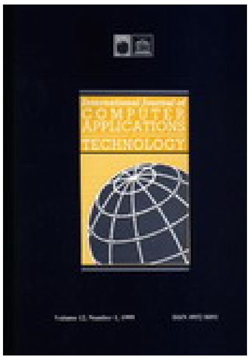

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Xiawei Lu

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Digital media video image data processing based on computer vision

Xiawei Lu

National Demonstration Centre for Experimental Designing Art Education,
Tai Yuan University of Technology,
Jinzhong, Shanxi, China
Email: luxiawei@tyut.edu.cn

Abstract: This paper describes the application direction of DMVI processing technology and the acquisition and post-processing of ultra-high-definition quality data, explores the application of DMVI processing technology in image analysis, proposes a method for obtaining ultra-high-definition quality video data, and discusses the reconstruction of ultra-high-definition quality video. According to the research results, satisfaction with the introduction of the five-dimensional light field function algorithm and CV technology reached over 21%; at 4K resolution, the processing time of the five-dimensional light field was 1.05±0.15 seconds, far superior to deep learning (10.2±0.85 seconds); at noise restoration, the restoration quality index of the five-dimensional light field dropped from 0.90 to 0.85, while the traditional CV and frequency domain filtering saw even greater declines. In addition, the five-dimensional light field performs well in both PSNR and SSIM indicators, and can maintain better image quality and detail preservation under high noise conditions.

Keywords: digital media video image; image data processing; computer vision; ultra clear picture quality image.

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Biographical notes: Xiawei Lu received her Master's degree from Taiyuan University of Technology. Now, she is working in College of Art, Taiyuan University of Technology. Her research interests include digital media and animation.

1 Introduction

Digital Image Processing (IP) uses computer technology to reduce noise, enhance, restore, separate and other operations on images, aiming to improve image quality and solve problems such as image resolution, brightness and file size. Initially, image processing focused on extracting clearer and more satisfactory images from low-quality images, but with the rapid development of computer science, especially breakthroughs in Computer Vision (CV), multimedia computing and artificial intelligence, digital image processing has moved from academic fields to practical applications. Today, it has become an important technology in scientific research, digital media, medical imaging, security monitoring, remote sensing imaging and human-computer interaction. Especially in the field of Digital Multi-View Imaging (DMVI), the technical demand for processing ultra-high-definition image data is increasing. DMVI technology simultaneously acquires image data from multiple perspectives and processes them, and fuses them to generate higher-quality images. It is widely used in fields such as autonomous driving, medical imaging, film and television production and digital content creation. However, with the popularisation of ultra-high-definition images and videos, DMVI technology faces huge data processing pressure, especially in the processing of high-resolution images. How to ensure the efficiency of data transmission and the accuracy of processing has become a problem that needs to be solved urgently.

To address these challenges, this paper proposes an innovative solution based on computer vision technology, combined with a five-dimensional light field function algorithm, which significantly improves the accuracy and efficiency of DMVI data processing. The five-dimensional light field function algorithm describes the colour and spatial position relationship of the image in a five-dimensional space, making image processing more refined and avoiding the information loss problem in traditional two-dimensional or three-dimensional processing methods. This method can effectively capture the tiny spatial and colour changes in the image, thereby improving the spatial resolution, colour depth and detail retention of the image. Combined with computer vision technology, this algorithm can not only perform real-time analysis and target recognition during image reconstruction, but also improve the automation of image processing, reduce manual intervention and improve processing efficiency. Compared with traditional DMVI processing systems, the five-dimensional light field function algorithm can overcome the problems of insufficient accuracy and slow processing speed, and significantly improve the accuracy and transmission efficiency of image data acquisition, especially in high-demand application fields such as autonomous driving, medical imaging and digital content creation. The introduction of this technology provides a faster, more accurate and scalable solution for ultra-high-definition image processing, showing great potential in high-precision image analysis and fast data transmission in the future. With the continuous development of this technology, its application prospects in the field of digital image processing will be broader.

