

Retraction

Retracted: Research on Clothing Image Database Retrieval Algorithm Based on Wavelet Transform

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] X. Cui, "Research on Clothing Image Database Retrieval Algorithm Based on Wavelet Transform," *Journal of Mathematics*, vol. 2022, Article ID 6332592, 8 pages, 2022.

Research Article

Research on Clothing Image Database Retrieval Algorithm Based on Wavelet Transform

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Aiming at the problems of low image data retrieval accuracy and slow retrieval speed in the existing image database retrieval algorithms, this paper designs a clothing image database retrieval algorithm based on wavelet transform. Firstly, it represents the color consistency vector of clothing image, reflects the composition and distribution of image color through color histogram, quantifies the visual features of clothing image, aggregates them into a fixed size representation vector, and uses the Fair Value (FV) model to complete the collection of clothing image data. Then, the size of the clothing image is adjusted by using the size transformation technology, and the clothing pattern is divided into four moments with the same size. On this basis, the clothing image is discretized with the help of Hu invariant moment to complete the preprocessing of clothing image data. Finally, the generating function of wavelet transform is determined, and a cluster of functions is obtained through translation and expansion. The wavelet filter is decomposed into basic modules, and then, the wavelet transform is studied step by step. The clothing image data are regarded as a signal, split, predicted, and updated and input into the wavelet model, and the retrieval research of clothing image database is completed. The experimental results show that the design of the retrieval algorithm is reasonable, the retrieval data accuracy is high, and the retrieval speed is fast.

1. Introduction

With the rapid development of the Internet and the popularization of various digital devices, the number of multimedia information in modern society is growing rapidly, which promotes the further prosperity of multimedia information management research. Image data retrieval and management system plays a particularly important role in the research of multimedia information management. Not only is the image the basis of video but also image database technology can be directly applied to many important fields, such as digital library, digital museum, medicine, geographic observation, petroleum geological exploration, public security, and clothing. Image is the main medium for people to communicate with each other and understand the world. It is not only the most intuitive form of important information expression but also the most difficult information content to obtain, transmit, process, realize, and store [1]. Research and statistics show that more than 70% of human information

from the outside comes from image information, and the role of image information is difficult to be replaced by other information forms. Image technology covers a wide range and has a close relationship with mathematical physics students' physical psychology, electronics, and computer science. It is widely used in various fields such as scientific research, agricultural production, industrial production, military and national defense, aerospace, culture and entertainment, medical and health care, and traffic management [2].

With the advent of information society, the information people deal with is not only digital and symbolic information but also a large number of image information. Computer image processing technology is a new computer application field developed with the development of computer technology. It is a discipline gradually developed on the basis of achievements in image analysis and research. This technology has been involved in all fields of people's life, study, and work. With the improvement of people's living and

economic standards, they also have their own unique opinions on the pattern requirements in clothing. Using computer technology to identify clothing patterns, so as to improve clothing production efficiency to meet market demand, has become the current trend. In the process of clothing pattern generation, a certain database is designed to generate directly according to people's favorite needs. Therefore, the management and retrieval of clothing pattern database is the key [3].

The traditional management of clothing images is in the form of documents. When users want to query a clothing image, they have to open the file one by one and browse manually to find the target image [4]. Although this manual retrieval method is still in use, with the rapid increase of the number of image files, this query method has been difficult to meet the retrieval requirements of large clothing image database. The retrieval method based on keyword or descriptive text needs to specify the text features or keywords during query, which requires users to describe the text features with certain accuracy and standardization. There are two major problems in this method. One is that manual annotation of images needs to pay a lot of labor cost. Second, image manual annotation is subjective and imprecise, which cannot standardize and accurately describe the rich information contained in the image. Because there is no unified standard for image description, people have different understanding of image content. For example, there is no exact boundary between "big" and "big" of an object [5]. In addition, different language environments, different social conditions, and different nationalities will have different understanding of the same object, which will affect the consistency of image text description. With the passage of time, the things or concepts that people are interested in will also change. The definition of text features of images in the early stage is difficult to adapt to various developments in the later stage.

