MULTIMEDIA TEXTBOOK OF CARTOGRAPHY AND GEOINFORMATICS

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Abstract:

Cartography and Geoinformatics is a basic subject of courses at the Institute of Geography, Masaryk University in Brno and its successful completion is required for passing to following stages of study. Fundamentals of Cartography and/or GIS (geographic information systems) can also be found in many other courses at the Faculty of Science, Faculty of Education, and Faculty of Informatics.

Most existing cartographic textbooks were published in the early 1980´s. These publications are usually unavailable for most students. Except for them, there are several GIS textbooks published at different universities, but they differ in quality and extent. Therefore, the project of multimedia textbook was proposed. It can provide valuable and complex material for study.

The multimedia textbook is created with the use of modern web technologies, such as hypertext, flash animation, JavaScript, XHTML, CSS, SVG, PHP, MySQL, etc. It contains an interactive interface with a possibility of testing basic cartographic knowledge and simple creation a map outputs. Topics are linked with hypertext links to show their interrelations.

Main sources of information include Czech and foreign literature (both printed and electronic). The list of literature is an important part of the textbook. It presents an overview of existing textbooks, web pages, professional magazines, software, map servers, institutions providing map sources, universities, etc. It also enables printing and downloading parts of this textbook to desktop PC.

The textbook will be periodically updated according to latest development in the field of geoinformation technologies.

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INTRODUCTION:

The idea of creating an electronic textbook of Cartography and Geoinformatics follows the tendency towards utilization of modern multimedia tools in education. This project is funded by the Ministry of Education, Youth and Sports of the Czech Republic, from the Universities Development Fund.

STATE-OF-THE-ART:

Cartography and Geoinformatics is a basic core subject in the first year of all accredited courses at the Institute of Geography and its successful completion is required for passing to following stages of study. At the moment, this subject is frequented in different forms of study by approximately 90 students. In the future, this number is expected to rise to 100 – 120 students. Moreover, basics of cartography and/or GIS (geographic information systems) are present in many other courses at the Science Faculty, and also at the Faculty of Education and Philosophical Faculty.

Study materials include mainly textbooks of cartography published in the 1980s that are nowadays available only in libraries in a small number of copies, and therefore unavailable for most students. There are also several monographic university textbooks focused on geographic information systems published at different universities. Their quality and extent of covered subject is variable. This fragmentation of available sources is the decisive reason for creation of a multimedia education text that will cover the entire subject.

There are already many foreign textbooks (including electronic textbooks) covering this topic, which merge basics of cartographic visualization with the use of GIS (modern electronic systems for storage, maintenance and analysis of geospatial data). However, most of them neglect basic cartographic rules and principles of creation of electronic maps. Therefore, it is necessary to cover the topic as a whole with integrated description of mutual relations.

TRENDS OF CURRENT CARTOGRAPHY:

Classical cartography has nowadays reached another milestone in its development – it is perceived as a scientific discipline with its subject located on the boundaries of technical, natural, and social sciences and it makes an effort to utilize its multi-disciplinary character in many areas. Its interconnection with geoinformation technologies provides a powerful tool for support of decision-making in crisis situations, landscape modeling, analyses and forecasting of future development. It can be utilized in every situation where it is necessary to visualize information on spatial distribution (geospatial information). Therefore, it is appropriate to include this variability of the scientific field of cartography (including cognitive approach and individualization) in education from the very beginning. In this way, students will learn to utilize its entire potential (not just classical cartography as we know it).

OBJECTIVES AND METHODS OF SOLUTION:

- to make all study materials accessible for students of the basic course and related courses for detailed individual study in the form of a multimedia study text published at the university network
- to combine topics of cartography and geoinformation (currently separated in several monographic textbooks) into one integrated publication
- to make students work individually, give them a chance to participate in development of the textbook itself, provide free access to study materials
- to enrich teaching of cartography and geoinformatics with the use of multimedia technologies (sound, web technologies, electronic interactive maps, hypertext links, etc.)
- to provide access for students to otherwise unavailable publications by means of purchasing foreign printed sources
- to support university policy of publishing e-learning materials in the university information systems
- to provide access to latest development in cartography to secondary-school teachers.

The multimedia education text is created with the use of latest web technologies. Many available tools for e-publishing (hypertext, JavaScript, XHTML, PHP, MySQL, CSS cascade styles, SVG vector graphics, etc.) were utilized in its creation.

The resulting product contains interactive environment with a possibility of testing knowledge, creating simple map outputs, and practicing basic cartographic and geoinformatic skills. Chapters are interconnected with hypertext links, which show mutual relations and connections of described topics.

Both Czech and foreign publications (printed and electronic) were used in elaboration of the textbook. It will include a detailed overview of available study literature and links to relevant web pages (professional magazines, software, map servers, private and public institutions providing map sources, universities, etc.). Rapid development in the field of geoinformation technologies also brings the necessity of periodical updating of the education textbook.

The multimedia textbook will be located directly in the web pages of the Institute of Geography. This will allow provision of unrestricted access to the publication for all students.

