

ENGINEERING SCIENCES

CLARIFICATION OF THE ELEMENTS OF THE «BLACK BOX» SYSTEM FOR THE TECHNOLOGICAL PROCESS OF CREATING AR-ELEMENTS

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Today, there are many ways to express the content of manufactured products. One of the new and little-studied technologies is augmented reality. It can be based on special marker pictures, or it can be markerless and based on other sources of information reading. Since the technology is quite new, there are a number of features and limitations that are characteristic of each method of its application. The correctness of the developed markers and the complexity of their structure, the algorithms of markerless technology and their complexity and correctness of compilation, the characteristics of the device for reading information (phone, tablet, etc.) and its software capabilities will determine both the correctness and accuracy of displaying encrypted content, and the perception of the entire product in the whole.

So, in the process of making augmented reality publications, the process of developing elements of augmented reality is important. The technology was chosen, according to which the elements of augmented reality were developed. The choice was made among 3 technologies – marker, markerless and based on new projections. The most appropriate and rational technology was selected using an analytical method of comparing, called «black box», which is made in accordance with [1, pp. 21–22] is shown in Figure 1.

Explanation of Figure 1:

I, I₁ – input and output information by the system; E, E₁ – energy required and expended for the process; T_{1,1}-T_n – variants of technological process; U_{1,1}-U_n – use of equipment; M_{1,1}-M_n – materials; C_{1,1}-C_n – technological modes of the production process.

T_{1,1} – input and processing of video information; T_{1,2} – input and processing of audio information; T_{1,3} – selection and processing of images for; T_{1,4} – creation of augmented reality marker code with download of the

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developed content; T_{1.5} – testing and editing (if necessary) the code; T_{1.6} – download the file to the server; T_{1.7} – introduction of a marker to the layout of the publication, testing;

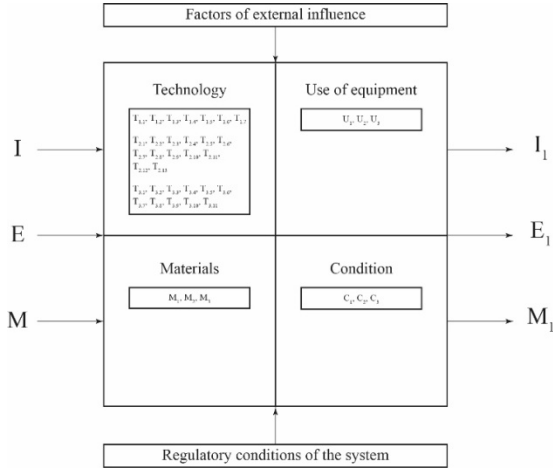


Figure 1. «Black box» system for process selection

T_{2.1} – input and processing of textual information; T_{2.2} – input and processing of illustrative information; T_{2.3} – input and processing of audio information; T_{2.4} – input and processing of video information; T_{2.5} – create animation; T_{2.6} – export of created elements in possible formats; T_{2.7} – creation of AR-marker; T_{2.8} – download the marker to the online service to create augmented reality; T_{2.9} – download the created content; T_{2.10} – creation of AR-element; T_{2.11} – testing of the created AR-element, editing as needed; T_{2.12} – download the file to the server; T_{2.13} – introduction of a marker to the layout of the publication, testing;

T_{3.1} – the choice of objects for the imposition of augmented reality on them; T_{3.2} – input and processing of audio information; T_{3.3} – input and processing of illustrative information, T_{3.4} – creation of animation; T_{3.5} – input and processing of video information; T_{3.6} – create an image of the selected object; T_{3.7} – download created files; T_{3.8} – creation of augmented reality on the basis of projection; T_{3.9} – re-checking the overlay and editing (if necessary) of the code; T_{3.10} – download the file to the server; T_{3.11} – introduction of a marker to the layout of the publication, testing.

U_1 – a workstation for creating a product. Software: Adobe Photoshop CC, Adobe Audition CC 2019, Adobe Premier Pro CC 2019, Adobe After Effects CC 2019, Google Chrome, Processing;

U_2 – a workstation for creating a product. Software: Adobe Photoshop CC, Adobe Audition CC 2019, Adobe Premier Pro CC 2019, Adobe After Effects CC 2019, Adobe Illustrator CC, Microsoft Word, Google Chrome, Adobe Animate CC;

U_3 – a workstation for creating a product. Software: Adobe Photoshop CC, Adobe Audition CC 2019, Adobe Premier Pro CC 2019, Adobe After Effects CC 2019, Adobe Illustrator CC, Google Chrome, Adobe Animate CC, Autodesk 3ds MAX, Unity.

M_1 – 2 Gb Internet traffic; M_2 – hard drive (32Gb); M_3 – RAM (8 Gb);

C_1 – Internet speed (up to 1000 Mbps); C_2 – 64-bit bit system Windows 10; C_3 – RGB color model.

Factors of external influence – vibration level (1-80 Hz); relative humidity (60±20%), temperature (22±4 °C), mains voltage (220±22 V).