In order to improve the retrieval efficiency of clothing pattern database, a new clothing image database retrieval algorithm based on wavelet transform is designed in this paper. By collecting and preprocessing the data in the existing clothing pattern database, the wavelet transform method is introduced to design the retrieval scheme of the database and complete the retrieval of clothing image database. The main technical route of this paper is as follows:

Step 1: in Section 2, the process of image data acquisition in the clothing image database is carried out, where we characterize the color consistency vector of the clothing image, reflect the composition and distribution of the image color through the color histogram, quantify the visual features of the clothing image, aggregate them into a fixed size representation vector, and complete the clothing image data acquisition by using the FV model.

Step 2: in the image data preprocessing in the clothing image database also carried out in Section 2, the size of the clothing image is adjusted by using the size transformation technology, and the clothing pattern is divided into four moments of the same size. On this

basis, the clothing image is discretized with the help of Hu invariant moment to complete the clothing image data preprocessing.

Step 3: progressing forward in Section 2, in the design of clothing image database retrieval algorithm based on wavelet transform, the generating function of wavelet transform is determined, and a cluster of functions is obtained through translation and expansion. The wavelet filter is decomposed into basic modules, and then, the wavelet transform is studied step by step. The clothing image data are regarded as a signal, split, predicted, and updated and input into the wavelet model. Complete the research of clothing image database retrieval.

Step 4: experimental analysis is performed in Section 3.

Step 5: conclusion is given in Section 4.

2. Image Data Acquisition and Preprocessing in Clothing Image Database

In this section, the image data acquisition in clothing database is described. Moreover, image data preprocessing in clothing image database is explained. Furthermore, the retrieval algorithm of clothing image database based on wavelet transform is proposed.

2.1. Image Data Acquisition in Clothing Image Database.

The retrieval work of clothing image database is very different from that of traditional document database. Clothing images are rich in content and unstructured data, so traditional text retrieval methods cannot be directly used for query and retrieval. Therefore, in order to realize the effective retrieval of this paper, key image data are collected in the existing clothing database to provide accurate pattern data for subsequent recognition [6].

In clothing image data acquisition, from the perspective of human vision, color feature is a basic visual feature for human to perceive and distinguish different objects. Therefore, first, the initial dress pattern data are collected according to the color consistency vector of the dress pattern. The color consistency vector not only counts the number of pixels of each color in the whole clothing image but also counts the pixel value of the largest region of each color in the image. Consistent pixels belong to areas with continuous colors in the image. The color consistency vector represents this classification of colors in the image. It makes the consistent pixels in one image cannot be compared with the inconsistent pixels in another image. This is not possible with a simple color histogram. An intuitive way to represent the content of the clothing image is to count the color of pixels to get the color histogram. The color histogram reflects the composition and distribution of colors in the image, that is, the occurrence of colors and the probability of various colors [7]. Color histogram represents a global characteristic of the image.

Assuming that the histogram of the dress pattern has L colors and floats in a certain order and assuming that the

number of pixels of the dress image on the i color is $G(i)$, the cumulative color histogram can be expressed as

$$v(k) = \sum_{i=1}^k G(i), \quad k = 1, 2, \dots, L \quad (1)$$

At this time, the global color histogram of the clothing image only considers the composition distribution of colors, which is easy to ignore the spatial distribution information of various colors in the image. Therefore, it is necessary to quantify the visual features of clothing images and aggregate them into a fixed size representation vector. In this feature quantization, the FV model [8] is used to represent them as a fixed size vector. Generally, the Gaussian mixture model aggregates the normalized cascade gradient vectors of all local descriptors into a unified Fisher variable. In essence, an image is expressed by the gradient vector of the likelihood function. For a clothing image, it is assumed to extract t local descriptors, expressed as

$$R = \{r_i\}, \quad i = 1, 2, \dots, T. \quad (2)$$

In formula (2), the set of costume image quantification parameters is represented.

On this basis, we make it obey the independent and equal distribution, expressed as follows:

$$L(R|\varphi) = \frac{1}{N} \sqrt{L} \sum R \quad (3)$$

where $L(R|\varphi)$ represents the set of costume image quantization parameters.

