GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 10, Issue 6, June (2022)

DESIGN OF COMPUTER GRAPHICS ON THE BASIS OF FRACTAL INFORMATION MODEL

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ABSTRACT

The article describes the application of the principle of resonant interaction of fractal pedagogy in the design of the subject "Computer Graphics" and the methodological basis for the fractal organization of personal and professional self-development of teachers and students in improving the modern educational process. The development of a classification of fractals is given.

Theoretical and methodological conditions for the formation and development of fractal pedagogy are given. In addition, the scientific basis of the features and principles of fractal pedagogy is considered. The article presents a new resonant approach to the study of personal and professional self-development of participants in the learning process.

The research is considered as an option to understand the problem of personal and professional self-development of participants in the learning process from a new perspective. The fractal methodology applied to the problem of student self-development serves as a basis for conducting various psychological and pedagogical research in their future.

Key words and concepts: educational process, fractal methodology, self-organization; principle of resonant interaction, self-development, thesaurus, Open Graphics Library, collaborative - dialogic productive activity.

INTRODUCTION

The Resolution of the President of the Republic of Uzbekistan dated April 20, 2017 “On measures to further develop the system of higher education” radically improve the system of higher education In order to radically reconsider the content of training, to create the necessary conditions for the training of higher education specialists in accordance with international standards, the most important task for further improvement and comprehensive development of the higher education system The widespread introduction of new pedagogical technologies and teaching methods in education curricula and programs is defined [1].

An important factor is the supply of intellectually gifted personnel (specialists) based on the goals and objectives set out in this resolution. If every teacher works on himself, teaches on his own when he enters the classroom, using modern pedagogical technologies to make the teaching process interesting and engaging students, the expected results will be achieved. [1]

In today's fast-paced society of information technology, the use of advanced pedagogical technologies in the education system is an important factor. Therefore, one of the most pressing issues that needs to be addressed is the professional and personal self-development of the educator, the organization of the learning process based on creative approaches to student self-formation.

Effective research is being conducted around the world on the widespread application of creative approaches such as fractal pedagogy in education. In this regard, the use of the

principles of fractal pedagogy in the training of future professionals based on best international practices is of particular importance.

The concept of "fractal pedagogy" comes from the theory of "fractals", which is widely used in the natural sciences, information technology, architecture, radio engineering, economics and finance. Fractal pedagogy is a mechanism of human inner movement for self-creation.

The modern stage of the development of civilization is characterized by cultural dialogue and interaction. Their content is characterized by such concepts as convergence, creative interaction - the processes that contribute to the formation of a single global socio-cultural space. Clearly, these processes are accompanied by an acceleration of the dynamics of knowledge growth in a new socio-cultural environment defined as a single space for knowledge, science and education. This process leads to the emergence of a new educational paradigm based on the ideas of fractal pedagogy. The fractal approach serves as a theoretical and methodological basis for this area of pedagogy.

PROBLEM STATEMENT

The fractal-resonance approach can be used based on the conceptual position that the fractal is the main stage of the evolving system and the network is considered as a process of fractional, similar transition states.

The fractal resonance approach is based on several principles:

- The principle of dynamic chaos;
- The principle of uncertainty of borders;
- The principle of uniformity of measurement;
- The principle of continuity of formation;
- Hierarchical principle of organization.

The methodological basis of these principles is the theory of self-organization, the theory of temporal processes, the theory of evolving systems, the theory of fractals. These theories serve as a scientific basis for the evolution of society in the context of high uncertainty and inconsistency of information, the development of human-scale strategies of social development.

The advantage of fractal pedagogy is to name a number of important positions, as a result of which it is possible to consider in a new way the process of transmitting socio-cultural experience from teacher to student in the educational process. First, fractal pedagogy deals with the main categories of modern pedagogy: teaching, learning, self-education, upbringing, self-education, development and self-development, including "creative activity" and "behavior and self-organization of activity". Second, the implementation of a model of education facilitation, taking into account the needs and personal potential of education, is effective in a joint dialogue in which participants in the learning process can feel in harmony with themselves and the world, express their personalities. allows you to design activities.

In the context of fractal pedagogy, it is possible to explain the mechanisms of integration and development of individual health (SS) and intellectual-creative (II) potentials at different stages of ontogeny. Ontogeny is the process of development of an individual organism as a process of forming a systematic group, in contrast to phylogeny.