The innovation of this paper is to combine computer vision technology with the five-dimensional light field function algorithm to propose a new DMVI data processing method. This method uses a five-dimensional space model to refine the processing of ultra-high-definition images, overcomes the limitations of traditional DMVI technology in processing accuracy and speed, and significantly improves image quality and data transmission efficiency. The purpose of this paper is to solve the problems of large data volume and slow processing speed in high-resolution image processing, and provide more efficient and accurate image processing technology support for fields such as autonomous driving and medical imaging.

2 Related work

CV is widely used in DMVI analysis. Kumar (2019) proposed a hybrid domain-based image fusion security technology for privacy protection and copyright protection. This method provided a security technology for digital content in the cloud environment. Two cloud services were used to develop this work, thus eliminating the role of trusted third parties. Ma (2019) gave a systematic, comprehensive and up-to-date overview of image and video compression technology based on neural networks, introduced the evolution and development of image and video compression methods based on neural network respectively, and revealed the interesting exploration of the next generation image and video coding framework or standard. Ansari and Wajid (2021) ensured the security of multimedia content by obtaining evidence of images and videos. Yao and Hu (2020) briefly introduced the basic principle and the challenges of VioBD, then category the existing approaches according to their framework, including the traditional framework, end-to-end deep learning framework and hybrid deep learning framework. Sengonul et al. (2025) introduced an innovative methodology for anomaly detection in video data, encompassing three primary stages: preprocessing, feature learning and anomaly detection. It was also characterised by fake news and uncritical consumption of the media. Pearce (2020) challenged these two popular forms of social media research by outlining the method of visual cross-platform analysis, which was defined as static and moving image research across two or more social media platforms. Yoo and Woo's (2021) research found that the progress of science and technology has made information transmission and sharing possible at any time. In the case of images, there was a risk of transmitting and randomly sharing intentionally modified images. The above studies have described the importance of DMVI analysis, but there are still some deficiencies in the research on CV.

Many scholars have analysed and studied image data processing. The survey of image enhancement algorithms discussed by Shorten and Khoshgoftaar (2019) included geometric transformation, colour space enhancement, mixed image, random erasure and feature space enhancement. Other features of data enhancement were briefly discussed, such as test time enhancement, resolution effect, data set size of fuzzy neural network analysis and course learning. Monga et al.'s (2021) survey found that the deep neural network has provided unprecedented performance improvement in many practical problems of signal and IP. Despite these advances, the future development and actual deployment of deep networks were hindered by their nature. Kaur et al. (2019) aimed to compare and analyse the methods of contemporary unbalanced image data analysis technology from the data preprocessing reference, algorithm and mixed paradigm, and compare and study the alternative data distribution and its application fields. Furuta et al. (2019) used pixels for reinforcement learning of IP. An effective learning method was proposed, which considered not only the future state of its pixel, but also the future state of adjacent pixels, thus significantly improving the performance. Zhang (2020) proposed a novel multi-view multi-label sparse feature selection method, which used view relations and label correlation to select discriminant features for further learning. Min (2019) systematically studied the evaluation of image defogging algorithms using synthetic hazy images. The first was to establish a synthetic haze removal quality database by integrating some functions related to haze removal, including image structure restoration, colour reproduction and over-enhancement of low-contrast areas. The above studies have analysed the application of image data processing, but there are still some deficiencies in the research of CV.

3 Development and application of DMVI processing technology

3.1 Evaluation of DMVI data processing elements

With the development of computers, DMVI processing technology has emerged as required by the times. It is a new technology that is constantly improving and maturing, and has made great progress in theory and practice. In the early stage of development, IP was designed to produce high-quality images, input low-quality images and obtain high-quality output images, which are usually used for recovery and compression. DMVI processing technology is also very successful in the medical field. The rapid development of computers and intelligence has led to the development of image processing technology. It includes access control and digital image protection. The mark-based control protects the image through the Joint Photographic Experts Group (JPEG) method. Through image protection, the marking problem is better solved. The technical image marking method mainly uses data compression and a low-frequency filter to achieve reasonable design standards and effectively improve the level of digital IP technology.

