

A Computer Graphic Image Technology with Visual Communication Based on Data Mining

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Abstract—With the continuous development of network computer technology, people's visual perception ability is enhanced, and the requirements for computer design are gradually increasing. Figure and picture design of computer is no longer limited to the simple design of graphics or images, but is more inclined to visually convey the effect and enhance the expressiveness and beauty of graphics and images. Based on this situation, based on data mining algorithm, this paper puts forward the optimization strategy of figure and picture design of computer and the design of visual sense transmitting, and discusses the specific application of computer-related design in people's practical life. In the application of figure and picture design of computer and the design of visual sense transmitting, data mining algorithm can not only efficiently and accurately mine the final frequent set association rules, but also meet the requirements of efficient data mining in multi-core and heterogeneous platforms, which verifies the effectiveness and feasibility of data mining algorithm in computer graphic images.

Keywords— Data mining; computer; graphic image design; visual communication design

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1. Introduction

In the digital age, with the rapid development of network and IT, all walks of life have accumulated a large amount of data. Using these data to dig out potential rules to better serve life and work has become a new trend [1]. Therefore, data mining technology plays an important role today. Nowadays, the general public's application requirements and demands for computer sci & tech are increasing, and people's life and work cannot leave the figure and picture design of computer [2]. Visual taste and visual comprehension have also been improved with the development of computer Internet technology. More and more products need to use figure and picture design of computer to express the connotation and function of the product [3]. Consumers' visual needs are also gradually increasing, and the visual experience that the product image depicted by the computer brings to people and the visual effect that they want to convey to people are gradually being valued by people [4]. High-level and high-quality figure and picture design of computer and the design of visual sense transmitting can not only convey a more real and beautiful visual experience to people, but also promote the progress and improvement of people's active consumer psychology [5]. Therefore, the analysis of figure and picture design of computer and the design of visual sense transmitting has extremely important practical significance for promoting the development of contemporary computer sci & tech in my country [6].

Figure and picture design of computer is a modern professional technology integrating imagination, creativity,

artistic sense and media [7]. Moreover, figure and picture design of computer is a new and high-tech IT, and its rapid development indicates the progress of the times [8]. At present, more and more young people like innovation and have wild ideas. Their demand and requirements for all creative products are gradually increasing [9]. Moreover, the quality of graphics and image design will also affect the initial influence and purchase desire of the public on products to a certain extent. Therefore, it is precisely because figure and picture design of computer is more and more widely used in life that its product level and quality will be improved [10]. Computer graphics and image related technology can present the artistic expression desired by designers through relevant data analysis and information processing means [11]. More importantly, the computer can meet the design needs of designers to a great extent, and quantify a variety of design details to very specific values. And allow them to compare and modify, so the graphics and images drawn based on the computer can better reflect the design intention and design concept that the author hopes to convey [12]. This paper first introduces the requirements of figure and picture design of computer and the design of visual sense transmitting, then puts forward the optimization strategy of figure and picture design of computer and the design of visual sense transmitting based on data mining algorithm, and discusses the specific application of computer related design in people's practical life, in order to provide a reliable theoretical reference for the development of computer sci & tech.

Computer graphic image design mainly aims at processing images and designing pictures, involving TV movies, animation, advertising, graphic design, architectural environment art,

fashion design, mechanical design, packaging and other industries, and has been well applied in the fields of writing, mathematics and medicine [13]. The application of computer technology in the field of multimedia design has greatly changed people's thinking and creative ideas [14]. The application of computer-related technologies and software to build models of graphic images and add and display virtual effects greatly promoted the communication between science and art, and brought new charm and visual effects to traditional graphic image design methods [15]. Compared with the traditional graphic design, the graphic images designed by computer contain more and richer contents and elements, and convey more comprehensive and prominent meanings and concepts [16]. Computer graphic design not only represents the purpose of graphic design, but also contains the future development trend of visual communication [17]. In the application of figure and picture design of computer and the design of visual sense transmitting, the data mining algorithm runs well, mining the final frequent set association rules efficiently and accurately, meeting the requirements of efficient data mining on multi-core and heterogeneous platforms, and verifying the effectiveness and feasibility of the data mining algorithm in computer graphics and images.

