



Research on Scale Space Fusion Method of Medical Big Data Video Image

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Abstract. In the research of scale space fusion of medical big data video image, due to the different spatial management methods of multi-source video image, the efficiency of multi-dimensional scale space fusion is low, so a new image scale space fusion method is designed according to the characteristics of medical big data video image. From the aspect of video image visualization and multi-dimensional space fusion, the space fusion method is designed respectively, and the sampling survey method is adopted for experimental analysis to obtain experimental data. The experimental results show that the proposed method is feasible and reliable.

Keywords: Medical treatment big data · Video image · Scale space fusion

1 Introduction

Image fusion is the integration of two or more complementary bands and useful information of a sensor into a unified image or integrated image feature for observation or further processing through a fusion system to achieve more accurate and comprehensive recognition of the target or scene. Analyzed image processing method [1]. With the development of society and the advancement of technology, the application of digital medical equipment in hospitals has become more widespread [2], so medical video data is growing at an unimaginable speed. However, until now, medical video image storage and management methods have lagged behind, which has led to great challenges in medical image video storage and processing [3].

The images of different imaging technologies, imaging directions and anatomical parts are mixed together, which need to be fused and managed for further analysis and utilization [4]. Therefore, the problem of video image fusion and processing under medical big data has become a social hot issue. Medical big data video image contains a lot of information [5]. There are usually many images for the same scene, so it is necessary to integrate them to realize information visualization, which can obtain more accurate and reliable description for the same scene, and improve the accuracy of medical diagnosis [6]. There are many research achievements on the scale-space fusion method of medical big data video images, such as the multi-feature based scale-space fusion method of medical big data video images. Firstly, edge features and average gradient features of the low-frequency coefficients after multi-scale decomposition

were extracted, and the correlation signal intensity ratio features of the high-frequency coefficients were extracted. Then, the edge feature level fusion is used to guide the pixel level image fusion to obtain the high frequency coefficient. In order to solve the problem that the simple weighting method in the synthesis module can easily cause local blurring of edges or textures, the multi-scale decomposition coefficients of the same position are synthesized in two cases. Finally, the low frequency coefficients of fusion images are obtained by means of adaptive weighting of average gradient features, and the low frequency and high frequency coefficients are inverted by multi-scale transformation to obtain the fusion images. However, this method has the problem of poor fusion image quality, and the practical application effect is not good.

It is very important for the hospital information system that the video image scale space under the medical big data can achieve complete fusion. Instead of simply overlaying the video images together, they form a composite image with more information, reducing the uncertainty of the information. The systematic improvement of medical image can make the hospital staff master the patient's medical record information more accurately, simplify the work flow, greatly improve the efficiency of the hospital [7, 8], and make the hospital no longer be unable to distinguish each person's electronic information because of the number of patients, thus leading to the decline of the efficiency of the people's medical treatment. Therefore, in the hospital big data environment, the processing and management of video image is very important [9–11]. Then, from the different attributes of video image to explore, we can design the scale space fusion scheme of medical big data video image.

2 Design of Scale Space Fusion Method for Medical Big Data Video Image

In terms of the design of video image scale space fusion method under medical big data, the visualization and multi-dimensional animation in image video should be considered first, because the data form of these modes is complex [12, 13], and the attribute problem should be considered to fuse them, as shown in Fig. 1, which is the image scale space fusion method designed under medical big data.

It can be seen from Fig. 1 that in the process of video image scale space fusion under medical big data [14], the steps of data processing, visual fusion and multi-dimensional scale space fusion are carried out at the same time, then the image format of the same attribute is screened, and the image of the same attribute is fused, and finally the fusion result is output.

2.1 Visual Fusion Design of Medical Big Data Video Image

Medical data information system is a system that integrates large-scale data, so it is necessary to fuse the scale space of image and video image retained in the medical process [15], so as to facilitate the management of staff. Video image visualization is a process that can not be ignored for video image processing, and it is also a key part for medical big data video image to realize scale space fusion [16]. The computer technology is applied to the construction of video image informatization under the medical

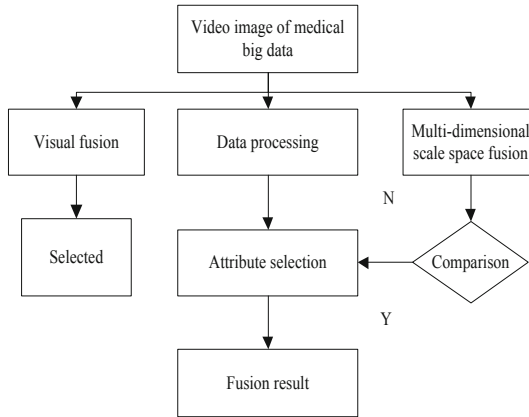


Fig. 1. Image spatial fusion method

big data. Through the processing of the computer in the video image visualization level and multi-dimensional animation level, the same attribute data fusion is carried out, so as to organize the medical big data more conveniently. Therefore, the computer technology is very important in the video image processing and data attribute screening fusion [17].

