

Learning High Mathematics on MathCad Base¹

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Nowadays application of modern achievements of information technologies in science, engineering and education is usual phenomenon. Application of these technologies allows easily creating new methods of learning of mathematics. More of new methods of creation of multimedia electronic manuals on high mathematics are founded to application of multimedia and communication opportunities of the computer. But application only multimedia and communication opportunities of the computer at creation of multimedia electronic manuals on high mathematics is insufficient to elimination of "gap" between training and studying high mathematics. So, we offer a new way of the decision of this problem: creation of a multimedia electronic manual on high mathematics with built-in a mathematical environment MathCad in the national language.

Keywords: MathCad, learning, high mathematics, multimedia, electronic manual

ZDM Classification: B40, C70, N80, U70

MSC2000 Classification: 97C70, 97C80, 97B40

1. INTRODUCTION

Nowadays application of modern achievements of information technologies in science, engineering and education is usual phenomenon. For example, there were some large-scale international meetings of a various level consider global problems of education. In these meetings the problems of training to mathematics were devoted a special place.

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Because, the high mathematics differs from other disciplines with its high level of abstraction, complexity of calculations and strict logic therefore for solution modern problems of mathematics, necessary availability highly qualified mathematicians. So preparation of such specialist's demands competence scientific research works in the area of mathematical teaching. At the present more of these researches conduct by means of new computer technologies. Application of these technologies allows easily creating new methods and even standards of teaching of mathematics.

More of new methods of creation of multimedia electronic manuals on high mathematics are founded to application of multimedia and communication opportunities of the computer. But application only multimedia and communication opportunities of the computer at creation of multimedia electronic manuals on high mathematics is insufficient to elimination of "gap" between training and studying high mathematics (Aripov 2004; Ralston 2003; González-Tablas et al. 2003). So, we offer a new way of the decision of this problem: creation of a multimedia electronic manual on high mathematics with built-in a mathematical environment MathCad.

This work is devoted to the discussion of the received results and a perspective of the further research works during development of multimedia electronic manuals on high mathematics in the national language.

2. METHODS

Following to the requirements of nowadays, by Sa'dullaev, Aripov, Varisov, Mansurov, Ganihodzhaev and Tashpulatov were created the multimedia electronic manual "Lectures on high mathematics" in the national language for institutes and universities with a nonmathematical direction. The basic purpose was creation of compact and simple in studying the electronic manual on high mathematics in national language, with the subsequent decision of some problems such as, increase of efficiency of perception of a material, liquidation of deficiency of textbooks in national language on high mathematics and conducting remote training on this discipline. In the future we'll suppose to update and send the given manual to all institutes and universities with a nonmathematical direction. Then users can economize their means and times for reception of the necessary mathematical knowledge's (Aripov 2004).

During work with the electronic manual as the initial data were used hand-written variants of the manual written by authors of the multimedia electronic manual "Lectures on high mathematics" for institutes and universities with a nonmathematical direction in the national language.

For development of electronic variant of the manual were used modern technologies

of creation of applications of databases, the technology of the real world, MDI and Internet technologies of the environment of programming Delphi 7. It is necessary to note, that opportunities of application of components Animate and Media Player at work with videos are very much limited (work with trade marks avi, mp4). The given limitation is caused by protection of copyrights that developers Delphi were based. Nevertheless, we have used Internet technology of Delphi to decide the problem of opening any video-file. Now there is possibility creation of e-learning multimedia manuals with any video-file as for mathematics disciplines as and for other disciplines on its basis (Cantu 2004).

With inclusion of MathCad to the multimedia electronic manual “Lectures on high mathematics” was created an original electronic manual on high mathematics. Efficiency of a choice of the given way follows from following properties MathCad:

- MathCad has the simple interface of dialogue, powerful graphic and computing algorithms. So you can quickly and easily cope with standard tasks of high mathematics;
- MathCad has simple algorithmic language that allows quickly creating programs for the numerical decision of non-standard mathematical problems (tasks);
- MathCad quickly allows raising level theoretical knowledge and practical skills of students at the decision of mathematical problems. Then the students can form their criticism thinking at studying mathematical concepts and to formulate the statements on the basis of own supervisions;
- MathCad effectively allows teachers to construct realization of lectures and practical occupations with using its graphic, animation and computing opportunities;
- Compatibility MathCad with Internet allows conducting remote training.
- MathCad is one of leaders for using in the student’s environment.

For this purpose we advise to apply to famous mathematical sites².

3. RESULTS

At the present the multimedia electronic manual on higher mathematics “Lectures on high mathematics” has the following opportunities:

- Students easily can proceed to necessary lecture using the convenient navigator;

² See also [exponenta.ru](http://www.exponenta.ru) (2005): [http:// www.exponenta.ru](http://www.exponenta.ru)
[mathsoft](http://www.mathsoft.com) (2005): <http:// www.mathsoft.com>

- Students can read the contents of the chosen lecture;
- Students can see a video clip on the chosen lecture. Thus he has an opportunity some times to scroll this video plot read by the lecturer;
- Students can study deeply the chosen lecture, analyze it, to do own conclusions with application of a MathCad document;
- students can rise the level of learning on the chosen lecture with help a method of intellectual testing, with next closing of gaps in studying;
- Lecturers can use graphic, animation, computing opportunities MathCad for preparation of effective and interesting lessons for students;
- Lecturers quickly can prepare a distributing material on the chosen lecture. It is desirable to prepare a distributing material on CD. It is convenient, compact, cheaper solving of the problem of liquidation of deficiency of textbooks on high mathematics.
- There is an opportunity of automatic loading MathCad from inside the multimedia electronic manual to learn deeply the chosen lecture;
- There is an opportunity getting of the help about work of the system and the system MathCad (in Russian);
- There is an opportunity of conducting remote training.
- With the help of the technology of the real world and creation of applications for databases of Delphi environment we have created the application of “intellectual testing of students” (Cantu 2004). There are three levels of tests: “the simple test”, “the difficult test” and “the missed questions.” The first of two variants of the tests correspond to the appropriate level of problems. The third variant of the tests is formed by the missed questions of first two.

4. THE CONCLUSION & FUTURE

Using of communication, computing, graphic and animation achievements of system MathCad in the manual has opened great and new opportunities before teachers at training and before students at mastering by necessary skills. The progress of students has raised visibly at the work with the multimedia electronic manual “Lectures on high mathematics” in a short time.

At the present we have purposes from the Kazakh National University about joint collaboration for creation of e-learning manuals on high mathematics for mathematicians in Russian. Exactly, we have created a multimedia e-learning manual on mathematical analysis with built-in environment MathCad in Russian based on our manual.

Now we work at the problem of the security of databases “intellectual testing of

students.”

Further we'll duly update the manual by new chapters of high mathematics, and also searching of new ways of easy mastering of mathematical concepts not breaking principles of mathematical severity.

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