Based on the established theoretical rules, we define fractal pedagogy as a field of modern pedagogy, the subject of which is its main categories - teaching, education, self-education,

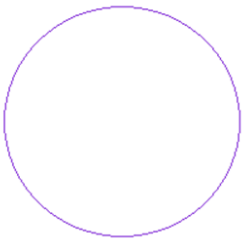
upbringing, self-education, development and education. z is self-improvement. Development - as self-similar structures with a nonlinear character and function in accordance with the principle of resonance, as a result of which the world emerges in communication with "others" in an environment of coexistence and creative activity of a constructive and creative dominant person in terms of changing its resource potential.

Indeed, in the context of the conceptual ideas of fractal pedagogy, attempts have been made to apply its laws to guide the development of education (V.G.Rindak) - Recognition of the equivalence of direct and inverse relations, the combination of methods of checking the quality of education, the spontaneous increase in the complexity of the nature of the requirements, the probability, the existence of statistical relationships, linearity between subjects and objects of management is to create open situations that are not. To solve these problems, it is necessary to follow a set of principles that reflect the laws of fractal pedagogy:

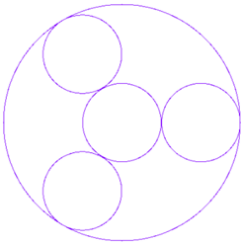
The principle of resonant interaction - the teacher's ability to create a certain inner mood of the student in the transmission of socio-cultural experience to the audience, its integral attributes are cognitive interest, orientation of the person to another, his words that is, the ability to hear the “inner voice”.

Information model using the recursive algorithm of fractal graphics, the principle of resonant interaction of fractal pedagogy

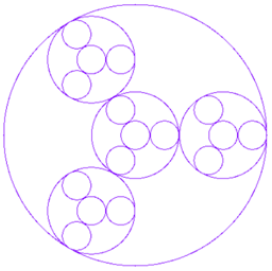
k is the number of students in the group k = 2,3,4, ...
a is the number of thesauruses
n is the number of steps
m is the number of tasks
t is the total time spent completing the tasks
t1, t2… tm is the time allotted for each task



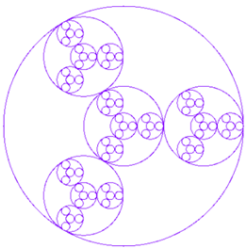
n=0, k=3, t=40%
Step 0. The teacher provides students with theoretical information



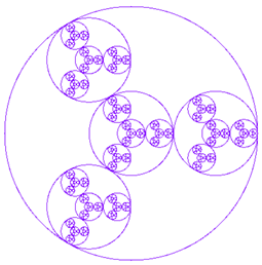
n=1, *k*=3, t=5%
Step 1. Reinforce the theme, identify thesauruses on the topic, identify the software.



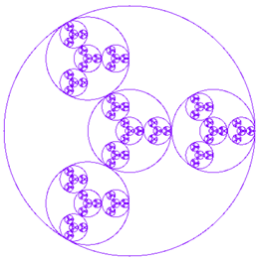
n=2, k=3, t=10%
Step 2. Link lectures to practical and laboratory classes, apply the thesaurus studied, work independently on assignments and specialize.



n=3, k=3, t=10%
Step 3. Collaboration. Group work, summarizing the results of structural tasks in a single task based on individual work.



n=4, k=3, t=10%
Step 4. Testing of completed tasks, work on presentation errors, resonance with the teacher..



n=m, k=3, t=5%
n-step. Complete mastery of the thesaurus within the topic, obtaining accurate results for the given tasks, formation of professional knowledge, assessment of the knowledge acquired by the teacher.

Note: You must complete the previous step to proceed to the next step.

SOLVE THE PROBLEM

We will develop a technology for teaching the principle of resonance interaction in the field of "Computer Graphics" in the OpenGL graphics library.
Applying this principle, we use a recursive algorithm of fractal graphics.0-qadam.
First of all, in step 0, students are given theoretical information on the topic.
Background: OpenGL is one of the most widely used application programming interfaces (APIs) for creating applications in the field of two- and three-dimensional graphics. The OpenGL (Open Graphics Library) standard was developed and approved in 1992 by a leading firm in the software industry as a hardware-independent interface that can be implemented across a variety of platforms. The basis of the standard is the IRIS GL library, developed by Silicon Graphics Inc.
The library contains about 120 different commands, which the programmer uses to assign operations and objects, as well as to write interactive graphics applications. Today, OpenGL graphics systems support many hardware and software platforms. This system is open to users of Windows and Linux operating systems.
The specific features of the OpenGL library, that is, the aspects that ensure the development and dissemination of this graphics standard, are:
Sustainability. Modifications and additions to the standard are made in the form of maintaining the compatibility of those developed in previous software.
Reliability and transmission. An application that uses OpenGL guarantees the same visual result, regardless of the organization of the information display and the type of operating system used. In addition, these applications run on workstations and supercomputers just as they do on PCs.