In the process of video image processing, computer visual fusion method can sort out the same format of visual image. The problem of medical security is very important. Like the financial information system of the hospital, the video image of the hospital should also ensure that the patient's data cannot be leaked, because once the medical data is leaked, the consequences will be unimaginable. Then the video image visualization data processing also needs to have the function of medical data protection, so as to realize the orderly and efficient work of the hospital. The visual fusion method of video image under the medical big data can guarantee the data screening of the hospital video image without changing the format, attribute and size, so as to lay the foundation for the realization of the scale space fusion of video image under the medical big data [18].

2.2 Multi Dimension Scale Space Fusion Design of Medical Big Data Video Image

In the scale space of video image, multi-dimensional data is very common, and it is also common in medical information system, so it is a highly feasible method to use multi-dimensional scale space fusion method to carry out spatial fusion of medical big data image, this method is to recombine and fuse the data packets with different information content. It is the result of upgrading and fusing the video image by using the key technology of information technology. It uses the relevant functions of data recognition by computer to fuse the medical video image data in scale space, and uses the public to filter the data attributes, so as to better manage the video image data [19]. The multi-dimensional scale space fusion method of computer data can also be called

the production tool of video image informatization under medical big data. The multi-dimensional scale space fusion method of computer data can recognize the size, attributes, format of image and whether the image can be fused, and filter the data through the following formula to achieve the goal of data fusion.

$$S_x = \frac{1}{n} \sum_{i=1}^n (x_j - X_j)(x_j - X_j)^T \tag{1}$$

Formula: T represents the magnitude of multi-source video image data. Since the feature matrix S_x does not satisfy the diagonal matrix in the geometric matrix, it is necessary to find the orthogonal matrix W of multi-source data, and meet the relationship of $W^T S_x W$ related diagonal matrix. Unilateralization is carried out for matrix S_x , and the geometric features of the matrix are decomposed in the process of unilateralization. The feature polynomial of feature matrix S_x should meet the following conditions,

$$|S_x - \lambda I| = 0 \tag{2}$$

In the formula: I represents the sequence characteristics of the correlation matrix; λ represents the data satisfying the characteristic values of all multi-source video image data. The absolute value is the single direction of the support vector. Because the multi-source video image scale space features need to express all the multi-source data, the size of the guarantee value is enough [20]. Take λ into the correlation diagonal matrix, and set the corresponding feature vector as V , and establish the relationship as follows:

$$X_j S_x W = \text{diag}(\lambda) V \tag{3}$$

The orthogonal matrix W of multi-source video image data features is obtained by formula (3), and W contains $[V, V_1, \dots, V_X]$; V , which represents the intersection features of multi-source data.

3 Experimental Demonstration and Analysis

In order to verify the effectiveness of the proposed scale space fusion method for medical big data video image, a simulation experiment is designed. During the experiment, the video image archiving of a hospital is taken as the experimental object, and the computer fusion experiment is carried out for the different attribute video images in this system. The traditional method is compared with the scale space fusion method of video image proposed in this paper, so as to effectively analyze the applicability of the two methods and the practicability in the scale space fusion of video image. Firstly, the speed and stability of video image data fusion management after the application of the two methods are compared. The better the index is, the better the comprehensive performance of the method is. Then the image resolution of different fusion methods is compared. The higher the image resolution is, the better the fusion image quality is. Finally, the lower the error rate is, indicating that the higher the fusion

accuracy is, the better the image is the clearer the image. The design of simulation experiment parameters is shown in Table 1.

Table 1. Simulation experiment parameter design

Project	Parameter
CPU	Intel Xeon
CPU hard disk capacity	1.5T
CPU frequency	1.2 GHz
Random access memory	128 GB
Operating system	Windows 10
Monitor resolution	1280*1024
Simulation software	MALTAB 7.11

The experimental data are shown in Table 2.

Table 2 Experimental data

	Parameter	Remarks parameter
Multiple video image management coefficient	6.75	Ensure it is within the controllable range of the experiment
Number of multiple video image data sources	7–8	Random collocation
Number of multiple video image data sources	6G	Standard limit unchanged
Data integration accuracy	1.65TH	$\pm 0.5TH$

An example of data sample is shown in the figure below (Fig. 2).

After the above experimental preparation process is ready, the data will be sampled and compared with the scale space fusion method proposed in this paper by using the traditional method. The experimental results are shown in Fig. 3.

As shown in Fig. 3, the number of video images of the traditional method is between 0–63, and the number of video images of the method in this paper is between 0–91, which shows that the video image scale space fusion method proposed in this paper has higher management speed than the traditional method, and the data fusion management is relatively stable, which shows that the method in this paper is effective and reliable.

Figure 4 are the image separation rates after the scale space fusion of medical video image using the traditional method and the method in this paper, which are the main reflection of the fusion image quality.