2. Computer graphics design and visual communication design

2.1 The similarities and differences between figure and picture design of computer and the design of visual sense transmitting

Figure and picture design of computer and the design of visual sense transmitting have similarities [18]. (1) In the learning process of development status and development history, they all have the basis of design and development history. (2) Part of the knowledge involved in figure and picture design of computer and the design of visual sense transmitting is the same. Designers must have professional knowledge and skills in color, graphic design and painting. (3) The computer software used in figure and picture design of computer and the design of visual sense transmitting is the same, including Auto CAD, 3DStudio MAX, etc. [19].

There are also differences between computer image design and visual communication design. (1) As for the design background, the main reason is that they are produced at different times. Visual communication design appeared after World War II [20]. For figure and picture design of computer, it comes into being after the emergence of computers. (2) Computer graphics image design only focuses on images and graphics processing effects, but pays more attention to the overall effect of the works. The visual communication design must first consider the response of the first vision to the overall effect of the people who contact the works [21]. (3) For visual communication design, its objective task is to increase aesthetic feeling and dynamic, and design images with artistic features and dynamic media images. For computer image design, its goal task is to effectively combine static images with dynamic

images, and to design two-dimensional space and three-dimensional space by computer [22].

2.2 The influence of computer graphics technology on visual communication design

Visual communication design works will show different styles due to the differences in the color, text and other factors contained in it [23]. Visual communication design can only stand the test of the audience if it emphasizes the integration of emotion. Emotion is the quintessence of visual communication design. A software platform based on figure and picture design of computer, focusing on the parameters and rules that affect the design [24]. Use existing technology to establish a multi-mode collaborative working environment. A collaborative work support platform with integrated and integrated multimedia mode. Figure 1 shows the collaborative interaction structure of computer graphics design.

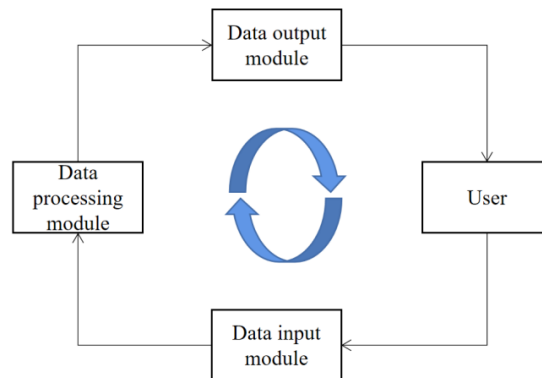


Figure 1 Graphic and image design collaborative interaction structure

Visual communication is mainly to design some information, and designers can use information elements to express their design ideas. Figure and picture design of computer is widely used in visual communication design, which is another way for designers to express their ideas [25]. In visual communication design, the application of computer graphics and images can enhance the artistic features of visual communication, and designers can enhance the artistic effect of visual communication works through related factors such as plane and color. Figure 2 shows the hierarchical structure of the computer graphic image design system for a three-dimensional virtual scene.

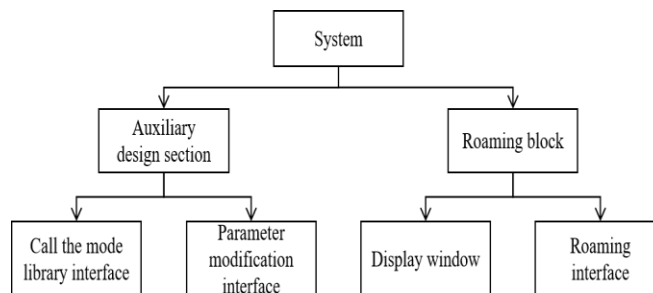


Figure 2 System hierarchy of 3D virtual scene

Advertising is different from other visual communication factors, it has a strong sense of movement, and advertising design can not be separated from graphic image design software, through which pictures can be synthesized and processed to enhance the effect of advertising design [26]. When designing advertisements, graphics and images should be applied integrally, especially in advertising photography. Designers can effectively combine hand-drawn methods with graphics and image software to integrate product features, thus enhancing people's attraction [27]. With the constant promotion of dynamic interaction, new media design and other concepts, the visual communication design handled by computer has sound, light, animation and other contents at the same time. And covers the paper media, packaging, network image, advertising, posters and other areas. The cooperative design flow of figure and picture design of computer is shown in Figure 3.