Ease of use. The OpenGL standard has a well-thought-out structure and a clear interface that allows you to create efficient applications with less program code than using other graphics libraries. The functions required to be compatible with a variety of devices are organized at the library level, making applications much easier to develop.

Key Features: We describe OpenGL capabilities through the functions in its library. All functions can be divided into five categories.

The primitive description function identifies objects at the lower level of the hierarchy that are capable of representing a graphical system. Primitives in OpenGL include dots, lines, polygons, and more.

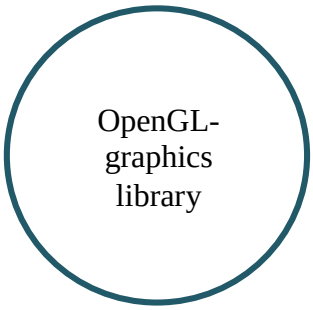
The Color Source Description function is located in a three-dimensional scene and is used to describe the color source parameter and status.

Attribute assignment function. By assigning attributes, the programmer determines how the displayed object will look on the screen. In other words, if what is created on the screen is determined by primitives, then the attributes determine how it is displayed. As attributes, OpenGL allows you to specify color, material properties, texture, and light settings.

The visualization function allows you to set the position of the observer (camera lens parameter) in virtual space. Knowing these parameters, the system can not only construct the image correctly, but also isolate objects outside the observation area.

A set of geometric resizing functions allows the programmer to perform various transformations of objects - rotate, move, zoom.

So OpenGL can also perform additional operations, such as using splines to build lines and surfaces, removing invisible parts of an image, working with pixel-level images, and more.



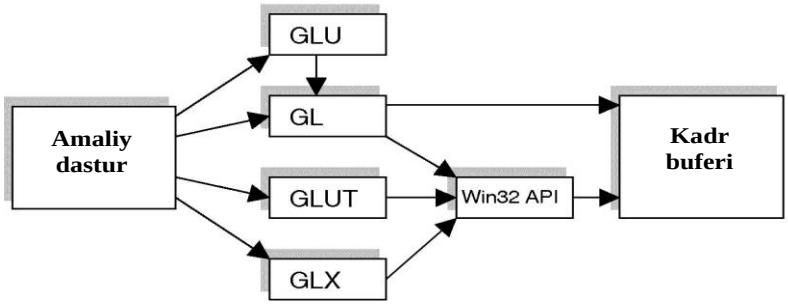
In step 0, the teacher explains the lecture in detail. Once students have a thorough knowledge of the topic, they move on to Step 1 when they are not fully informed about the thesauruses on the topic.

Step 1. In the first step, students first set up a graphics library to reinforce the theme and develop skills in working with the OpenGL graphics library. Each student understands the procedure for installing a graphic library and is self-improving in overcoming deficiencies and exposure to the external environment. That is, it pays attention to which programming language the library being installed is adapted to.

The program is installed and thesaurus is detected on the subject.

Faster and faster: GL, GLU, GLUT, GLX, GL_POINTS, GL_LINES, GL_LINE_STRIP, GL_LINE_LOOP, GL_TRIANGLES, GL_TRIANGLE_STRIP, GL_TRIANGLE_FAN, GL_QUADSt, GL_QUAD_STRIP, GL_POLYGON

Establishment of OpenGL libraries



In addition, features that typically work with a window system are included in its application interface. This means that the features that make OpenGL work are included in the Win32 API and X Window. The figure above shows a schematic of the organization of library systems running on Windows. Other versions of OpenGL do the same.
The GL command is located in the gl.h file, you need to type it to add it:
#include <gl/gl.h>
To work with the GLU library, you need to add a glu.h file. These library versions are usually installed automatically on programming system distributions, such as Microsoft Visual C ++, DevC ++, or Borland C ++.
Unlike standard libraries, the GLUT package must be installed and added separately. Detailed information on setting up a programming environment to work with OpenGL is provided in Appendix C.
All commands (procedures and functions) in the GL library begin with the prefix gl, and all variables begin with the prefix GL_. The corresponding commands and variables in the GLU and GLUT libraries have the prefixes glu (GLU_) and glut (GLUT_).

