# Virtual Reality Technology for Studying Historical Monuments

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Abstract: In today's educational system, modern technologies are widely used. The use of virtual reality technology in conveying our cultural heritage to the younger generation ensures that students learn information in an interesting and easy way. This article analyzes the potential of exploring historical monuments through virtual reality.

Currently, significant attention is being devoted to the study of our cultural heritage in the field of education, resulting in considerable achievements. The issues of presenting these achievements to the general public and passing them on to future generations are on the agenda. In particular, one of the most important issues is the study of our spiritual heritage and its presentation to the general public using the capabilities of the multimedia system of information technologies.

The use of virtual reality technology in the study of historical monuments in the education system allows the student not only to receive information, but also to form their imagination.
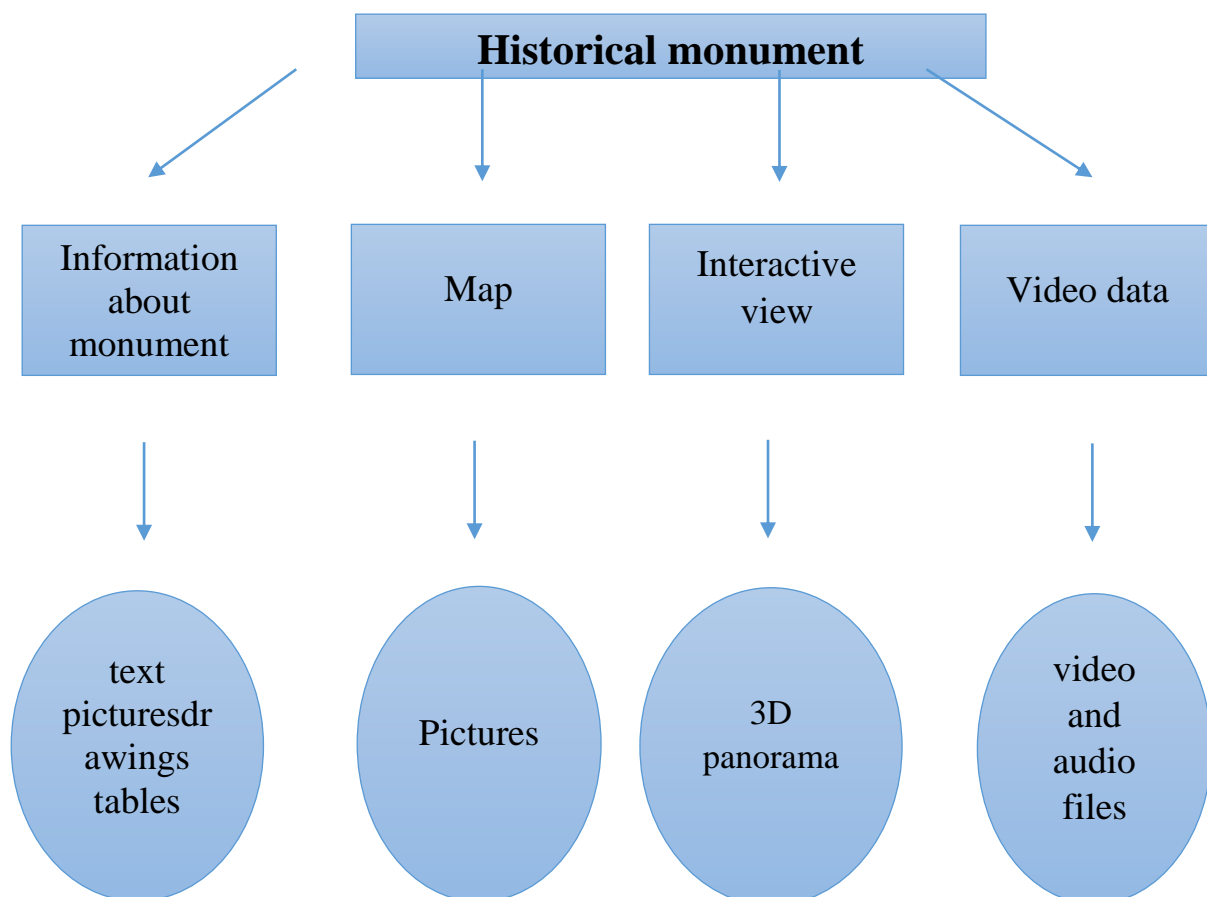
[1,2] Fergana branch of the Tashkent University of Information Technologies named after Muhammad al-Khwarizmi

Figure 1. Data formation

The word "virtual" is derived from the Latin word meaning "reflecting reality." This word was first used in the 14th century, and we can now see that it has its own meaning in various fields.