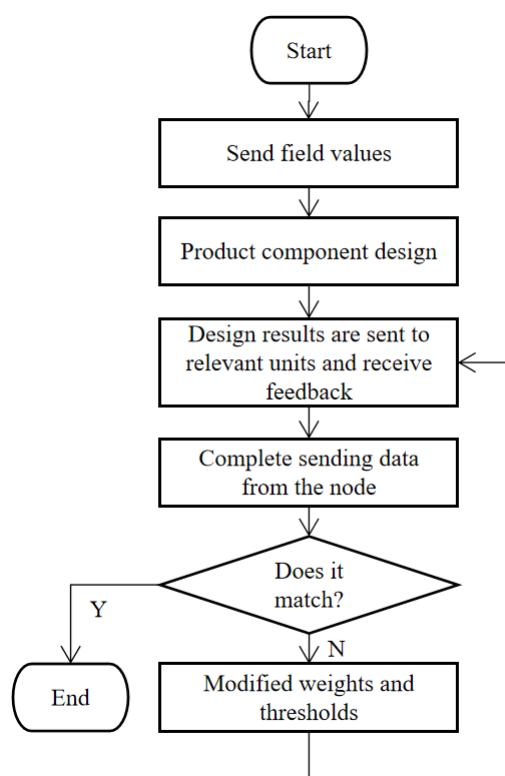


Figure 3 Cooperative design operation process

In daily life, people tend to be more willing to buy products with better visual effects. It can be said that the appearance, color and packaging of a product will greatly affect people's consumption desire. Generally speaking, people's first impression of the product formation is extremely important. The graphic image design of the product and the visual expression effect displayed by it will convey the profound connotation and brand culture image of the product to people in the first time. Consumers will quickly perceive whether the product meets their own needs through their first feeling of the product, and quickly make a judgment on whether to buy or not.

3. Graphic image design and visual communication design based on data mining

3.1 Image data mining technology

Data mining technology is to automatically find out the special relationship hidden in the data from a large number of data. The application of data mining technology has arisen due to the maturity of data collection technology, high-speed processor architecture and mining algorithm. It repeatedly uses a variety of data mining algorithms to determine patterns or reasonable models from observation data. These data can be stored in databases, data warehouses or other information stores. Data mining is to find out the distance or relationship between items, and its mining technology includes frequent itemset search, cluster analysis, prediction query, decision tree, regression prediction and so on.

The effective use of visual communication can expand the field of information expression. The rise of figure and picture design of computer has injected new vitality into visual communication design. It is an effective way of visual communication design. The effective combination of figure and picture design of computer and the design of visual sense transmitting can enhance the aesthetic feeling of visual communication works, and then bring people a beautiful experience. Image resources in visual communication include many aspects, such as illustrations, drawings and illustrations. If the picture is not processed, it will become monotonous and boring. Therefore, in order to enhance the visual communication effect of illustration design, the pictures can be adjusted through figure and picture design of computer. The data mining system structure of figure and picture design of computer is shown in Figure 4.