Assuming that the Y distribution is verified in a Gaussian hybrid model, the quantified costume image parameters and the determined quantified parameters are effectively fit, thus obtaining

$$\psi(v) = \sum_{i=1}^n w_k u_k(x) \quad (4)$$

where $\psi(v)$ represents the Gaussian score, u represents the coefficient of linear combinations of costume pattern data, and x represents the covariance matrix.

The quantification process of extracting the costume image data based on the FV model is shown in Figure 1:

After quantizing the above clothing image data, describe its local features, determine the nearest feature point of each local feature, and obtain

$$B(x) = \operatorname{argmin} |c_i - x_i| \quad (5)$$

According to the determined feature points of clothing pattern data, calculate the residual value of the feature and complete the collection of clothing image data, namely,

$$h_K = \sum_{i=1}^h (x - c_i), \quad (6)$$

where c represents the dimension value of the dress pattern feature descriptor and k represents the residual value.

In the process of image data acquisition in clothing image database, the color consistency vector of the clothing image is characterized, the composition and distribution of the image color is reflected through color histogram, and the visual features of clothing image are quantified and aggregated into a fixed size representation vector. The FV model is used to complete the collection of clothing image data.

2.2. Image Data Preprocessing in Clothing Image Database.

Image data preprocessing is carried out in clothing image database because there are many interferences in the above collected clothing image data; it cannot be retrieved directly and effectively. Therefore, it is necessary to preprocess the clothing image data. In the process of clothing image processing, the processing effects of clothing image feature extraction, segmentation, recognition, and matching are easily affected by factors such as uneven illumination, image size, rotation, and noise. Therefore, before garment image processing, the image should be preprocessed to eliminate the influence of these irrelevant factors, so as to restore or enhance the useful information in the image and improve the detectability of relevant information [9].

In dress image preprocessing, only when certain conditions are met can the dress image be retrieved by wavelet or contour wave. Therefore, the clothing image is converted to a certain size. Generally, the size transformation technology is used to adjust the size of clothing image, and the size transformation technology usually uses the interpolation method to change the size of the image [10]. The commonly used interpolation algorithms include nearest neighbor interpolation, bilinear interpolation, bicubic interpolation, and wavelet interpolation. Different interpolation algorithms have different processing accuracy, and different interpolation algorithms will also affect the degree of image distortion. The nearest neighbor interpolation method is used to transform the size of $232 * 205$ tire clothing image. In the process of clothing image processing, sometimes, an image with high dimension is divided into nonoverlapping blocks to obtain several subimages with low dimension, and the subimages are used for image analysis [11]. This process is based on the idea of image segmentation. Let the matrix [12] of a discrete two-dimensional clothing image be expressed as

$$P = \begin{bmatrix} P_{11}, P_{12}, \dots, P_{1n} \\ P_{21}, P_{22}, \dots, P \\ \dots \\ P_{m1}, P_{m2}, \dots, P_{mn} \end{bmatrix} \quad (7)$$

where p represents the number of pixels in the clothing image Assuming that m and n can be divided by 2, the costume image is divided into four pieces without overlap and expressed as

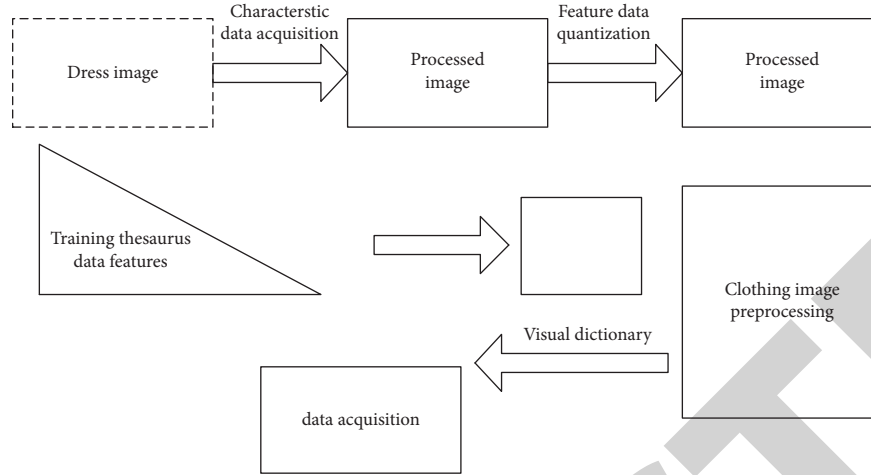


FIGURE 1: Quantization process of extracting clothing image data based on the FV model.

