Application of Image Processing Technology in Art Design System

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Abstract. The realization purpose of art design is to meet people's aesthetic needs and functional use needs. With the rapid development of computer technology, image processing technology has brought a new development direction for art design. By applying image processing technology in artistic design, the artificial intelligence of artistic design can be enhanced while improving the real-time processing ability of artistic design. The image processing technology in art design is mainly divided into two kinds: one is the image noise reduction technology, which can purify the image and effectively enhance the information expression ability of the image. The second is image fusion filtering technology, image fusion filter technology can be through wavelet noise reduction or median filter noise reduction, to realize the tracking and recognition function of image information, and correct image features, detection and analysis of image features. The final test results also proved that the art design system based on image processing technology has stronger human-computer interaction performance. Therefore, the art design system based on image processing technology itself has a certain artificial intelligence, and compared with the traditional art design system, more targeted.

Keywords: Maplnfo · System Design · Creator · Image Processing · Face Tools

1 Introduction

Through the image processing technology, the color difference compensation method can be used to balance and repair the image brightness, or the pixel quantitative tracking method can be used to fuse the image, or to reduce the noise for the image [1]. These are the operations belonging to the image processing module in the art design system. To design the art design system in the Maplnfo software development platform, you can selectively utilize Creator and Face Tools, and realize the image processing and develop the main interface of the art design system [2]. In addition. Map Texture can also choose the mapping mode and image processing type function, and by loading the image processing algorithm, the art design system system of embedded Linux can be designed [9].

1. Design of the image processing algorithm.

For wavelet noise reduction processing and fusion combined with pixel quantification tracking method, the characteristics of the image in the art design area grid are expressed through the following equations:

$$W^{ij}(x, y) = \frac{G^{ij}(x, y)}{\sum\limits_{i=1}^{nx} \sum\limits_{i=1}^{nx} G^{ij}(x, y) + \varepsilon} \tag{1}$$

where $G^{ij}(x, y)$ is the template distribution center moment of the rectangular block with (x^{ij}, y^{ij}) as the fusion area, using the pixel tag to get the edge contour line:

$$G^{ij}(x, y) = \exp\left(-\frac{(x - x^{ij})^2 + (y - y^{ij})^2}{2\sigma^2}\right) \tag{2}$$

In the process of 3D geometric model art image design, need to convert different angles, rebuild the image adjacent element matrix, and the x axis and y axis parallel to the image plane axis, through the high order features of fusion data D (p), and using wavelet noise reduction technology for image noise reduction processing, the wavelet mother wavelet noise reduction is:

$$Q_w(a, b, f) = \sum_{w \in W} c(w)(\lambda(w)Q_0(a, f|w) + (1 - \lambda)(w)Q_0(a, f|w)) \tag{3}$$

In this:

$$Q_0(x, y) = \frac{\sigma_{xy}}{\sigma_x \sigma_y} \cdot \frac{2\overline{xy}}{\overline{x}^2 + \overline{y}^2} \cdot \frac{2\sigma_x \sigma_y}{a_x^2 + a_x^2} \tag{4}$$

$$\lambda(w) = \frac{H(a|w)}{H(a|w) + H(b|w)} \tag{5}$$

Represents the scale and weighted system of wavelet noise reduction respectively, and then find the gray scale histogram of the image in the wavelet basis vector, where the wavelet scale is σ, and the Hennon matrix H(x, σ) of noise reduction output is:

$$H(x, \sigma) \begin{bmatrix} L_{xx}(x, \sigma)L_{xy}(x, \sigma) \\ L_{yx}(x, \sigma)L_{yy}(x, \sigma) \end{bmatrix} \tag{6}$$

where, $L_{xx}(x, \sigma)$ is the second derivative of $g(x, y, \sigma)$, while $L_{xy}(x, \sigma) = \frac{\partial^2}{\partial x^2} g(\alpha)$, $L_{xy}(x, \sigma)$, and $L_{yy}(x, \sigma)$ represent the image features.

According to the above image processing results, the application of image processing technology in art design system and the design of art design system can be optimized [3, 4].