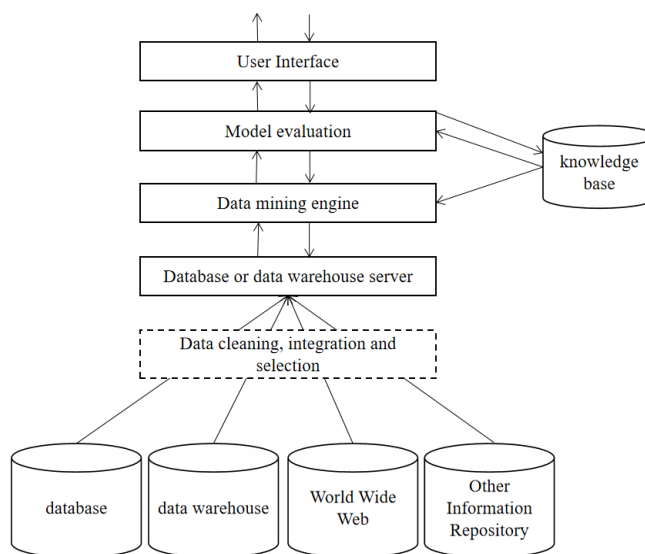


Figure 4 Data mining system structure designed by computer graphics

The design of computer technology in the field of graphics and images belongs to quantitative design. It can decompose the color information and structure information in graphic images into several independent elements that can be measured and evaluated by numerical values. Therefore, the purpose of graphic image design based on computer is more clear, and the collocation between the contents is more reasonable and prominent, and the designer can be liberated from the traditional manual drawing process. And turn your creative inspiration into a concrete and realizable creative process, so that computer-aided designers can achieve and complete the precision and design effect that traditional creative methods can't achieve. Function-driven image data mining is to design the driving framework of mining system according to the specific requirements of specific applications. The data mining function-driven model is shown in Figure 5. It consists of four functional modules.

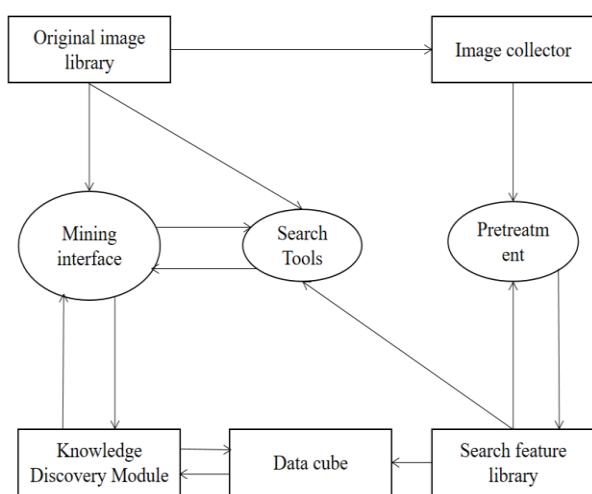


Figure 5 Data mining function-driven model

Since the graphic grammar relationship matrix is a triangular matrix, each row represents the grammatical relationship between a graphic element at the front and the graphic elements at the back of other positions. Therefore, first calculate the similarity coefficient of the grammatical relationship of each row, then calculate the similarity coefficient of each column, and finally calculate the similarity of the two graphics. The calculation method is as follows.

$$S_{ab} = \left(\sum_{i=1}^{N-1} \left(\sum_{j=1}^{N-1} w_{ij} f_{ij} / (N-i) \right) \right) / (N-1) \quad (1)$$

An effective method for texture feature extraction is based on gray-level co-occurrence matrix. Because, the joint probability distribution of two gray-scale pixels that are separated by $(\Delta x, \Delta y)$ appearing at the same time in the image can be represented by a gray-scale co-occurrence matrix. If the gray level of the image is set to N level, then the co-occurrence matrix is N×N matrix can be expressed as $M_{(\Delta x, \Delta y)}(h, k)$,

where the element value at (h,k) represents two gray levels of h and the other gray level of k. The number of occurrences of pixel pairs separated by $(\Delta x, \Delta y)$. In this way, the various statistics of the gray-level co-occurrence matrix can be used as the texture feature in content-based image retrieval for feature measurement. The statistics of the gray-level co-occurrence matrix used for content-based image retrieval are:

(1) Contrast (moment of inertia of the main diagonal) G:

$$G = \sum_h \sum_k (h-k)^2 m_{hk} \quad (2)$$

For coarse texture, since the value of m_{hk} is more concentrated near the main diagonal, the value of (h-k) is smaller at this time. Therefore, the corresponding G value is also smaller; on the contrary, for fine texture, the corresponding G value is larger.

