

SCTMG 2023**International Scientific Conference «Social and Cultural Transformations in the Context of
Modern Globalism»****POSSIBILITIES OF USING VISUAL LEVEL EDITORS TO
DEVELOP MULTIMEDIA EDUCATIONAL RESOURCES**

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Abstract

At the present stage of development of society, information technologies (IT) are an important component of any sphere of human life and activity. Every day significant changes occur in this area: new high-tech devices, new software are created, conferences and exhibitions are held demonstrating new developments in science and technology. To manage modern devices and programs, it is necessary to have a highly intellectual personality, the preparation of which is given special attention in the field of education today. The article deals with the possibilities of using visual level editors in the development of multimedia educational resources for their subsequent implementation in the educational activity of a higher education institution. In recent years, information technologies have become an obligatory part of the educational process that are introduced in the implementation of all training programs and improve the effectiveness of the educational process. The authors believe that the above example shows the working capabilities and efficiency of using the Unreal Engine editor in the preparation of multimedia educational resources.

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1. Introduction

New software products can be implemented using tool software, which include integrated development tools, SDK tools, CASE program development automation tools, integrated development environment IDE, a wxWidgets tool, and several others.

Educational resources are a capacious and multifaceted concept, including human (teachers and students), material (premises, equipment, means of communication) and information resources. Teaching aids are any objects of nature and technology, specially introduced into the educational process in order to study the properties of ideal objects. They in turn can have different execution and material carriers. Teaching aids with encoded information require the use of technical devices for their presentation. Multimedia educational resources are understood as a set of all electronic and computer multimedia tools designed to teach or support learning. Information learning resources can be divided into two groups: those located directly at the learner (local components) and those placed on the computers of the training center (network components). The method of information placement imposes certain requirements on the technologies of resource creation and access to them. Local e-learning resource is an electronic publication intended for local use and produced in a certain number of identical copies (circulation) on portable machine-readable media. Network electronic publication is an electronic publication available to a potentially unlimited number of users via telecommunication networks. Electronic publication of combined distribution is an electronic publication that can be accessed by an unlimited number of users through a network of telecommunication networks.

Information retrieval and reference multimedia systems are designed for entering, storing, searching and presenting information to teachers, students and parents. Such systems can include various hypermedia programs that provide a hierarchical organization of material and quick search for multimedia information by one or another feature. The concept of the information retrieval system directly deals with the more modern and widespread ones in connection with the expansion of telecommunication systems and portals, the concept of applied multimedia encyclopedia, which is a set of training information modules together with the appropriate management system. Applied multimedia encyclopedias give rise to one of the most common forms for the development of educational multimedia resources. An applied multimedia encyclopedia can correspond either to a single discipline or to a group of disciplines. In this case, an educational module can be devoted to a particular topic or concept addressed in the academic disciplines.

2. Problem Statement

A great popularity among 3D application developers today belongs to the Unreal Editor, a resource editor for creating games on the Unreal Engine game engine, which is a development environment for creating and editing programs using scripting constructs (Epikhin, 2021; Tenischeva et al., 2020).

The program interface is written on the cross-platform open source tool library wx Widgets (based on the LGPL free software license), which allows importing the finished product under the Linux family of operating systems. The wxWidgets library is used to create a large amount of software, including the

Audacity sound editor, the CodeLite editor for programmers, the FileZilla ftp client, the TrueCrypt encryption program, the BitTorrent file sharing client, and many others.

Despite the original purpose of the editor to create games, this editor can be used with great efficiency to create various training and demonstration programs to use them in the educational activities of universities. We consider it possible, for example, to use Unreal Editor to create visual models for such disciplines as "Informatics", "Mechanics", "Mathematical modeling", "Aeronavigation", "Aviation radio-electronic equipment", "Electrical equipment of aircrafts", etc. We can use Unreal Editor to create visual models for such disciplines as "Computer science", "Mechanics", "Mathematical modeling", "Aeronautical navigation", "Aircraft electrical equipment", etc.

One of the main advantages of the editor is the availability of many tools and features of the editor itself. A big plus of this editor is that the developers do not need to install additional utilities for quality work.

To develop programs, you can use one of the proposed ready-made templates or create a program product from scratch yourself.

When using templates, the developer is offered to choose a project (a prototype of some action with already written logic and graphics worked out by other developers) that is the most suitable for solving the task at hand and to develop his program product on the basis of the selected project.

During the development of the software product, the WYSIWYG (What You See Is What You Get) technology is used, which is based on displaying the created objects in the process of editing as similar as possible to the object in real life.

In the editor itself, the developers provide a large enough functionality to work and there are all the necessary settings. But to create professional content, after creating prototypes template means of the editor, it is worth using separate programs (for example, for a full-fledged drawing of 3-d objects, textures, creating high-quality sound, etc.).