3.2 Main contents of digital IP evaluation

In the stage of image acquisition and image generation, the analogue image signal is basically converted to a digital format acceptable on the computer, and the digital image is displayed in the required format. If the reason for image degradation is known, the image can be adjusted using recovery technology. The recovery method is based on the data model and image. The influence of degradation is solved by restoration, and the image conforms to the ideal IP system. If the quantitative information of image degradation is not clear, image quality can be improved in a more subjective way through image enhancement technology. Through extraction and display, the computer can classify, recognise, understand or interpret images. Image reconstruction in multi-dimensional projection is considered a special image recovery technology. The main purpose of image coding and image compression is to compress, store and transmit data, as shown in Figure 1.

3.3 Application of DMVI processing technology

DMVI processing technology allows high-quality images to be maintained in various conversion processes, and always ensures high-quality images. The current IP technology can display analogue images in digital form and convert them into corresponding tables closely connected with the conversion equipment. In theory, these parameters can be changed and converted without considering the accuracy of the paper. There are many sources of information for creating images. People can mitigate the impact of different information sources by changing the digital coding. All these can be displayed as corresponding image arrays and solved by computers. Especially in optics, linear calculation can only be carried out at the theoretical level, which limits the target to a certain extent. However, in digital IP, linear computing can not only be successfully applied, but also be used for nonlinear processing. There is a strong connection between the pixels in the image. Multifaceted images usually have the same pixel or grey level, so information compression plays an important role in IP.

Figure 2 shows the process of improving video quality through advanced computer vision and image processing techniques. It starts with capturing the original video stream, followed by ultra-clear data acquisition and optical parameter adjustment, including depth of field control through a high-resolution lens. The image is pre-processed and restored, and the degradation model is processed for enhancement. Computer vision processing includes low-level, intermediate and high-level processing, involving tasks such as denoising, contrast adjustment, region segmentation and semantic understanding. Finally, through steps such as a five-dimensional light field algorithm, light field slice reconstruction and non-linear editing, the video is reconstructed and outputs ultra-clear image quality.

Figure 1 Main contents of the digital IP research (see online version for colours)