(2) Energy J:

$$J = \sum_h \sum_k (m_{hk})^2 \quad (3)$$

This is a measure of the uniformity of image grayscale distribution. When the numerical distribution of m_{hk} is more concentrated near the main diagonal, the corresponding J value is larger; on the contrary, the J value is smaller.

Autocorrelation A:

$$A = \sum_h \sum_k hk(m_{hk}) \quad (4)$$

Autocorrelation is used to describe the similarity of gray levels between row or column elements in an image matrix.

Entropy S:

$$S = - \sum_h \sum_k m_{hk} \log(m_{hk}) \quad (5)$$

When the m_{hk} values in the gray-level co-occurrence matrix are not much different and relatively scattered, the S value is larger; on the contrary, when the m_{hk} values are more concentrated, the S value is smaller.

Image retrieval based on spatial relationship features has always been an important research direction of image data mining, and there are many methods at present. However, it is difficult to transform the spatial relationship of images into quantitative measurement of image similarity. In content-based image retrieval, it is necessary to calculate the similarity between images according to the low-level visual features of image content, and then retrieve images according to the similarity. The retrieval process can also be regarded as K-nearest neighbor search with given distance measure in feature space. Distance can be directly used for retrieval, or it can be transformed into similarity between 0 and 1 by a monotone decreasing function.

Assuming that the image is represented as a d-dimensional feature vector, given that the features of two images are

$x = (x_1, x_2, \dots, x_d)^T$, $y = (y_1, y_2, \dots, y_d)^T$ respectively, the cosine of the angle between them can be used as the similarity measure:

$$\text{Sin}_i(x, y) = \frac{x \cdot y}{\|x\| \|y\|} \quad (6)$$

Cosine metric is often used in text retrieval, and it is also used in image retrieval. The distance between two histograms can be measured by histogram minus.

$$D_h(x, y) = \frac{\sum_i \min(x_i, y_i)}{\min\left(\sum_i x_i, \sum_i y_i\right)} \quad (7)$$

Formula (8) is mainly used to measure the similarity between histograms. In addition, the more frequently used Minnesota distance is defined as:

$$D_p(x, y) = \left(\sum_{i=1}^d |x_i - y_i|^p\right)^{1/p} \quad (8)$$

When $p=1$, it is the block distance, also known as the L_1 distance. When $p=2$, it is the Euclidean distance, also known as the L_2 distance. In order to distinguish the role of different feature components in the similarity measurement, their weighted form is often used. For example, the weighted L_1 distance is:

$$D_1(x, y, w) = \sum_{i=1}^d w_i |x_i - y_i| \quad (9)$$

In addition, the secondary distance is also often used, the main of which is the Mahalanobis distance, which is defined as:

$$D_2(x, y, M) = \sum_i \sum_j m_{ij} (x_i - y_i)(x_j - y_j) \quad (10)$$

Where M is a real symmetric matrix. If M is restricted to a diagonal matrix, the weighted Euclidean distance can be obtained.

At present, the commonly used technologies mainly include similarity search, image association rule mining, image classification, image clustering and neural network. A complete data mining process, first of all, should pre-process the data, not only to ensure that the amount of data is enough to make the mining results more meaningful, but also to evaluate whether the analysis data can be finished in unit time. In addition, it is also necessary to purify and filter the data to filter out some unnecessary or unknown data, so as not to cause mining errors.

3.2 Design of Computer Graphics Vision System

For people in the era of modern visual communication, digital art has penetrated into people's daily

life. It belongs to a more popular way of artistic creation. Most young people like to try. Using this way can release their imagination and effectively express their feelings. Figure and picture design of computer and visual communication design release not only the designer's hands, but also make their brain thinking flexible, liberate their bound imagination, no longer limited to the skill framework, and can create unconscious and supernatural special works.