Unlike other development tools, in the Unreal Editor, it is possible to view the performance of fragments of the created program directly in the editor, avoiding compilation of the program and time to run it. We can use a separate editor of static objects, and use the animation editor to edit the animation or change the location of the object we created (a person, a vehicle, etc.) (Figure 01).

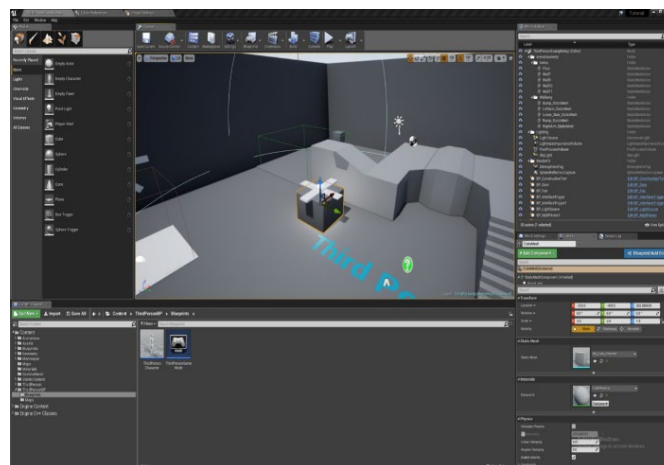


Figure 1. Unreal Editor program interface

All objects used in the developed application are combined in the object browser, which allows us to view the entire contents of our product (e.g. materials, textures and objects together) in one list.

When creating graphical images, the editor can be used as a constructive block geometry (technology used in modeling solids and is a way of modeling in 3D graphics and CAD) and additive geometry, speeding up the assembly of the map and simplifying the creation of the sky: the entire level is covered with a giant dome having a sky texture.

Blueprint, a visual programming-based system with a visual interface, is used to make changes to the created product. Blueprint allows you to develop a software product using block diagrams: small functional blocks connected to each other according to the constructor principle, which trigger the execution of a task when a certain event occurs or in accordance with the prescribed functions (Figure 02).

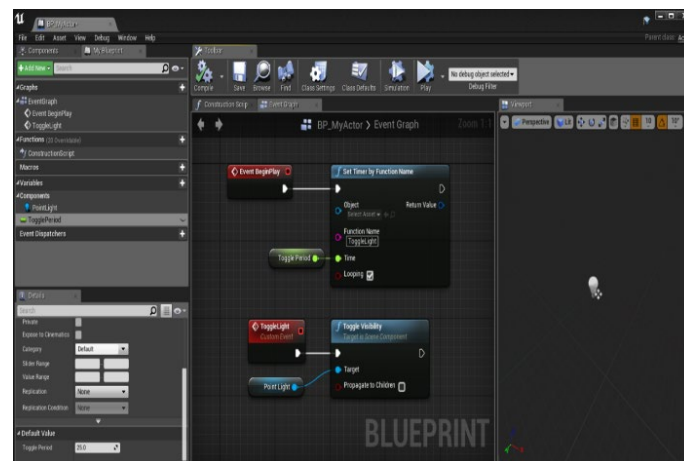


Figure 2. Program fragment created with Blueprint

Blueprint is a strictly object-oriented and typed programming language for developers who want to save development time and use C++ as little as possible. However, when launching a finished program, Blueprint codes are compiled into C++, and the program itself uses already translated code in C++ (Figure 03).

```

1  // pragma once
2
3  #include "CoreMinimal.h"
4  #include "GameFramework/Actor.h"
5  #include "Engine/World.h"
6  #include "TimerManager.h"
7  #include "Components/PointLightComponent.h"
8  #include "MyActor.generated.h"
9
10 UCLASS()
11 class AAI_API AMyActor : public Actor
12 {
13     GENERATED_BODY()
14 public:
15     UPROPERTY(VisibleAnywhere, BlueprintReadOnly)
16     class UPointLightComponent* Light;
17
18     AMyActor(): TogglePeriod(25)
19     { Light = CreateDefaultSubobject(UPointLightComponent)(TEXT("Light")); }
20 protected:
21
22     UPROPERTY(EditDefaultsOnly, BlueprintReadWrite, Category="Variables")
23     float TogglePeriod;
24
25     virtual void BeginPlay() override
26     {
27         FTimerHandle ToggleTimer;
28         GetWorld()->GetTimerManager().SetTimer(ToggleTimer, this, &AMyActor::ToggleLight, TogglePeriod, true);
29     }
30
31     UFUNCTION(BlueprintCallable)
32     void ToggleLight()
33     { Light->ToggleVisibility(); }
34
35 }

```

Figure 3. Program fragment written in the C++ language

It is easier for a developer to work with Blueprints, because it is impossible to make a syntax error, such as submitting the wrong data type or forgetting to put the right sign. Blueprints also protect against program crashes. For example, if you try to access a non-existent object in C++, the program will crash, while in Blueprint you will simply see an error in the log. All this is possible because Blueprint is a full-fledged tool of object-oriented programming (OOP).