$$\begin{aligned}
 P_1 &= \begin{bmatrix} p_{11} & \cdots & p_{1L} \\ & \cdots & \\ p_{k1} & & p_{KL} \end{bmatrix}, \\
 P_2 &= \begin{bmatrix} p_{1(L+1)} & \cdots & p_{1L} \\ & \cdots & \\ p_{k(L-1)} & & p_{K(L+1)} \end{bmatrix}, \\
 P_3 &= \begin{bmatrix} p_{(K+1)} & \cdots & p_{1L} \\ & \cdots & \\ p_{M1} & & p_{KL} \end{bmatrix}, \\
 P_4 &= \begin{bmatrix} p_{11} & \cdots & p_{1L} \\ & \cdots & \\ p_{k1} & & p_{ML} \end{bmatrix},
 \end{aligned} \tag{8}$$

where the matrix is divided into four submatrices, and each submatrix represents a subblock image. According to the above image blocking method, this technology can be applied in image retrieval technology to establish a new image retrieval database by nonoverlapping segmentation of images. The 128×128 tire image is divided into non-overlapping blocks to obtain four subclothing images of the same size.

According to the divided image, moment invariants are used for noise reduction [13]. Hu invariant moment is based on the divided image subblock, and the subblock image is discretized to obtain

$$D_{pq} = \sum_x \sum_y x^p y^q f(a, b) \tag{9}$$

where $f(a, b)$ represents a 2-dimensional discrete image, representing the moment.

In the image data preprocessing in the clothing image database, the size of the clothing image is adjusted by using the size transformation technology, and the clothing pattern is divided into four moments of the same size. On this basis, the clothing image is discretized with the help of Hu

invariant moment to complete the clothing image data preprocessing.

2.3. Retrieval Algorithm of Clothing Image Database Based on Wavelet Transform. Wavelet transform is the development and upgrading of Fourier transform. It has the local analysis characteristics that Fourier transform does not have. It can transform the time-frequency resolution according to the local regional characteristics of the signal. Wavelet function is a cluster of functions obtained by the translation and expansion of the generating function of wavelet. If it is set as the generating function of wavelet, the derived wavelet function [14] is

$$\eta_{a,b}(t) = |a|^{(1/2)} \phi\left(\frac{t-b}{a}\right) \tag{10}$$

In wavelet transform, not all functions can become generating functions, and they need to meet certain conditions. The conditions to be met are

$$E_\varphi = \int_r \frac{|\phi(w)|^2}{|w|} dw < \infty \tag{11}$$

where E represents the generating function of wavelet transform and the allowable limiting index. At this time, the wavelet of continuous transformation is expressed as

$$W_f(a, b) = r < f, a > \frac{1}{\sqrt{a}} \int_{-\infty}^{\infty} E_\varphi vt \tag{12}$$

where $W_f(a, b)$ represents wavelet transformation, r represents wavelet inversion transformation, and vt represents the time of wavelet window as a function.

Wavelet transform is a very important artificial intelligence algorithm. Therefore, in the retrieval of clothing image database designed in this paper, the clothing image retrieval model is designed, and then, the above processed clothing image data are input into the model to complete the retrieval of clothing image data.

The wavelet filter is decomposed into several basic modules, and then, the wavelet transform is carried out step

by step, which is the basic idea of lifting wavelet. The lifting algorithm is also relatively simple, mainly to obtain high-frequency components and low-frequency components. High-frequency components can be obtained by polynomial interpolation, and there is a prerequisite for the acquisition of low-frequency components, that is to keep the high-order moment and mean value of the original signal unchanged. The improvement scheme can be divided into the following three steps: splitting, prediction, and updating [15], and the process is shown in Figure 2.