The original image can not be directly used for image mining. We must preprocess the original image, extract the relevant features of the image, generate the image feature database, and mine the image features by relying on relevant technologies. The performance parameters of layout optimization before and after algorithm optimization are shown in Table 1. The comparison of topology reliability optimization simulation is shown in Figure 6.

Table 1 Layout optimization performance parameters before and after optimization

	Before optimization	Optimized
Number of lines	32	41
Number of columns	10	20
Number of monitoring points	320	820

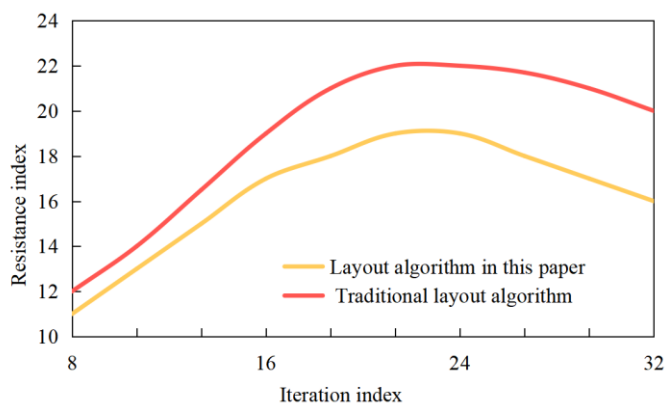


Figure 6 Simulation comparison of graph layout optimization

A key problem of multimedia data mining is the representation of image data itself. This is also the key of image processing and pattern recognition. Generally speaking, the basic features of an image can be represented by colors, textures, shapes and motion vectors. Advanced concept can be regarded as a characteristic pattern. Advanced concept is our concern, it may be the existence of some kind of object or the occurrence of some kind of phenomenon. There must be a mapping relationship between the basic features of the bottom layer and the high-level concepts, which can be found by data mining. The simulation comparison of reliability optimization of image segmentation topology is shown in Figure 7.

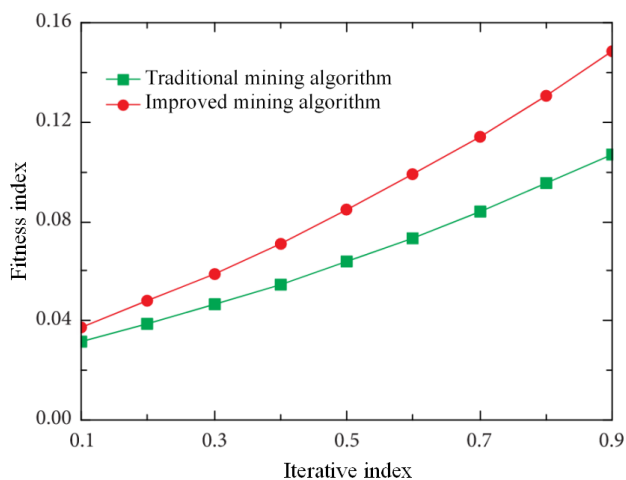


Figure 7 Image segmentation filtering optimization simulation comparison

The Internet is the largest place for data production, circulation and consumption, and there are a lot of image data on the Internet. The data source of the system mainly consists of two parts, one is the local image database and the other is the Internet. Taking the statistical results of big data, the index parameters of page evaluation, as the research object, data clustering and information fusion are carried out to realize the evaluation of design ability. The analysis shows that the accuracy of design capability evaluation with this method is high, and the utilization rate of design resources is good. Comparison of the two analysis methods is shown in Figure 8.