CONTENT AND STRUCTURE OF THE MULTIMEDIA TEXTBOOK:

The content is divided into two main sections – cartography and geoinformatics. In the future, sections on remote sensing and applications will be added (at the moment, content of these two sections is incomplete). Individual chapters are mutually interconnected with hypertext links.

Sections are divided into chapters in the following way:

1. CARTOGRAPHY
   - 1.1 Introduction to cartography
   - 1.2 Development of cartography
   - 1.3 Cartographic works (maps, atlases)
   - 1.4 Mathematical cartography (geometry, projections)
   - 1.5 Expression methods (point, line, polygon, description)
   - 1.6 Generalization
   - 1.7 Cartographic data collecting (photogrammetry, geodesy, etc.)
   - 1.8 Thematic cartography
   - 1.9 National topographic map series
2. GEOINFORMATICS
   - 2.1 Introduction to geoinformatics
   - 2.2 Data collecting for geoinformatics (digitalization, scanning, remote sensing, geodesy, etc.)
   - 2.3 Data storage and editing
   - 2.4 Analyses (classification, modeling, etc.)
   - 2.5 Visualization and creating output
   - 2.6 Electronic national topographic map series (ZABAGED, IZGARD, COSMC Portal, etc.)
   - 2.7 Software and companies in geoinformatics
3. REMOTE SENSING
4. APPLICATIONS

STRUCTURE OF MULTIMEDIA TEXTBOOK:

The textbook Cartography and Geoinformatics is created in accordance with standards of XHTML in specification 1.1 Strict. Textbook graphics is defined in cascade styles (CSS). Also used are PHP scripting language and MySQL database server. The textbook can be fully edited on-line, i.e. chapters can be added easily, without the necessity of physical updating of files via FTP protocol. This helps to keep updating easy and simplifies general maintenance.