It can be seen from the analysis of Fig. 4 that the resolution of the output image is always lower than 80 dpi after using the traditional method for medical video image spatial fusion. After using the method in this paper for medical video image spatial

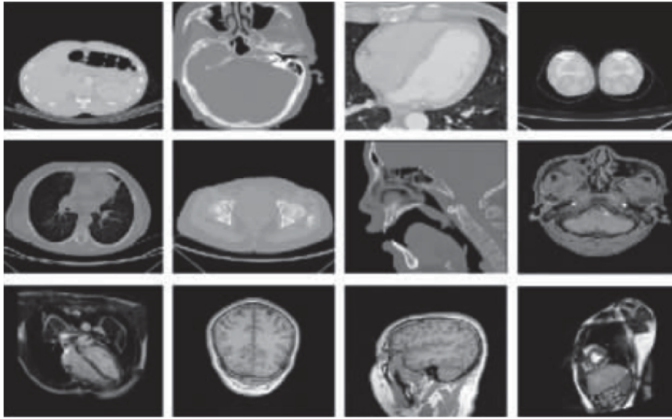


Fig. 2. Example of medical big data video data

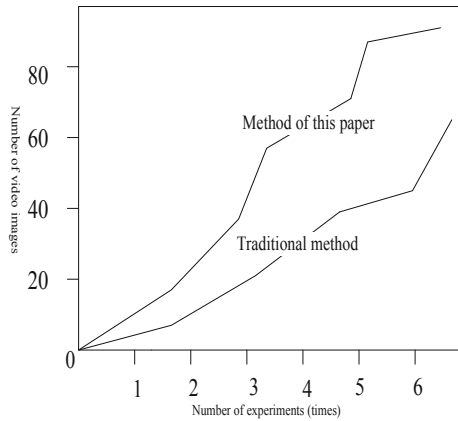


Fig. 3. Comparison diagram of video image data fusion

fusion, the resolution of the output image is about 300 dpi, the imaging quality is high, more clear, and the actual application effect is good.

Image fusion error rate comparison test is shown in Fig. 5.

From the analysis of Fig. 5, it can be seen that the fusion error rate of the traditional method is between 19% and 23%, while the error rate of the method in this paper is always lower than 5%, which shows that the image scale space fusion error of the method in this paper is far lower than that of the traditional method, with high fusion accuracy and feasibility.

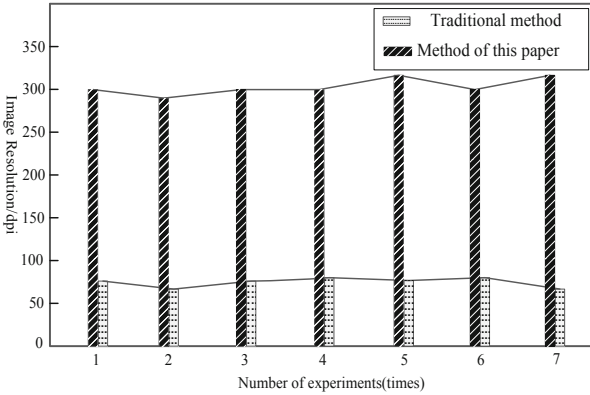


Fig. 4. Different methods of fusion image resolution comparison

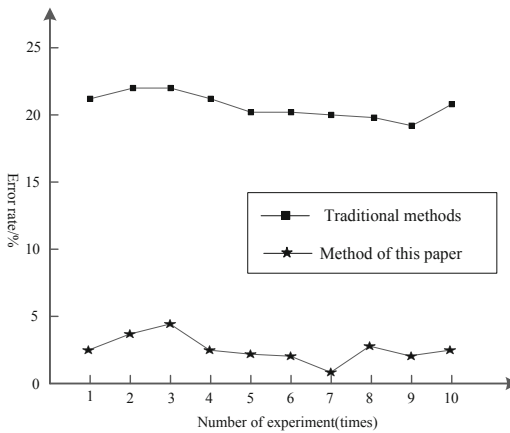


Fig. 5. The error rate of different methods is compared

4 Conclusions

In the aspect of video image information fusion, it is necessary to classify the database generation and images with different attribute formats, and to achieve a large number of fusion of image scale space efficiently to a certain extent, so as to promote the continuous progress of medical information management technology. So according to the characteristics of medical big data video image, this paper designs a new image scale space fusion method. From the aspect of video image visualization and multi-dimensional space fusion, the space fusion method is designed respectively, and the sampling survey method is adopted for experimental analysis to obtain experimental data. The experiment verifies the feasibility and reliability of the design method. This method is very important for the improvement of medical system, the effective arrangement of medical data, the convenience of staff operation, and the promotion of

medical development. It is also of clinical application value for the people's life and the development of the country. In the future research, we should further describe the local features of medical images, and build a fusion classification model combining local and global features to further improve the classification performance.

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