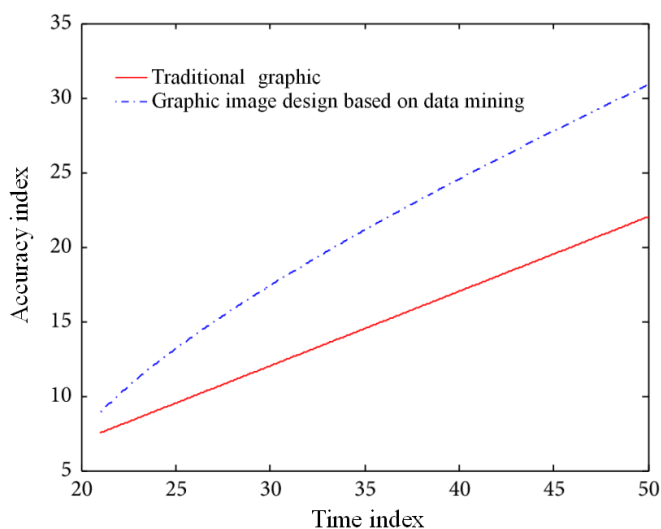


Figure 8 Accuracy comparison

The results of mining also need to be further transformed into a more understandable form, and visualization is one of the most important processing methods. Make users participate in interactive color matching, through evolutionary operation. The output schemes have good satisfaction and consensus, and the evolution process is terminated. From the evolutionary process, the maximum fitness value may decrease, but the average fitness shows an increasing trend, with good global

convergence and faster overall convergence speed. The variation curve of fitness value is shown in Figure 9.

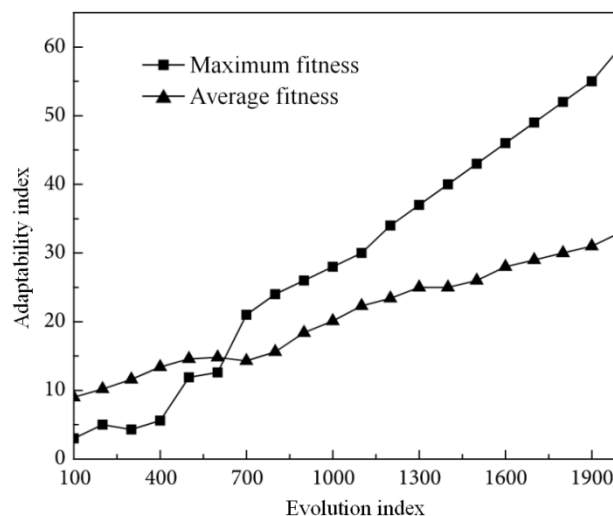


Figure 9 Changes in fitness value

Multimedia data cube presents users with a view that is easier to understand and abstract. It can evaluate the mining results from different levels and angles, and optimize each module according to the evaluation results. Figure and picture design of computer is based on user experience and pays attention to the layout of interface. From the perspective of cognitive psychology, following the user-centered design principle is essentially the embodiment of the people-oriented design concept, which is a way to convey information more effectively and enhance users' experience and feelings. In the process of mining, real-time human-computer interaction with experts in various fields, users and other task-related personnel is also needed. Appropriate manual intervention can greatly reduce the difficulty of mining and improve the efficiency of mining.

4. Conclusion

Today, with the rapid development of sci & tech, with the help of computer image processing software, the realization efficiency of graphic image design and visual communication design can be effectively improved, rich design contents can be provided for designers, and designers can use more processing skills and means to adjust or improve the designed works. Moreover, the combination of graphic images and visual communication design can also create more shocking and infectious works of art, and constantly push people to use modern tools to show their thinking and innovation ability to others. The design of computer graphics and images not only helps to improve the design of graphics and images, but also promotes the development of computers. The research of visual communication design has brought creative and personalized visual appreciation works to people, and influenced people's life and consumption concept. It can be seen that computer image design and visual communication design are interrelated and influence each other. Therefore, in the era of information

development, we should improve the technical deficiencies. Strive for the use of figure and picture design of computer means to promote artistic development. And continue to study the innovation of visual communication design, combine them closely, and achieve the perfect combination of technology and art on the basis of exerting their common advantages. The integration of the two has high application value in people's production and life, and the future development prospect is very broad.

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