2 Software Development of Art and Design Systems

2.1 Overall Structure of the Art and Design System

Art design system in Maplnfo software development platform, we first need to determine variables, such as variables of the SOCKADDER-IN type as image processing
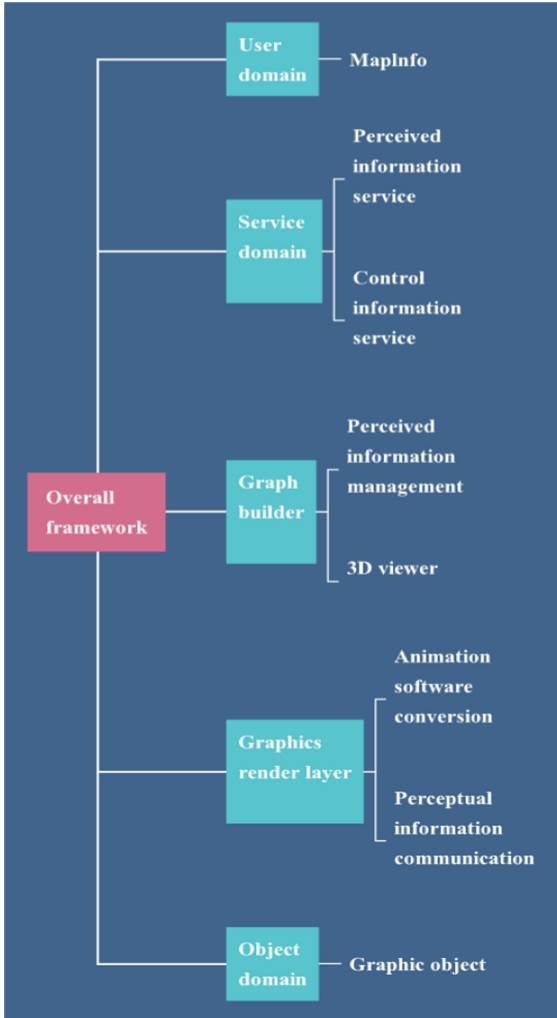
Fig. 1. Overall architecture of the art design system based on MapInfo.

control variables. After the variables are determined, the art design system can implement the software transformation in the 3D observer [8], using the graph generation layer, the object domain and the 3D rendering layer [13]. The art design system framework established from it is shown in Fig. 1.

2.2 Module Design

2.2.1 Data Storage and Read and Write Module

Data storage and reading and writing module can help the users of art design system to realize data storage and reading and writing function, through the server and script configuration, 3D model exists in the art design system database, which not only includes the
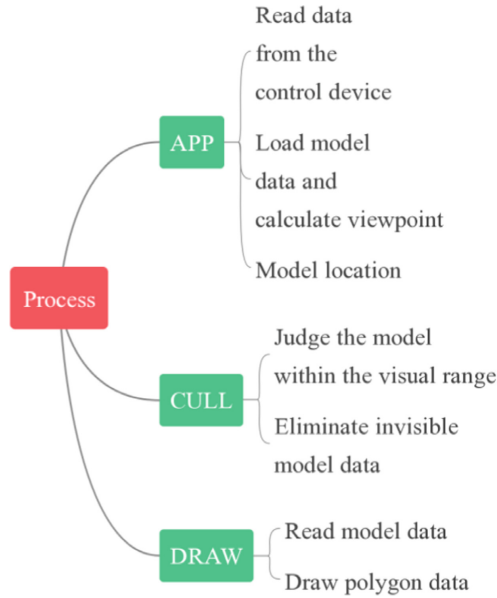
Fig. 2. Data reading and storage procedures of the Art Design system.

color rendering of art design graphics, material attributes, etc.[5, 6]. Including the texture and characteristics of art design graphics. Rendering art and design system graphics goes through three processes: APP, CULL, and DRAW. The relevant graphic data is read in the art design system, and then the data is entered to get the current viewpoint through the algorithm [8]. You can start drawing after the rendering cycle. Specifically, the data read and stored procedures are shown in Fig. 2.

2.2.2 Human-Computer Interaction Module

The core of the art design system is the human-computer interaction module [11]. The embedded Linux architecture can realize the human-computer interaction design of the design of the art design system [10]. First, build a new directory, second, build the device node under the directory, and finally, build the human-computer interaction file [16].

