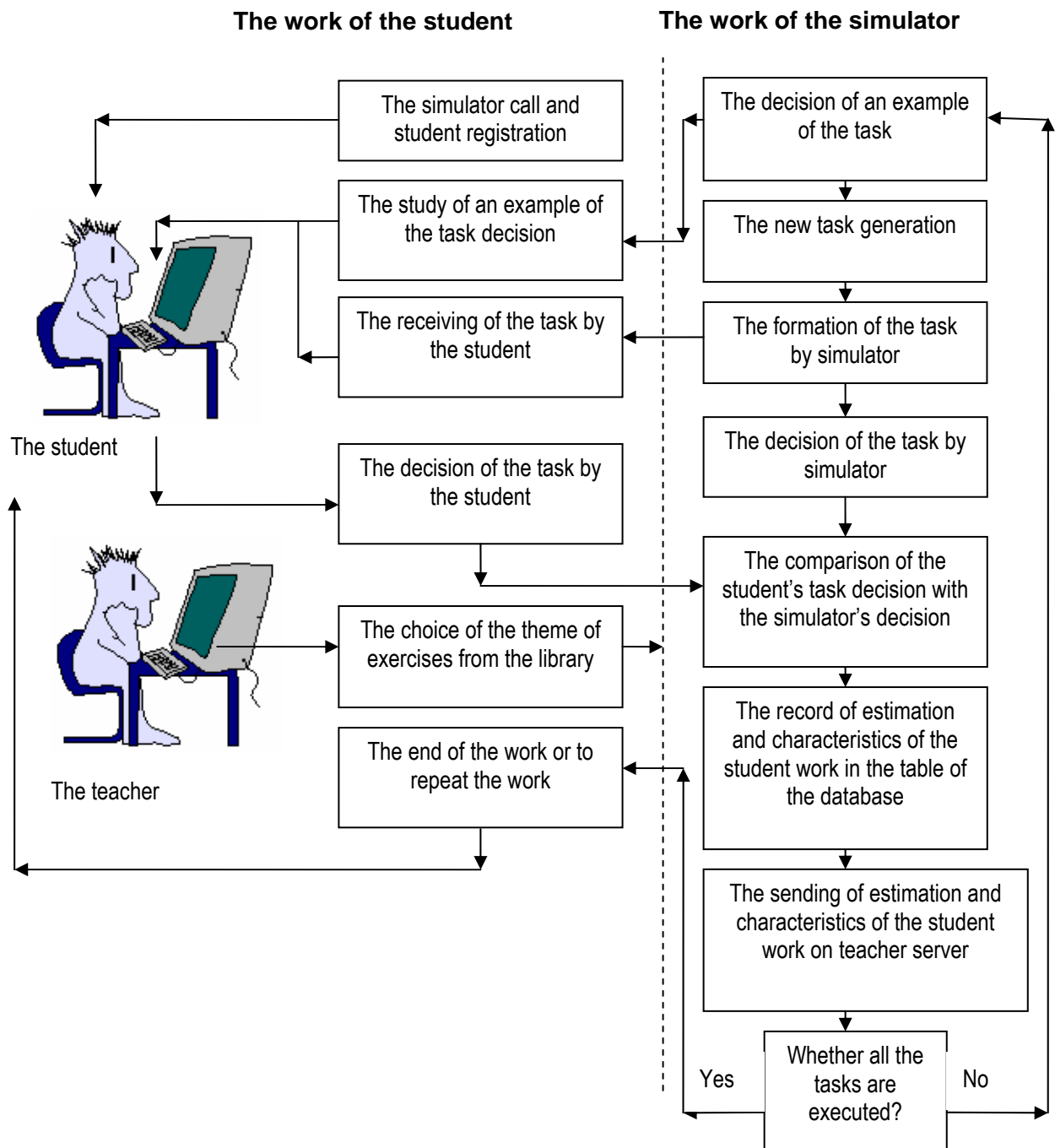**The work of the student**   **The work of the simulator**

Fig. 3. The structure of the simulator functioning.

