APPLICATION OF THE OPENGL LIBRARY IN THE COURSE OF PROGRAMMING AND COMPUTER SIMULATION

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Annotation. *The author describes the technology of using the OpenGL library in the educational process in high school and in universities that train computer science teachers.*
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The topic "Programming" traditionally refers to one of the most difficult topics to study in the course of computer science and information technology in high school. First of all, the computer science teacher faces the problem of choosing a teaching methodology that will help students master the basic algorithmic structures. This problem is closely related to the choice of programming language and development environment. Here it is necessary to take into account the simplicity of the programming language, the correspondence of the programming language to the modern level of development of information technologies, and the possibility of students using the chosen programming language when passing the State Examination and the Unified State Examination is also important.

Universities that train informatics teachers face the same problems.

When choosing an IDE, it is necessary to take into account that the programming environment must be modern and accessible for work, in this case, IDEs supported by developers are preferable. It is desirable that the environment be free for use by students. So, for example, Delphi 7 IDE, popular in Russia, is not relevant due to the release of newer versions, moreover, the cost of this product is very high for schools. However, there is a free analogue of this environment - IDE Lazarus, which completely replaces this software product.

An important motivational component in teaching programming is the applicability of the acquired knowledge and skills in practice. To captivate students, you can use tasks for building graphic objects in the educational process.

The author's experience shows that if you start learning a language with its simplest graphical capabilities (building simple geometric shapes, managing their color and other parameters), then students' motivation to learn programming increases significantly. Moreover, with this approach, students are much easier to master the methods of solving abstract problems.

For example, when studying cyclic algorithms, one can consider the problem of building several identical objects. Graphical objects are well suited for learning a procedural approach to programming. Of particular interest are the tasks for creating animation.

To make learning programming more interesting, you can use three-dimensional graphics. Unfortunately, the choice of 3D visualization tools available to schools is not so great. The way out can be the use in the educational process and research activities of students and students of the open library OpenGL, which can be associated with the programming languages Pascal, C ++, and many other languages.

This library will also help diversify the study of the course of computer modeling. The principles of constructing two-dimensional and three-dimensional computer models of many processes considered in teaching computer modeling are almost the same in practice, however, 3D models win as a representation of the process.

On fig. 1 shows standard geometric objects built using the GLScene library based on OpenGL and the Lazarus IDE. The construction of these objects is not difficult and will introduce

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students to the basics of 3D graphics. The Lazarus environment has been chosen as an alternative to the traditional Turbo Pascal and Delphi 7 environments.

OpenGL also allows you to model systems consisting of a large number of particles. The user has the ability to create both static and dynamic computer models. This opportunity can be used in the research activities of students. As an example, in fig. 2 shows the window of the program demonstrating the animation of the construction of the dendrite.