Firstly, the clothing image data are regarded as the signal input into the wavelet model and divided. The presplit costume image data signal is S_n , and the split was set to S_{n-1} and d_{n-1} , respectively. The decomposition process is shown in Figure 3:

Then, the clothing image data are predicted. The significance of prediction is to obtain the detailed information of the signal. First, the filter acts on the even sequence, then takes the obtained value as the predicted value of the odd sequence, and then obtains the detailed information by calculating the difference between the actual value of the odd sequence and the predicted value, that is,

$$d_{n-1} = \text{odd}_{n-1} - P(\text{even}_{n-1}) \quad (13)$$

Thirdly, the clothing image data are updated. The update is mainly to maintain the global characteristics of the original data in the retrieval. The update algorithm is introduced to obtain the updated clothing image data as follows:

$$S_{n-1} = \text{even}_i + U(d_{n-1}) \quad (14)$$

where U represents the updated original image data.

Finally, design the wavelet change model, input the updated clothing image data, and complete the retrieval of clothing image data, that is,

$$Q = \int_{-\infty}^{\infty} F(T)dt < f, \varphi_i > \quad (15)$$

where Q represent costume image data retrieved from the wavelet model.

In the above retrieval, due to some omissions in the retrieved data, it is necessary to reverse transform it and retrieve the clothing image data globally. The results are as follows:

$$l(x, y) = \frac{1}{z} \int_{i=1}^n W_f(x, y) \varepsilon \frac{da}{a^3} dt \quad (16)$$

where z represents the reverse conversion factor, $l(x, y)$ represents the results after retrieval, and ε represents the wavelet base in the vertical direction of the costume image.

In the design of clothing image database retrieval algorithm based on wavelet transform, the generating function of wavelet transform is determined, and a cluster function is obtained through translation and expansion. The wavelet filter is decomposed into basic modules, and then, the wavelet transform is studied step by step. The clothing image data are regarded as a signal, split, predicted, and updated

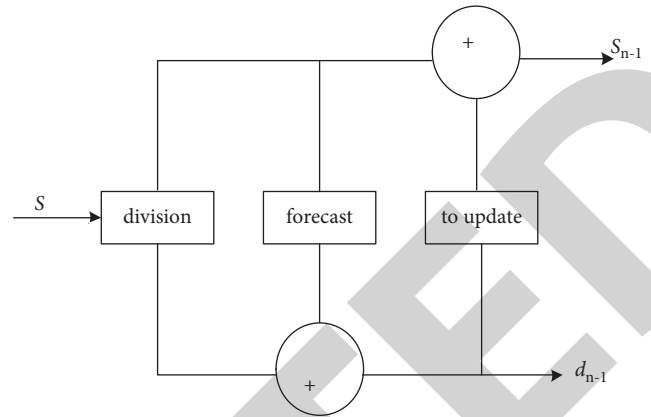


FIGURE 2: Wavelet transform model scheme.

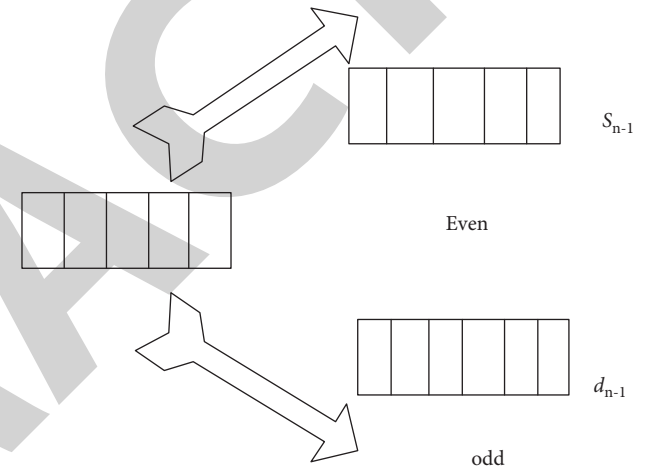


FIGURE 3: Clothing image data signal classification process.

and input into the wavelet model. Complete the research of clothing image database retrieval.

3. Experimental Analysis

In order to confirm the authenticity of proposed methods, this section performs the experiments and analyses the results. First, we design the experimental scheme, followed by experimental index design, and finally, the analysis of the experimental results is given.