After the simulator call, the student should be registered. He begins the work with the simulator by pressing the button «Beginning of training». The structure of the work with the simulator is shown in Fig. 3.

The student consistently carries out such actions during his work with the simulator (see Fig. 4.):

1. First it is necessary to analyze examples of the task correct solution, which are executed by simulator (to press the button 1).

2. Further, the student receives the task with the data, which are random generated by the simulator (to press the button 2).

3. The student solves independently the task (solution should be brought in area «Results»).

4. It is necessary to confirm the termination of the task performance by pressing the button 3.

The simulator solves the same task simultaneously with a student and further it compares the correct task solution to the student's task solution. After such comparison, the simulator puts mark to the student for the executed exercise in the table of the database, which is constructed in environment of the system Access.

Fig. 4. The simulator window for receiving skills of mathematical expressions calculation in the system Excel.

The table of the database contains the name of the student, number of his group, title of exercise, the date of its performance, time of a beginning and termination of exercise performance, time which student spends for exercise performance, mark for the executed exercise.

The student activity information is kept in the database Access as the table 1.

Table 1. The information of the student's activity in educational process.

Name	Group	Exercise	Date	Beginning	End	Time of performance of exercise	Mark
Bondarenko	6108/2	Calculation	02-08-2004	20:26:23	20:26:24	1	0
Ivanov	6108/2	Forecast	02-08-2004	20:26:29	20:26:30	1	1

The teacher can analyze activity of each student in different planes with the help of typical queries, which are generated in language SQL. He can determine weak places in the educational material learning, most expedient

tactics of educational process conducting both in group as a whole and for the separate students. Such analysis is carried out with the help of the analysis system.

The work with the simulator is one of the constituents of student's preparation on the Computer Science course.

The tests. The next components of educational process are the automated tests, which are constructed with the help of test-constructed system [Bondarenko, 2004]. For example, Excel and Visual Basic test. The test includes questions about the systems Windows-2000/XP, Word, Excel and Visual Basic. It consists of 87 questions. Time of testing is 20 minutes. Figures are widely used in the test. These figures show panels and menu of systems Windows-2000/XP, Word, Excel.

The Fig. 5 shows the general view of other test, which is used during study of the discipline «Bases of the Electrical Engineers and Electronics». The test consists of four tasks. The time of testing is 20 minutes. In case of necessity of calculations performance, the student can made such calculations with the help of the system Excel, temporarily entering in the Excel from the test is possible to do with the help of the button «Excel» pressing.

After the termination of the test, the student automatically receives a mark and quantity of questions, on which he has answered correctly. Questions, on which the student had no time to answer during time allocated for the test, are considered as such, on which are given the wrong answers. The protocol of the answers of the student is fixed in a file and the teacher can see it in future during the analysis of educational process.
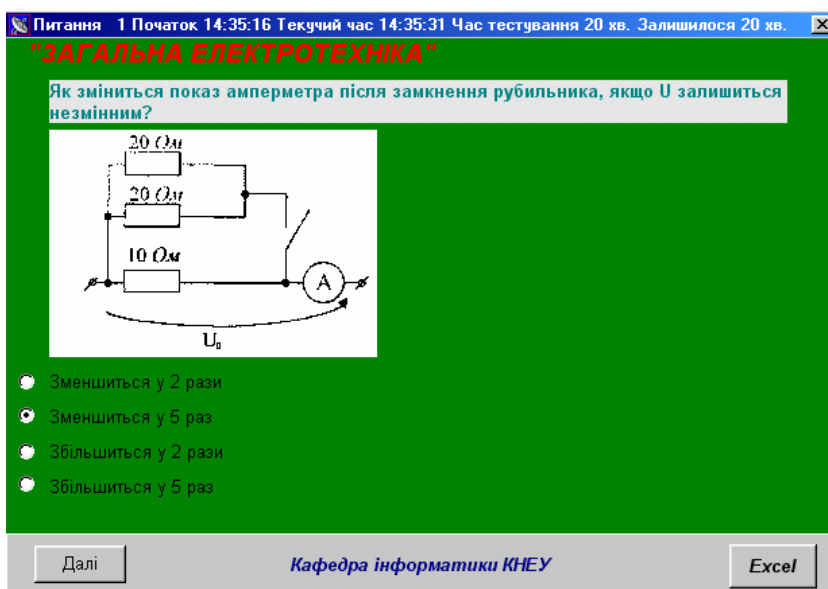

Fig. 5. A general view of the test on the course «Bases of the Electrical Engineers and Electronics».

