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Features of raster and vector computer graphics application in the process of designing products for traditional art crafts

Abstract. The article examines key aspects of using raster and vector graphics in the design of products from traditional art crafts. A comparative analysis is conducted between these two main formats of computer graphics with regard to their specific applications within this field. The practical significance of the work lies in establishing clear criteria for selecting a graphic format tailored to solving particular tasks in the area of traditional art crafts, which contributes to improving the quality of project documentation and reducing time spent on its preparation.

Keywords: computer graphics, raster computer graphics, vector computer graphics, traditional art crafts, design, digital technologies, ornament, graphic package, modeling.

Raster and vector graphics are distinct methods used for creating images in digital format. The fundamental differences between them manifest themselves in levels of detail, editability, scaling properties, and ultimate use cases.

Raster graphics consists of pixels – tiny color points that collectively make up photo-like and drawing images produced by raster graphic software. The more numerous the pixels, the finer the image's detailing. Resolution determines sharpness and is quantified in pixels per inch. When scaled up, raster images lose definition, becoming visibly pixelated. Despite this limitation, raster format remains optimal for intricate visual elements like smooth transitions, shading effects, gradients, and textured surfaces, making it particularly suitable for photography and fine art reproduction [4, pp. 24-27; 7].

Vector graphics is constructed based on mathematical formulas: anchor points, lines and curves known as vectors. Its primary advantage over raster graphics is scalability without compromising quality, ensuring consistent sharpness regardless of size. Another benefit of vector graphics is ease of editing, allowing simple changes to colors, shapes and sizes of individual components. However, one drawback of vector graphics is its inability to handle highly complex photorealistic images effectively, including textures, shadows, lighting and gradients similar to those achieved through raster graphics [2].

Thus, both raster and vector formats have advantages and disadvantages and their choice depends on the goals and objectives of the design process.

Computer graphics facilitates the creation, processing and visualization of images related to traditional art craft products, thereby expanding and enriching conventional manufacturing techniques while accelerating the implementation of creative ideas.

Composition modeling involves developing several variations based on a single motif, plot, or element, differing in size or color. Graphic packages designed for working with raster graphics are primarily utilized for visualizing finished items. For instance, sketches processed in graphic editors become clearer and more defined, enhancing the overall presentation of future product designs (Figs. 1¹⁰¹, 2¹⁰², 3¹⁰³, 4).

After creating a realistic image and presenting it, a decision is made regarding whether to proceed with production or if further refinement of the design, final shape, structure and other details, including materials used in the item, is necessary.



Figs. 1, 2. Hand-drawn sketches of jewelry pieces



Figs. 3, 4. Design works of jewelry decoration performed by students in a raster editor

¹⁰¹ Fig. 1. Sketch of earrings. Transformer earrings. Design development for jewelry house “Carat”: Pin on board Sketches. – URL: <https://ru.pinterest.com/pin/440367669816636985> (Access date: December 10, 2025).

¹⁰² Fig. 2. Decoration in the form of a drawing // Logoslab.ru. – URL: https://logoslab.ru/full_img/ukrashenie-v-vide-risunka/42 (Access date: December 10, 2025).

³ Figs. 3, 4. Photo by the author of the article.

Using vector graphics allows for the creation of complex and detailed models, which are then converted into formats compatible with 3D printers and subsequently used for printing (Fig. 8¹⁰⁶). Printed 3D models can be applied in mold-making for art casting in jewelry art [5].

Fig. 8. Model of a jewelry item printed on a 3D printer



Fig. 9. Use of vector images (vector layouts) for NCP milling machines

Vector graphics is employed in the creation of layouts and geometric models, based on which control programs for numerically controlled machines are generated (Fig. 9¹⁰⁷), for engraving and cutting using laser engraving machines (Fig. 10¹⁰⁸), as well as for vector images in embroidery machines for creating embroidery designs [3] (Fig. 11¹⁰⁹).

It is important to emphasize that alongside expensive graphic suites, there exist free alternatives for both raster and vector programs. For example, among raster graphics programs are Paint.NET, GIMP, Krita, and for vector graphics – Inkscape. Utilization of accessible software solutions enables students to study programs additionally and perform extracurricular independent work.



