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DEVELOPMENT OF INTERACTIVE SOFTWARE FOR THE COURSE "MULTIMEDIA TECHNOLOGIES" BASED ON WEB TECHNOLOGIES

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Abstract: This article discusses in detail the issue of developing interactive software based on web technologies for the course "Multimedia Technologies". It analyzes the need for interactivity in the educational process, the capabilities of modern web technologies, and the importance of UX/UI design principles. The article highlights the role of interactive tools in modern education and provides practical recommendations for increasing its effectiveness.

Keywords: Multimedia technologies, interactive software, web technologies, innovations in education, frontend and backend technologies**,** databases, UX/UI design, visualization, simulations, distance learning, learning resources, pedagogical approach.

1. Introduction

The 21st century is the century of information technologies, and the use of modern approaches and tools in the educational process is becoming increasingly important. Traditional teaching methods can often limit the activity of students and dampen their interest in science. Especially in practical and creative courses such as "Multimedia technologies", ensuring interactivity, using visualization and practical exercises significantly increases the level of understanding and mastery of students. In this regard, the development of interactive software based on web technologies is an important step in increasing the effectiveness of this course. This work comprehensively examines the theoretical and practical aspects of creating interactive software using web technologies for the "Multimedia technologies" course, the technologies that can be used, as well as the advantages of such a system and its future development prospects.

2. Main results

1. The need for interactive software in the course "Multimedia Technologies". The course "Multimedia Technologies" teaches methods for combining, processing and presenting various types of information, such as audio, video, text, graphics and animation. This field is constantly developing, new technologies and tools are emerging. Along with mastering the theoretical part of the course, it is important to give students practical skills. When teaching using traditional methods:

Lack of visualization: Multimedia concepts are often complex and difficult to explain verbally or in text form alone. Interactive visualization tools can greatly simplify this process.

Limited hands-on training: Hands-on training with software often requires limited time and resources. Interactive software allows students to practice independently at their own pace.

Lack of feedback: Students need immediate feedback when they are applying their knowledge. An interactive system helps them identify errors and find the right solutions.

Decreased motivation: A monotonous teaching style can lead to boredom and decreased motivation in students. Interactive and game-like elements make the learning process more interesting.

Interactive software built on web technologies can overcome these problems. It is platform-independent, can be constantly updated, and can reach a wide audience.

2. The main stages and technologies of developing interactive software based on web technologies. Interactive software development involves several key steps:

2.1. Define system architecture and requirements: First, the purpose of the software, functional requirements (e.g. interactive modules, tests, simulations, and resource library), user interface requirements, and the overall architecture of the system are determined. The age and level of knowledge of the students, as well as the curriculum of the course, should be the main criteria.

2.2. Technology Selection: There are wide ranges of options within web technologies. Depending on the project requirements, the following technologies can be selected:

- Frontend (user interface) :

o HTML5: The standard markup language for creating the structure and content of web pages. New HTML5 elements (e.g. <video>, <audio>, <canvas>, <svg>) allow multimedia content to be displayed and processed directly in the browser.

o CSS3: Used to define the appearance , style, and layout of web pages . It provides extensive capabilities for animations, transformations, and responsive design.

o JavaScript: The primary language for providing interactivity, creating dynamic content, and managing user interaction. JavaScript libraries and frameworks (e.g., React, Vue.js, and Angular) help create complex interfaces quickly and efficiently.

▪ Libraries for configuration and visualization: D3.js (data visualization), Pixi.js or Three.js (2D/3D graphics and animations) can be very useful in visualizing multimedia concepts.

- Backend (server part):

o Node.js: Allows you to create server-side applications based on JavaScript. Convenient for real-time work (chat via WebSocket, collaborative projects).

o Python (Django/Flask): Widely used and powerful frameworks, suitable for working with databases, authentication and authorization, and creating content management systems.

o PHP (Laravel/Symfony): Traditional and common choice in web development .

o Database:

▪ Relational: MySQL, PostgreSQL (for user data, test results, course materials).