3 System Test and Result Analysis

In order to test the specific application of the image processing technology in the art design system, it is necessary to carry out the simulation experiment, and the experimental environment is mainly built by the Windows 10 operating system, [12] and designs the image processing algorithm by using various image processing tools, such as Multigen Creator, Visual C++ 7.0, etc. The 3D model library of the art and design system includes MFCD42D. DLL and MFC420D. DLL. The selected image parameters are 600400 and 12001200, from which the edge error = 0.12, and the color compensation contrast and structure coefficient are 0.28 and 3.89, respectively. Furthermore, the conduction system

Fig. 3. Original image.

Fig. 4. Image Improvement Processing.

Fig. 5. Art and design rendering diagram output.

= 0.26 and the pixel-level parallax D = 180. According to the above parameters, the image effect after noise reduction processing is shown in Fig. 4 (the original picture is shown in Fig. 3.)

By entering Fig. 4, Fig. 5 can be obtained. Figure 5 also confirms that the application of image processing technology in an art design system can effectively control the quality of image processing [14].

4 Conclusion

The key point of the design of the art design system based on image processing technology lies in the image processing algorithm. First, the appropriate image processing algorithm should be selected to realize the efficient noise reduction and fusion of images [7]. The development and design of art design system focuses on the loading and design of programs and modules. Whether it is human-computer interaction module or data storage module [15]. Only by reasonable design of these modules can the image rendering process of art design system be fully realized and ensure the real-time reading and storage or output of images.

References

1. Chen Lina. Intangible Cultural Heritage into the campus- -Intangible Cultural Heritage into the university art design professional curriculum resource system exploration—evaluation "Wuqiang New Year Pictures Atlas" [J]. Journal of Tropical Crop, 2021, 42 (07): 2119.
2. Dongxue Liu. Study of Traditional Weaving Blanket in Xinjiang in the context of Grid System in Art Design [D]. Xinjiang Normal University, 2021.
3. He Wang. Takes the "Global Frontier of Public Art Design" as an example [J]. Creative design source, 2020 (01): 55–59.
4. Huali Wang. Systematic Innovation Analysis of Art Design Teaching in the Background of the Internet Era [J]. Science and Education Guide (journal), 2020(29):131–132. https://doi.org/10.16400/j.cnki.kjdkz.2020.10.061.
5. Junhui Qin. Research on Environmental Art Design System Based on Virtual Reality Technology [J]. Modern Electronic Technology, 2020, 43(13):92–94+98. https://doi.org/10.16652/j.issn.1004-373x.2020.13.022.
6. Jin Zhang, Wenjun Li. Research on the Construction of Practical Training and Teaching Management Platform of Higher Vocational Art Design Major in the Era of "virtualization" [J]. Transmission Power Research, 2019, 3 (33): 207–208.
7. Liangyu Chen, Hong Zhang, Xiaofeng Li. —— takes the clothing design major as an example [J]. Digital World, 2019 (02): 105.
8. Nan Qi, Jiazheng Guan. Analysis on the Relations between Art Design and Communication and Information System [J]. Industrial Design, 2021 (05): 28–29.
9. Qin Wang. Takes the guide system design as an example [J]. Art Mirror, 2021 (21): 75–76.
10. Qianlin Xue. Takes the field of art and design as an example [J]. East, West, North, South, 2020 (06): 244–245+247.
11. Shaohan Yang, Xingchen Pan. Research on the Theory and Methods of Art Design Creative Thinking System [J]. Daguan, 2020 (02): 11–12.
12. Rui He. Application of green environmental art design concept in sewage treatment System—evaluation "Typical Application legend of Mechanical Design" [J]. Mechanical Design, 2019, 36(12):154. https://doi.org/10.13841/j.cnki.jxsj.2019.12.027.
13. Sudan Zhan. Teaching and Application Research of "we Media" in Art Design and Landscape Sketching Course in Universities [J]. Art Mirror, 2019 (17): 329–330.

14. Shaohua Zhang, Lu Zhang. Takes the Teachers' Garden College of Nanning Normal University as an example [J]. Art Education, 2019 (05): 166–167.
15. Xing Yuan. Analysis of innovation and Entrepreneurship Education for "Four Spirals" Art and design Students [J]. Northwest Fine Arts, 2021(03):101–104. https://doi.org/10.13772/j.cnki.61-1042/j.2021.03.020.
16. Zhirong Fu. Research on Computer-aided Art Design System Based on B/S Structural Framework [J]. Journal of Changchun Normal University, 2021, 40 (02): 70–76.