Step 2. Once the OpenGL graphics library is installed in the program, students will be given a task to work with simple primitives. Each student begins to create a program from the easiest primitive. The student is given the task of creating one primitive one using geometric primitives.
For example, each group is given the following tasks.
GL_POINTS Each end defines the coordinates of several points.
GL_LINES defines the cross section of each individual pair of ends; if odd-numbered ends are specified, then the last three are ignored.
GL_LINE_STRIP defines the intersection with each of the next three previous ones
GL_LINE_LOOP Unlike the previous primitive, the last intersection defines the last and the first three, represented by a solid straight line.
GL_TRIANGLES defines three triangles for each individual; if the three-pointed number is not given multiple times, then the last three ends are ignored.
GL_TRIANGLE_STRIP defines a triangle along with each of the next three previous two.
GL_TRIANGLE_FAN triangles are given with the first three and with each subsequent pair of ends (pairs do not intersect).

GL_QUADS defines three separate rectangles for each; if the four ends are not given multiple times, the last three ends are ignored.
GL_QUAD_STRIP The rectangle n is denoted by the ends 2n-1, 2n, 2n + 2, 2n + 1.
GL_POLYGON Convey the ends of a convex polygon in sequence.
Each primitive must be combined with the assignments that students have completed and the assignments that other students have completed. Checks each primitive in its program and presents the final result.
The goal is self-improvement, self-education, taking into account external factors, based on the main purpose of the resonance principle. Comparing one's own work with the work of others and self-improvement based on one's achievements and shortcomings.

Step 3. In this step, students present to each other the work they have done. Each student compares his or her generalized program with his or her own. He is convinced that he has mastered the task.
In this way, students work in partnership with one another. This means that the student takes into account the views of others when working on himself.

Step 4. Assignments include testing, presenting, working on errors, and getting feedback from the instructor. Students' assignments will be reviewed by the teacher. Errors and omissions will be corrected and additions will be made so that the teacher's suggestions are reflected in the completed assignment. After the program runs, each student is assessed.

n-step. The thesaurus of the subject is fully mastered, the results of the given tasks are obtained, the formation of professional knowledge is assessed by the teacher, the lesson is completed.

CONCLUSION

In the presented model, effective management of the learning process, understanding of its development trends and external influences are related to the implementation of resonant effects on the system and its components, which correspond to the internal characteristics of the system. In resonance (universal harmony), it is not the strength and intensity that is important, but the correct organization of the effect.
In describing the relationships that exist in the model, we focus on the area of control called educational and pedagogical collaboration, which is based on effective mechanisms of dialogue. Collaborative-dialogic productive activity refers to a special form of learning activity aimed at acquiring new knowledge based on the subject-object-subject interactions of its participants. The effectiveness of this activity is determined by the process of mutual reconstruction of goals by the participants of the learning environment. It serves as a systemic factor in the structure of the learning process. The learning process, based on collaborative productive activities, focuses on shaping the motivational and semantic core of learning activities (the general fund of semantic structures), the overall motivations and goals of teachers and students.
This type of activity solves a major problem of the effectiveness of thinking, such as actualizing the cognitive needs of students and then externally stimulating them. Collaborative-dialogic

production activity goes through a number of stages in its development, from the joint perception of objects of knowledge to the formation of joint mental activity - to the highest level of development of joint cognition. The empirical criterion for the formation of the motivational and semantic core of this type of activity is the constant (independent) manifestation of the research (cognitive search) initiative among students in problem situations.

As part of this activity, the teacher plays a different social role - he or she now acts as a facilitator in the fractal pedagogy paradigm and treats students as open to their thoughts, feelings, and experiences; motivation, confidence as an expression of the teacher's inner personal confidence in the capabilities and abilities of students; "Empathic understanding" - the student's behavior, reactions, actions, abilities (K. Rodgers).

In the presented model, we consider the following concepts as the formation of a system by its nature and function: interdependence, interdependence, interaction, interdependence, differentiation and integration, hierarchy, ta Learning contexts, fractal bases and fractal principles, logic and self-management algorithms, external and internal self-affine reflection.

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