Fig. 10. Use of vector images in laser engraving machines

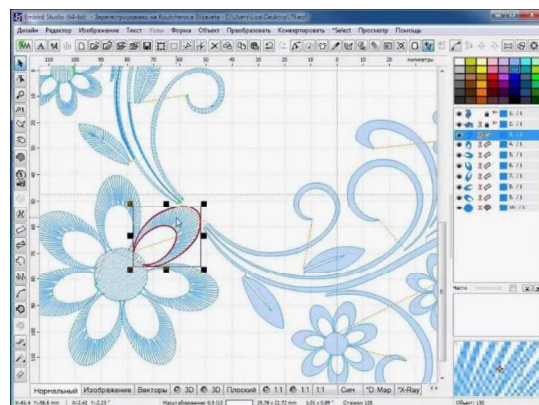


Fig. 11. Use of vector images in embroidery machines

¹⁰⁶ Fig. 8. Printing of jewelry items and decorations on a 3D printer // 3D VINCI : website. – URL: <https://3dvinci.ru/pechat-yuvelirnykh-izdeliy-i-ukrasheniy-na-3d-printere> (Access date: December 10, 2025).

¹⁰⁷ Fig. 9. Fresher cutting // proreklama.kz [website]. – URL: <https://proreklama.kz/frezernaya-rezka> (Access date: December 10, 2025).

¹⁰⁸ Fig. 10. Laser marking of titanium // all-ready.ru : website. – URL: <https://all-ready.ru/glossariy/lazernaya-markirovka-titana> (Access date: December 10, 2025).

¹⁰⁹ Fig. 11 Embird lessons: Working with objects Columns. Lesson 3. – URL: <https://pt.pinterest.com/pin/700943129542659537> (Access date: December 10, 2025).

Students' proficiency in operating diverse graphic editors significantly simplifies the path from idea to creation of traditional art craft products since these programs include toolsets divided into the following categories:

- image creation;
- image editing;
- work with outlines and fills;
- text manipulation;
- application of effects, etc.

Thanks to computer graphic editors, the journey from an idea to a finished product is simplified and optimized: it becomes possible to create and edit design options, visualize sketches, preview results and prepare files for modern technologies such as 3D printing, numerically controlled machines, laser engravers and embroidery machines [1, p. 126-127].

Thus, mastery of computer graphic tools, specifically raster and vector graphic editors, becomes an essential professional skill for aspiring artists who create works of various kinds of traditional art crafts. It enhances effective realization of creative concepts and improves the quality of design activities.

References

1. Belaya T. V. Ispol'zovanie komp'yuterny'x tekhnologij v dekorativno-prikladnom iskusstve / T. V. Belaya, O. I. Mal'ceva. – Tekst : e'lektronny'j // Xudozhestvennoe obrazovanie i nauka. – Moskva, 2022. – № 4 (33). – S. 122-130. – DOI: 10.36871/hon.202204122. – URL: <https://rgsai.ru/upload/medialibrary/a59/t2pi9piwbf6eve702vneev4zamhe394k.pdf> (data obrashheniya: 30.11.2025).
2. Kasheikova I. E'. Metody' obucheniya cifrovym tekhnologiyam v proektirovanii izdelij tradicionny'x xudozhestvenny'x promy'slov / I. E'. Kasheikova, A. V. Vaneev. – Tekst : e'lektronny'j // Tradicionnoe prikladnoe iskusstvo i obrazovanie : e'lektronny'j zhurnal. – Sankt-Peterburg, 2023. – № 1 (44). – S. 173-182. – DOI: 10.24412/2619-1504-2023-1-173-182. – URL: https://www.dpio.ru/stat/2023_1/2023-01-17.pdf (data obrashheniya: 30.11.2025).
3. Komp'yuternye tekhnologii v dekorativno-prikladnom iskusstve – Tekst : e'lektronny'j // Mul'turok : sayt. – URL: <https://multiurok.ru/files/tema-kompiuternye-tekhnologii-v-dekorativno-prikla.html> (data obrashheniya: 30.11.2025).
4. Nagaeva I. A. Art-informatika : uchebnoe posobie / I. A. Nagaeva. – 3-e izdanie, ispravlennoe i dopolnennoe. – Moskva : Direkt-Media, 2022. – 384 s. – ISBN 978-5-4499-3283-9. – Tekst : neposredstvenny'j.
5. Michael Tantsura. Kak sozdayotsya yuvelirnoe izdelie: ot e'skiza do konechnogo produkta / Michael Tantsura. – Tekst : e'lektronny'j // O Leta : [sayt]. – URL: <https://leta.st/ru/blog/2018/10/designing-a-jewelry-collection> (data obrashheniya: 05.12.2025).
6. Oleg M. Kak narisovat' podnos v vektore / Oleg M. – Tekst : e'lektronny'j // Uroki vektornoj grafiki. Russkie promy'sly', rospis' : [sayt]. – URL: <https://enascor.ru/russkie-promysly-rospis/zhostovskaya-zhivopis-v-vektore-uroki-inksca/#more-2633> (data obrashheniya: 05.12.2025)