In the field of computer science and information technology, the concept of "virtual" is used in the following meanings: virtual machine, virtual memory, virtual disk, virtual communication, virtual travel, virtual classroom, etc. In multimedia systems, the concept of "virtual" implies virtual reality.

The concept of "virtual reality" is used in the sense of computer modeling and reflection when creating a model of something. The word "virtual reality" was first used in French theaters in the 1970s. Later, it began to be used in the field of computer science. Virtual reality refers to an environment created through computer simulation of the real world. There is one aspect of virtual reality that determines its future. This is interactivity. There are three main features of virtual reality. These include:

➢ the range of influence;

➢ high visibility;

➢ 3D environment.

The creation of virtual reality is impossible without computer graphics, real-time mode, and programming technologies. Currently, computer graphics APIs such as OpenGL, Direct3D, Java3D, 3DMax, Adobe Photoshop, and VRML are used, while C++, Perl, Java, and Python are used for programming.

In the early stages of the term "virtual reality," the meaning of "panorama" (the word panorama comes from the Greek word for "field of view") was understood. In information technology, a panorama is an image that can be viewed at an angle of 360 degrees. Through the panorama, a person can see the entire universe from one point.

Figure 2. The level of human vision.

There are three different ways to create a panorama:

➢ through a digital panoramic camera;

➢ through panoramic platforms;

➢ Through Adobe Photoshop and other panoramic programs.

To create a panorama, pictures of the desired object are first prepared. In this case, each captured image must contain a 120-degree image from one point. That is, when the pictures are placed in a row, a 360-degree picture is formed. The required images are created in Adobe Photoshop using the File-Automate-Photomerge command and converted into a panorama using the 0-360 Panoramic program. Each created panorama can be displayed on a website with applet, embed, and object elements.

Figure 3. Panorama of Hazrat Imam Complex

VRML - Virtual Reality Modeling Language - is a language that allows you to display and create 3D objects in a World Wide Web. VRML technology was first used in 1994. Later, VRML 97 was developed and formalized by the ISO organization in September of this year. VRML is a plain text language for creating three-dimensional objects and interactive environments. Its file will have a .wrl extension. VRML is seen as the future shaper of web technology.

Through VRML technology:

➢ creating a web database;

➢ visualization;

➢ three-dimensional interface for remote web resources;

➢ interactivity for education;

➢ virtual museums can be created.

To use VRML, we need a VRML browser. It can also be viewed in an HTML browser using the VRML plug-in. Overview via VRML:
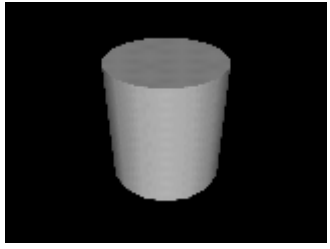
➢ shapes, geometric figures, various views;

➢ animations, geometric dimensions;

➢ textures, lights, environment;

➢ we can create script codes.

The general structure of a VRML file is:

➢ the beginning of the file (header);

➢ comments (comments) – for the user;

➢ declaration of data location (nodes);

➢ field where data attributes are changed (fields ;

➢ attribute value (values)

Example:

Create a cylinder	#VRML V2.0 utf8
	#A Cylinder
	Shape {
	appearance Appearance {
	material Material { }
	}
	geometry Cylinder {
	height 2.0
	radius 1.5 } }	

Here:

➢ #VRML - means that this file consists of VRML text;

➢ V2.0 – this code is written based on V2.0 syntax;

➢ utf8 – text type (international encoding standard);

➢ # A Cylinder – general description of the code;

➢ Cylinder {...} – announce of data location;

➢ Cylinder { height 2.0 radius 1.5} - data attributes change;

➢ height 2.0 - attribute values.

The use of virtual presence technology in the study of historical monuments provides the following opportunities:

➢ creation of a model of formation of historical monuments based on Internet technology;

➢ placement and presentation of information to the public in a panoramic view based on Internet technologies;

➢ virtual modeling;

➢ use of specific methods of creating three-dimensional graphics on the Internet;

➢ advantages of virtual travel;

➢ methods of creating a virtual file database;

➢ reflect the difference between virtual file base and relational base;

➢ wide use of interactive communication;

➢ virtual form of receiving information;

➢ introduction of innovative technologies (for example, VRML technology).

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