Fig.1: Title page of textbook

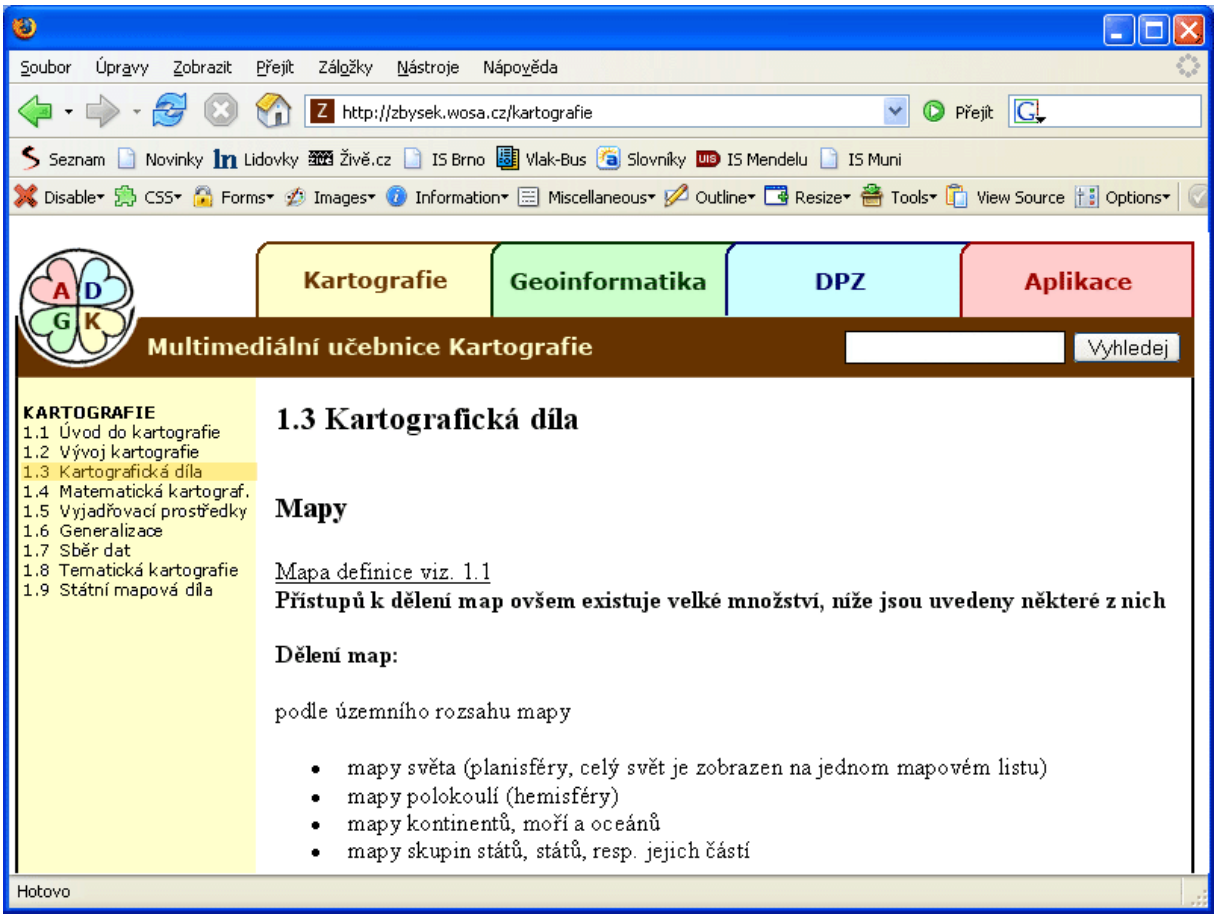

Fig.2: Selection of a chapter

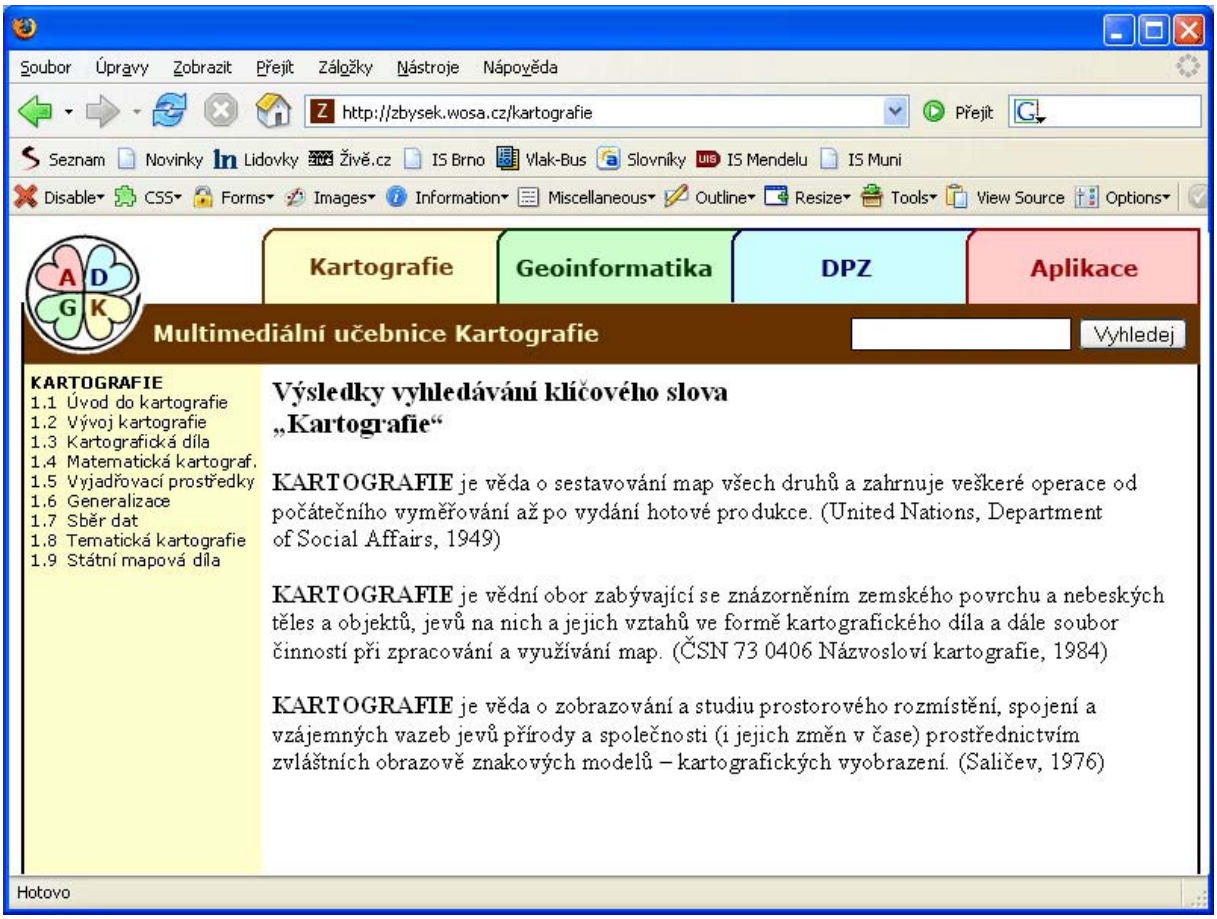

Fig.3: Demonstration of search results of keyword "cartography"

Individual chapters are supplemented with testing questions, which enable verification of acquired knowledge. Tests include factual questions ("who?", "when?", "where?"), motivational questions (requiring active thinking – "why?") and also questions aimed at utilization of gained knowledge and skills in specific areas of practice.

Use of hypertext links enables tracking of up-to-date development both in the Czech Republic and abroad, searching for individual authors and publications in an index, or to returning to terms defined and explained in the first part.

The textbook has been partly translated into English.

CONCLUSION:

The presented multimedia textbook Cartography and Geoinformatics is an answer to difficulties with accessing existing textbooks for these topics and varying quality of existing publications. It has been created with the use of latest web technologies and follows the trend towards extended utilization of e-learning.

The most important task for the future is to guarantee periodical updating of the textbook with information on latest technological development in geoinformatics.

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