Regulatory conditions of the system are sanitary rules and regulations relating to work with computers, industrial general and local vibration, industrial noise, ultrasound and infrasound, microclimate of industrial premises, ergonomic requirements for the workplace and its organization.

Input information will include all the information that is not necessary to create content for augmented reality (text, illustration, audio and video information, animation elements), as well as the concept of the finished edition and elements of augmented reality.

The source information is, in this case, ready-made augmented reality elements or a ready-made multimedia object, which will then be used for other purposes.

The input materials can be the minimum amount of memory required: Internet traffic, hard disk, RAM. The source material is the size of the finished file and the required amount of memory for it on the server.

The energy needed to carry out the process is the power of the workstations, as well as the electricity needed to light the room. The consumed electricity can include electricity actually consumed by appliances and lighting, as well as thermal energy released during the operation of appliances.

To compare the technologies presented in Figure 1, the following chains were compiled:

For the first technology T_1 : $T_{1.1} - T_{1.2} - T_{1.3} - T_{1.4} - T_{1.5} - T_{1.6} - T_{1.7}$; U_1 ; M_1, M_2, M_3 ; C_1, C_2, C_3 .

For the second technology T_2 : $T_{2.1} - T_{2.2} - T_{2.3} - T_{2.4} - T_{2.5} - T_{2.6} - T_{2.7} - T_{2.8} - T_{2.9} - T_{2.10} - T_{2.11} - T_{2.12} - T_{2.13}$; U_2 ; M_1, M_2, M_3 ; C_1, C_2, C_3 .

For the third technology T_3 : $T_{3.1} - T_{3.2} - T_{3.3} - T_{3.4} - T_{3.5} - T_{3.6} - T_{3.7} - T_{3.8} - T_{3.9} - T_{3.10} - T_{3.11}$; U_3 ; M_1, M_2, M_3 ; C_1, C_2, C_3 .

The second and third chains are longer than the first, so the first option was chosen. It is the creation of augmented reality on the basis of a marker.

The interaction of information, energy and material flows can be represented as follows in accordance with [2], shown in Figure 2.

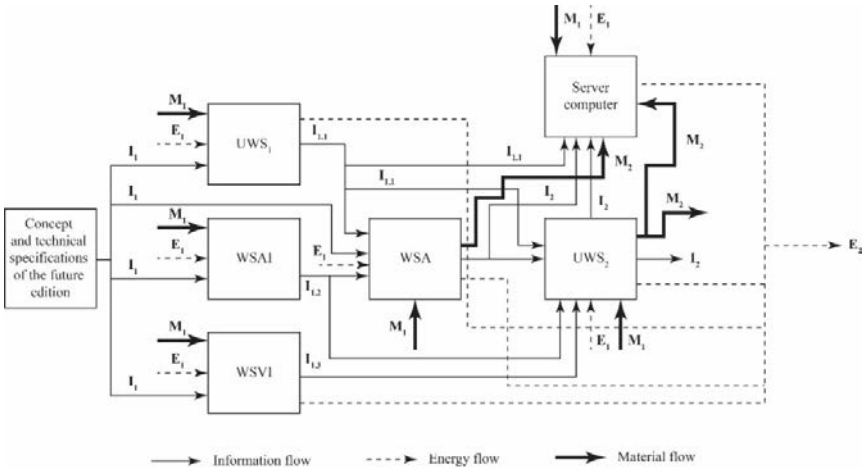


Figure 2. Scheme of interaction of flows at the stage of development of elements of augmented reality

Explanation of Figure 2:

I_1 – input information; $I_{1.1}$ – textual and illustrative information; $I_{1.2}$ – video information; $I_{1.3}$ – audio information; $I_{1.4}$ – animation elements;

I_2 – ready-made elements of augmented reality, ready multimedia object.

M_1 – Internet traffic, hard disk, RAM; M_2 – the size of the finished file and the required amount of memory for it on the server.

E_1 – power of workstations (input energy); E_2 – electricity consumed by appliances and lighting; thermal energy released during the operation of appliances.

UWS_1 – universal workstation for input and processing of text and illustrative information; UWS_2 – universal workstation for creating and testing AR-elements, WSVI – workstation for input and processing of video information; WSAI – workstation for input and processing of audio information; WSA – workstation for creating animation.

Thus, this article considers various technologies for creating elements of augmented reality as one of the most important operations of the technological process of creating augmented reality publications, the choice of the most rational – creation with special markers, because it was the least time consuming and fastest among those presented, and also developed a scheme of relationships between flows in this process. As well as due to the fact that the process is entirely in electronic form, at each stage there is a constant interaction of information, energy and material flows.

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MODELING OF A HIERARCHICAL ORDERED MODEL OF PARAMETERS OF INFLUENCE ON THE PROCESS OF PROCESSING AND INPUT OF AUDIO INFORMATION

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Modern digital technologies are rapidly becoming used by modern people [1]. This year, the global virus-caused pandemic has given a big impetus to the further development of such technologies. The public felt the need to use digital technologies not only to find out the news through the online media or to spend their leisure time watching Youtube-channels, blogs, actively maintaining social networks. The use of digital technologies for work, business meetings or meetings with friends, as well as training has become

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