Within the framework of the section "Informatics" of the military-scientific society of cadets in the Unreal Editor, we developed a computer program for demonstration of tactical schemes used by pilot-assassin A.I. Pokryshkin. He was thrice Hero of the Soviet Union taking part in air battles during the Great Patriotic War (Epikhin, 2021; Garayeva, 2021; Kondratiev et al., 2019; Tenischeva et al., 2020). When choosing the programming object, we took into account not only the purpose of the program: a visual demonstration of the possibilities of computer graphics and 3D modeling. It was done in the study of the educational topic "Computer graphics" within the discipline "Computer science". There was also the military-professional orientation of students, interdisciplinary links, as well as the importance of military-patriotic education of students.

At the initial stage of development, an extensive list of sources was studied, including scientific works by (Avanesova et al., 2019; Antonov et al., 2021; Botnaryuk & Kalinina, 2021; Pokryshkin, 1999; Stukonog, 2021). Further, the program structure was developed, the algorithm was compiled, and the principles of program development were determined. The program structure consists of the main button form and 5 subordinate forms that open by pressing the appropriate button on the main form.

The program demonstrates such tactical schemes as: barrel roll; attack with an upward spiral; turn on the retreating enemy Immelman; exit from the slide to attack by turning half-turn. These tactical methods and schemes of air combat were used by pilot-assassin A.I. Pokryshkin, his comrades and colleagues participating in air battles with the Luftwaffe aces during the Great Patriotic War.

Most of all, you have to spend most of your time searching for graphic images in good resolution and quality, checking historical facts about the use of certain types of aircraft in various battles.

Since the Unreal Engine has a special widget editor, UMG, that allows you to place elements with anchors, you can create a block layout, embed widgets inside other widgets, and so on. Therefore, animated graphics are inserted into the forms with tactical schemes, demonstrating the desired scheme, for example, an attack from an upward spiral (Figure 04).



Figure 4. Tactical Air Combat Demonstration Form "Attack from the Ascending Spiral"

The program also has a form with reference information about pilot-assassin A.I. Pokryshkin (Figure 05), as well as a form with a list of sources describing in detail the tactical schemes animated by the program. This will undoubtedly allow the students interested in them, using the given sources, to study them independently, as well as to get acquainted with the life and exploits of I.I. Pokryshkin and his comrades-in-arms.



Figure 5. Form with background information about A.I. Pokryshkin

3. Research Questions

The interactivity of multimedia means a wide range of possibilities for influencing the learning process and the content of educational materials on the part of teachers and students, including: manipulation of screen objects; linear navigation scrolling within the screen; hierarchical navigation selection of content subsections using a hierarchically organized menu system; an online help function called up by special buttons on the navigation bar.

4. Purpose of the Study

Context-sensitive help is most effective; user interaction, when the tool has the ability to respond to requests and actions of teachers and students; constructive interaction, when a multimedia resource provides the ability to create or configure screen objects; reflective interaction, when a multimedia resource takes into account the user's actions for subsequent analysis (for example, in order to recommend to the student the optimal sequence of studying the material based on this information).

5. Research Methods

The choice between an “expert” or “introductory” version of the study, as well as simulated interactivity in the case when screen objects are connected to each other and interact in such a way that the settings of these objects determine their “behavior” (simulating the real functioning of technical devices, social processes, and so on.); non-in-depth contextual interactivity, thanks to which the student is involved in various activities that have an implicit didactic meaning. This type of interactivity is used in numerous entertainment-educational multimedia programs and in various multimedia games for students; in-depth contextual interactivity, reduced to the specifics of the functioning of virtual reality systems, in

which the student and teacher are immersed in a simulated three-dimensional world [12, 13, 14]. It is necessary to combine information resources and technologies used in all areas of activity of educational institutions and forming the basis of information educational environments, into one unified complex. Extended to the entire system of general secondary education, such a complex should be supplemented by general, uniform methodological requirements and recommendations. The development of appropriate design, technical, pedagogical and methodological approaches will make it possible to gradually build uniform information educational environments of individual educational institutions and, by combining them, to form a single information educational space..

6. Findings

In recent years, information technologies have become an obligatory part of the educational process that are introduced in the implementation of all training programs and improve the effectiveness of the educational process.

7. Conclusion

We believe that the above example shows the working capabilities and efficiency of using the Unreal Engine editor in the preparation of multimedia educational resources

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