Technology of educational process

The technology of educational process is shown in Fig. 6. We will present the use of the satellite and mobile communication technology in educational process using the considered above opportunities.

The teacher prepares and places an educational material, necessary for study (task, abstracts of lectures, multimedia courses, simulators, tests) on Web-portals *educator.narod.ru* and *victorbondarenko.euro.ru* for the using in the Internet. Simultaneously same information with changes focused on the mobile telephone using is brought on Wap-portal (*www.tagtag.com/educator*).

The preparation of an educational material is carried out with the help of the various specialized editors (Fig. 6).

The student reads out the necessary information from Wap-portal on the mobile telephone or from Web-portal through satellite communication on the computer, carries out the task and results are sent with the help of e-mail to the teacher, using for sending the mobile telephone or the Internet from the stationary computer.

If communication of the student with the teacher is direct, the teacher has an opportunity to write in the student mobile telephone the abstracts of lectures, tests, tasks and other information from the computer connected to the mobile telephone with the help of the cable. In such form the educational material is very convenient for daily work and it can be used as useful intellectual amusement if this material would be realized as the game project, which is interesting to the student.
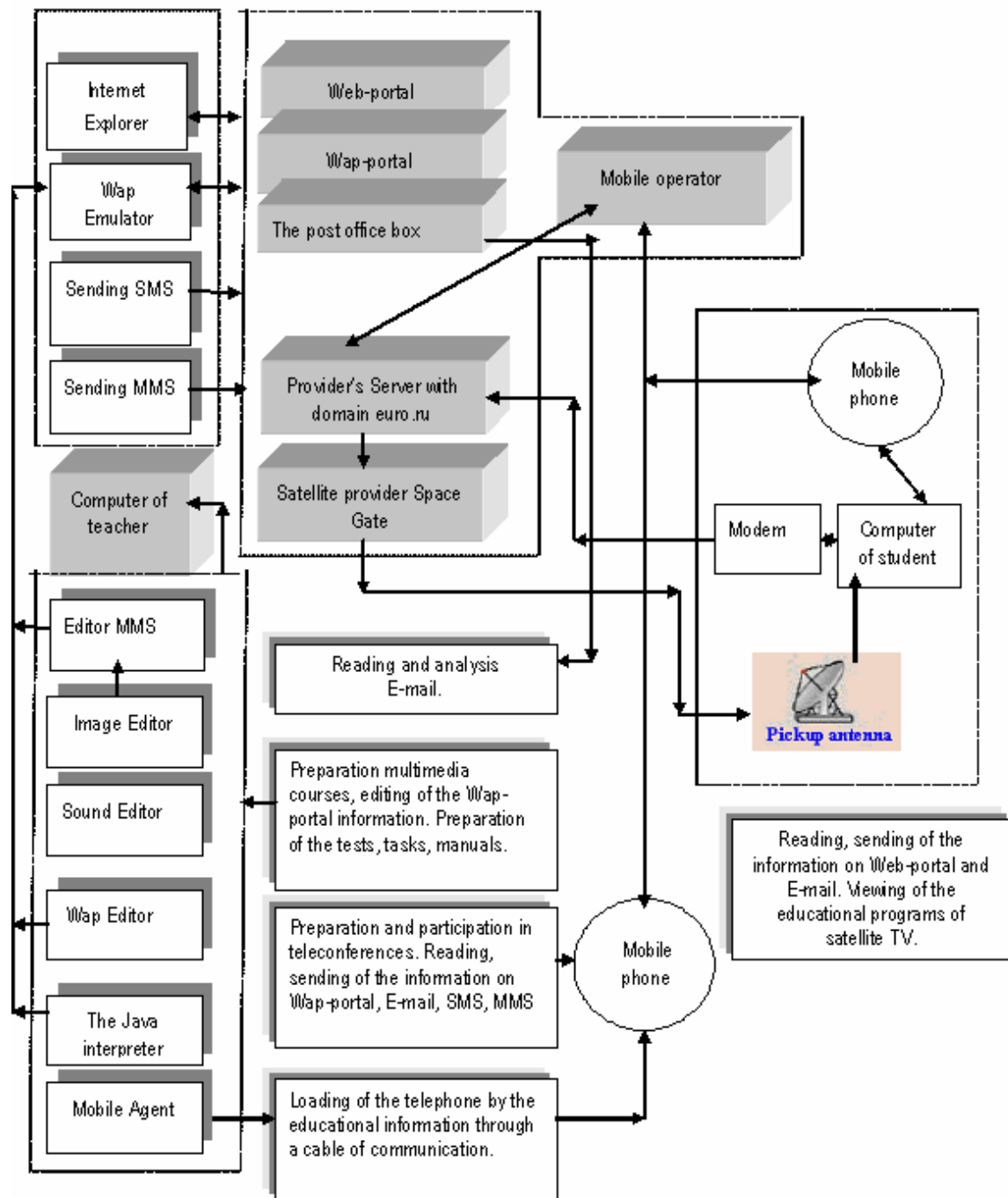
Fig. 6. The technology of the satellite and mobile communication in educational process.