3.1. Experimental Scheme Design. In order to verify the effectiveness of this method, experimental analysis is carried out. In the experiment, 100 experimental retrieved images were selected from the professional “My Structural Query Language” (MySQL) database, these images were set to the size of $256 * 256$, and the images were preprocessed. The processed experimental representative clothing images were used as the experimental sample images to retrieve the colors in the clothing patterns. There were many image colors in the experimental samples. Therefore, in the experiment, the specific recognition color is determined to identify the



FIGURE 4: Experimental sample image.



FIGURE 5: Comparison of retrieval effects of different retrieval methods. (a) Sample image color retrieval. (b) Proposed method. (c) Image data retrieval based on the block dominant color method. (d) Image retrieval based on joint weighted aggregation depth convolution features.

TABLE 1: Retrieval time of different methods (s).

Retrieval times	The proposed method	The search of image disorder surge data based on the block primary color method	Image retrieval of jointly weighted aggregate depth convolutional features
20	1.3	1.5	1.6
40	1.3	1.5	1.7
60	1.2	1.6	1.9
80	1.2	1.9	2.1
100	1.2	2.0	2.3

typical clothing pattern color. The experimental sample image is shown in Figure 4:

In Figure 4, the green line box is the color area retrieved in the experiment.

3.2. Experimental Index Design. In order to verify the effectiveness of this method for clothing image retrieval, the experiment is carried out by comparing this method, the image disordered surge data retrieval method based on the block dominant color method, and the image retrieval method based on joint weighted aggregation depth convolution feature. In the experiment, the retrieval accuracy of the color in the sample image and the retrieval time overhead are taken as the experimental indexes. The experimental results obtained in the experiment have been verified for many times and meet the requirements of the experiment.

3.3. Analysis of Experimental Results. Firstly, the experiment analyzes the method in this paper, the image disorderly surge data retrieval method based on block dominant color method, and the image retrieval method combined with weighted aggregation depth convolution feature to retrieve the color in the sample image. The retrieval effect is shown in Figure 5.

By analyzing the retrieval results in Figure 5, it can be seen that there are some differences in the retrieval effects of the method in this paper, the image disorderly surge data retrieval method based on the block main color method, and the image retrieval method combined with weighted aggregation depth convolution feature on the color in the sample image. Among them, the color retrieval accuracy of this method is better; only one part cannot be retrieved, while the color retrieval results of the other two methods are lower than that of this method. In contrast, the retrieval effect of this method is better, which verifies that the retrieval accuracy of this method is higher.

In order to further verify the effectiveness of this method, on the basis of ensuring the retrieval accuracy, the experiment further analyzes the time cost of this method, the image disordered surge data retrieval method based on the block dominant color method, and the image retrieval method combined with weighted aggregation depth convolution feature to retrieve the color in the sample image. The results are shown in Table 1.

By analyzing the data in Table 1, it can be seen that the time cost of color retrieval in the sample image is different by using the method in this paper, the image disordered surge data retrieval method based on the block dominant color

method, and the image retrieval method combined with weighted aggregation depth convolution feature. Among them, the retrieval speed of this method is short, up to about 1.3 s, while the image disordered surge data retrieval method based on the block main color method and the image retrieval method based on joint weighted aggregation depth convolution feature have a longer time overhead than this method. In contrast, this method is more effective. It is verified that the work efficiency of this method is faster.

4. Conclusion

In order to solve the problems of low image data retrieval accuracy and slow retrieval speed in the existing image database retrieval algorithms, this paper designed a clothing image database retrieval algorithm based on wavelet transform. Moreover, the characterization of color consistency vector of clothing image is done, in which the color histogram reflects the composition and distribution of image color, which is aggregated into a fixed size representation vector, and the FV model is used to complete the collection of clothing image data. Furthermore, the size of clothing image is adjusted through the use of size transformation technology. In addition, with the aid of Hu invariant moment, the clothing image was discretized to complete the preprocessing of clothing image data. Determine the generating function of wavelet transform, decompose the wavelet filter into basic modules, and then study the wavelet transform step by step. The clothing image data are regarded as a signal, split, predicted, and updated, input into the wavelet model, and complete the retrieval research of clothing image database. The experimental results show that this method has certain retrieval advantages.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that he has no conflicts of interest.

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