▪ NoSQL: MongoDB (for complex and rapidly changing data).

2.3. Software design and interface creation (UI/UX design): It is important to create a user-friendly and intuitive interface. Following the principles of UX (user experience) and UI (user interface) design ensures that students can use the program effectively. Attention should be paid to the correct placement of multimedia elements, ease of navigation, and visual appeal.

2.4. Module Development: In this phase, interactive modules, simulations, tests, and other functionalities are programmed. For example:

- Interactive animations: Visual demonstration of sound waves, principles of video codecs, and image compression algorithms.

- Simulators: Simple simulators that allow you to practice the basics of voice synthesis, video editing, and graphic design.

- Practical exercises: Interactive tasks on editing images, cutting short videos, and applying sound effects.

- Tests and Quizzes: Interactive tests to reinforce student knowledge after each module.

- Resource Library: Additional course materials, sample projects, and literature.

2.5. Testing and Improvement: The developed software should be thoroughly tested. The ability to work on various devices (computers, tablets, and smartphones) and browsers is checked. Feedback from users (students and teachers) should be collected and the system should be improved.
2.6. Deployment and technical support: The software is deployed on a server and made available to users. Ongoing technical support, bug fixes, and new features are important.
3. Advantages of interactive software in teaching the course "Multimedia Technologies". Interactive software created based on web technologies has many advantages in teaching the "Multimedia Technologies" course:
Active learning and practical skills development: Students actively learn through interactive modules rather than being passive listeners. This helps them develop practical skills faster.

Visualization and increased understanding: Complex multimedia concepts (e.g., codecs, formats, compression algorithms) are more easily explained and mastered through animations, simulations, and interactive graphics.

Flexibility and self-control: Students can study at their own pace, anytime, anywhere. This is especially convenient for distance learning.

Feedback and assessment options: Interactive tests and exercises allow students to assess their own learning, while teachers can monitor student performance and provide immediate feedback.

Motivation and interest: Game elements, achievements, and a visually appealing interface increase students' interest in the learning process.

Efficient resource management: Software created once can be used for many years, saving teacher’s time. Resources are also centrally stored and updated.

Collaborative learning: If collaborative tools are incorporated into a project (e.g., real-time co-creation of projects), students will also develop collaborative skills.

4. Development considerations and problems. There are a number of aspects to consider and potential problems to consider when developing interactive software:
Content quality and relevance: Due to rapid changes in the multimedia field, the materials in the program must be constantly updated.

Technical requirements and adaptability: The application must work with the same quality on different devices and browsers (responsive design).

User Experience (UX): The intuitiveness of the interface, ease of navigation, and visual appeal are important factors that influence the student learning process.

Security: Ensuring the security of user data and the system is important.

Technical Support: After launching the software, technical support and regular updates are

necessary.

Development costs and time: Creating such a complex system requires time and resources. Proper project planning is important.

Pedagogical approach: In addition to using technology, it is important to adhere to pedagogical principles, that is, the appropriateness of the learning process and adherence to didactic rules.

3. Conclusion

The development of interactive software for the course “Multimedia Technologies” based on web technologies is an innovative approach that significantly increases the efficiency of the educational process. This system provides students with the opportunity to deepen their theoretical knowledge, develop practical skills and learn independently through self-management. The use of modern web technologies such as HTML5, CSS3, JavaScript allows you to create a platform-independent, dynamic and visually rich learning environment.

In the future, such software can be further enhanced by introducing artificial intelligence (AI) elements, such as creating adaptive learning paths that analyze students' learning pace and style, providing personalized recommendations, and automatic grading systems. It can also make multimedia processes more immersive and interactive by integrating Virtual Reality (VR) and Augmented Reality (AR) technologies.

In general, interactive software based on web technologies serves as an important tool for improving the quality of education in courses of practical orientation, such as “Multimedia Technologies”, stimulating students' interest in science and effectively preparing them for future professional activities. This approach is becoming an integral part of the modern education system, and its development opens up new opportunities in the field of education.

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