Sound files with an explanation of a difficult educational material by the teacher can be loaded on the mobile telephone of the student from Wap-portal or from the computer connected to the mobile telephone with the help of the cable.

In case of a necessary consultation, the student can use such opportunities of the mobile telephone: voice communication, E-mail, and short messages SMS. The teacher frequently uses the SMS-message also for the purpose to make in group the announcements, appointments, and so forth. MMS-message can be used for receiving of fragments of multimedia courses.

The conferencing can be used for a difficult material discussion and «brain attacks» realization.

It is planned in the future the using of the satellite TV for the educational programs and lectures reception.

Conclusion

The described above technology of remote organization of educational process is successfully developed at the Bank Faculty of the Kiev National Economic University. The implementation of this technology is carried out in parts and in the future it is planned inclusion of the educational programs of the satellite TV. This technology is used for preparation of the specialists of the various forms of training. However, it is observed greatest efficiency of the technology in the student's preparation process of the correspondence form of training, because such students have not stable possibilities of direct communication with the teacher and this technology makes such communication more active.

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IMPLEMENTATION OF DISTANT LEARNING PORTALS BASED ON CASE-TECHNOLOGY METAS

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Abstract: The paper describes an approach to the development of software aimed at the creation of distant learning portals integrated with education support and educational institution management systems. The software being developed is based on CASE-technology METAS which is used for the creation of adaptive distributed information systems. This technology allows to dynamically adjust the portal's structure and portal's functionality enhancements.

Keywords: portal, learning portal, distant learning, testing, information system, CASE-technology.

ACM Classification Keywords: D.2 Software Engineering: D.2.2 Design Tools and Techniques – Computer-aided software engineering (CASE); H.3 Information Storage and Retrieval: H.3.5 Online Information Services – Web-based services; K.3 Computers and Education: K.3.1 Computer Uses in Education – Distance learning.

Introduction

Because of a widespread occurrence of the Internet during the late decade its users became able to quickly and easily access the desired information. It is well known that demand determines supply. That's why with the growth of users' needs there appeared many internet resources. It also applies to educational resources. Many educational portals were created lately. They include, for example, the Federal Portal «Russian Education» (www.edu.ru) and the Russian Educational Portal (www.educentral.ru). Besides there are educational institutions' portals which are certainly playing now an important role in the educational system. It means that they provide not only the delivery of important on-line information for students and teachers of these institutions, but also abilities