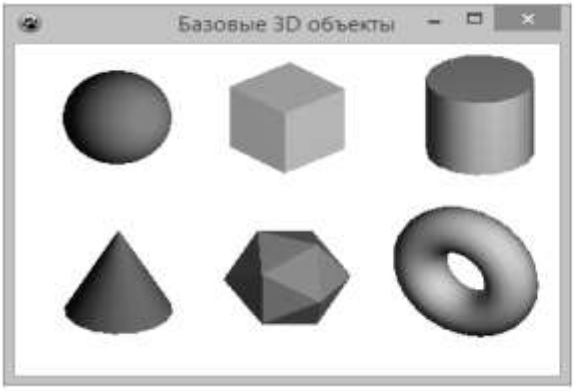

Fig.1. Basic 3D objects

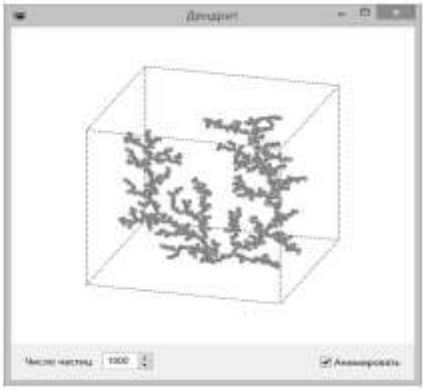

Fig.2. Building a dendrite

References

1. Azamxonov, B.S. & Burxanova, M.M.(2023). Oliy o'quv yurti talabalarining axborot kompetentsiyasini shakllantirish usullari. Talqin va tadqiqotlar ilmiy-uslubiy jurnali, 1 (17), 308-311.
2. Burxonova M.M. CISCO tarmoq texnologiyasi va uni kompyuter tarmoqlarini o'qitishdagi o'rni va samaradorligi. Интернаука. 2020. № 36 (165). С. 75-76.
3. Djalilov, M. L., Abdullaev, S. S., & Pulatov, G. G. (2016). Improve the strength of hmac based one time passwords using sha3 in hmac. In Современные научно-практические решения и подходы (pp. 42-44).
4. Kasimaxunova, A. M., Umarova, G. A., & Zokirov, S. I. O. G. L. The role of broad implementation of modeling on the subject of semiconductor in the higher education institutions.
5. Khoitkulov, A. A., & Pulatov, G. G. (2022). Development of organizational and economic mechanisms to increase the capacity of textile enterprises. Gospodarka i Innowacje., 23, 142-145.
6. Latipdjanovich, D. M., Shavkatjonovich, A. S., & Gofurjonovich, P. G. Improve the strength of hmac based one time passwords using sha3 in hmac. Научно-практические решения и подходы, 2016, 34.
7. Malohat Mamirovna Burxonova, Jahongir Nuriddin Ogli Avazov, & Mirziyod Mo'Sajon O'G'Li Bo'Riboyev (2021). Ma'lumotlar bazasi fanini oliy ta'lim talabalariga o'qitishdagi qo'yilgan asosiy talablar. Scientific progress, 2 (8), 942-946.
8. Otaqulov, O. X., & Pulatova, G. A. Q. (2021). Sun'iy intellekt va uning insoniyat faoliyatida tutgan o'rni. Scientific progress, 2(8), 929-935.
9. Pulatov, G. I. G. (2021). Simsiz tarmoqni uzaytirish muammolari va yechimlari. Central Asian Academic Journal of Scientific Research, 1(1), 120-127.
10. Suyumov, J. (2022). The use of computer simulation models to increase students' knowledge on the subject of biology. O`zbekiston Milliy Universiteti.
11. Suyumov, J.Yu. (2021). Theoretical basis of active teaching technology on the basis of computer imitation models. Academicia aninternational multidisciplinary research journal. (7), 205-210

12. Suyumov, J.Yu. (2022). Zamonaviy ta'limda kompyuter imitatsion modellaridan foydalanish uchun ilg'or texnologiyalar, Yosh Tadqiqotchi Jurnali, 7(1)
13. Бурхонова М.М., Мирзарахимова Д.Ж., Ғиёсова Д.Х. Билим самарадорлигини оширишда жаҳоннинг илғор технологияларидан фойдаланиш. Интернаука. 2020. № 7-2 (136). С. 45-47.
14. Горовик Александр Альфредович, Лазарева Марина Викторовна, Нематова Супарна Анваржоновна, & Хасанова Мохинур Юлдашбаевна (2020). Базовые основы методики преподавания визуального программирования для школьников. Universum: технические науки, (4-1 (73)), 30-33.
15. Джалилов, М. Л., Миркомилов, Д. М., & Полвонов, А. Қ. (2023). Бир ўзгарувчили фунцияни maple математик дастурида тадқиқ қилиш. Journal of innovations in scientific and educational research, 2(14), 246-250.
16. Зокиров, С. & Рахматова, Г. (2023). Использование компьютерных игр в современном образовании: проблемы и решения. Engineering problems and innovations, 1(1), 27-34
17. Касимахунова, А., & Атажонова, С. (2023). Модернизация обучения в технических вузах, перспективы и результаты в цифрах: Модернизация обучения в технических вузах. Engineering problems and innovations, 1(1), 10-19.
18. Лазарева М.В. (2022) Современные информационные технологии и их роль в преподавании дисциплин программирования Educational Research in Universal Sciences, 2022 том 1 № 6, 213-216
19. Лазарева М.В. (2022) Факторы, влияющие на организационно-экономические механизмы управления в химической отрасли Universum: технические науки № 5-2 (98), 36-40
20. Лазарева М.В.(2023) Использование инноваций в нефтегазовой отрасли Universum: технические науки № 1, 30
21. Лазарева, М.В. & Хасанова, М. (2023). Современное управление и цифровизация. Talqin va tadqiqotlar ilmiy-uslubiy jurnali, 1 (17), 301-307
22. Пулатов, Г. Г., & Мадалиева, Г. А. (2018). Исследование свойств каустик при помощи MAPLETS. Инновационное развитие науки и образования: сборник статей II, 30.
23. Расулов, А. Х., & Хасанова, М. (2022). Система защиты в системе волоконной связи с использованием нейронных сетей. Educational Research in Universal Sciences, 1(6), 241–250. Retrieved from http://erus.uz/index.php/er/article/view/521
24. Суюмов, Ж.Ю.; Х., Лутфиллаев М.(2021) Компьютер имитацион моделлар асосида мультимедиали электрон қўлланмалар яратишнинг назарий асослари. Наманган Давлат университети Илмий ахборотномаси