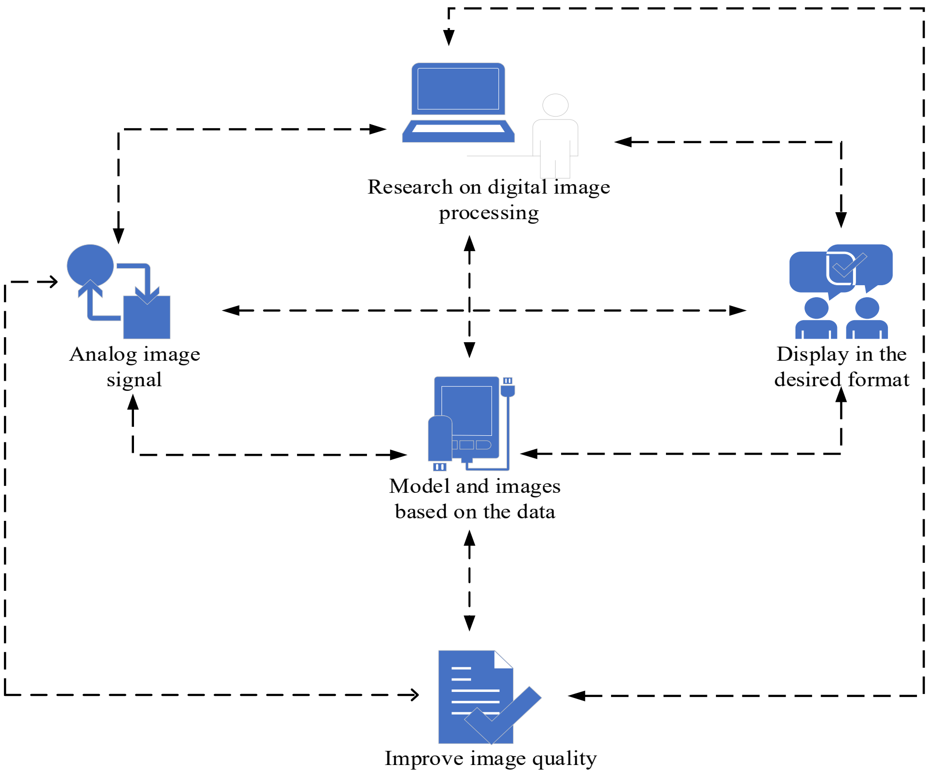
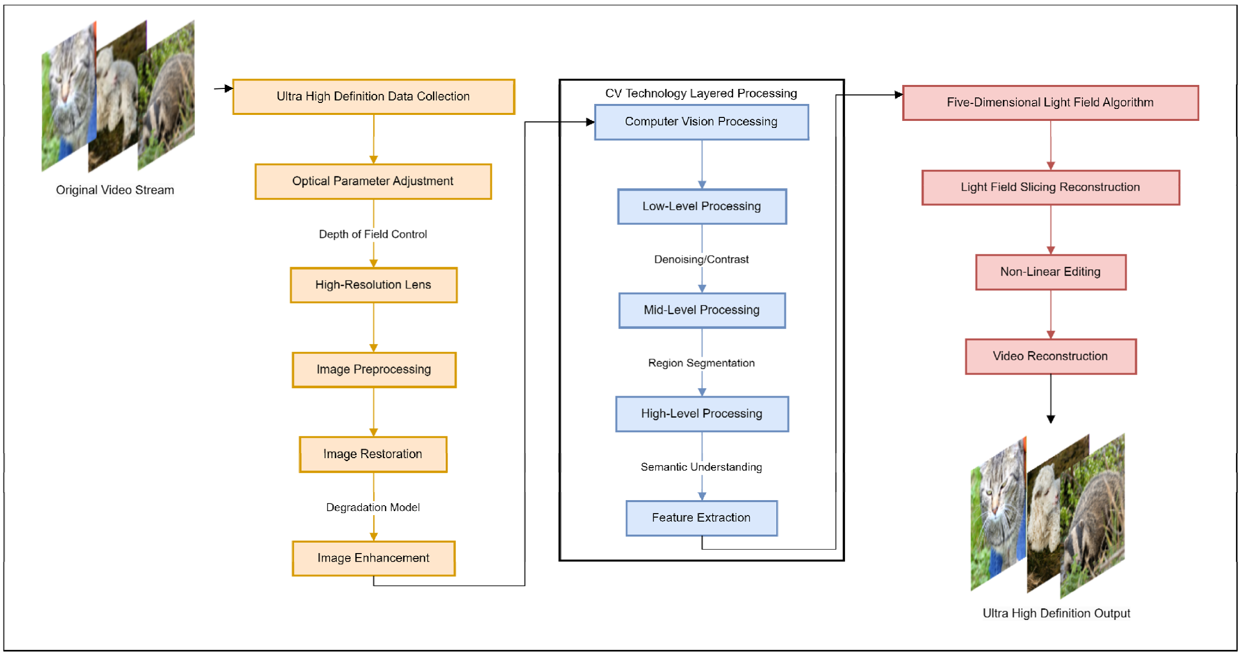


Figure 2 Schematic diagram of image and video processing (see online version for colours)



4 Application direction of DMVI processing technology and acquisition and post-processing of ultra-clear image quality data

4.1 Application of DMVI processing technology in image evaluation

Image conversion is mainly through image reduction. It is not performed directly in space, but mainly in the conversion fields related to space conversion. Image conversion can significantly reduce the workload and improve the efficiency of IP. The compression algorithm can not only prevent image distortion, but also improve the efficiency of IP, reducing the number and space of image storage, simplifying image processing and transmission to a certain extent. The coding algorithm is the most important technology in the process of image compression. The coding algorithm mainly includes transform field coding and precoding. Image enhancement and restoration technology can effectively improve image quality and image definition. Image separation technology mainly involves extracting image feature edge areas to create special conditions for image recognition and analysis. Although the image separation technology has made great progress, the current image separation technology has not been popularised. Therefore, with the rapid development of AI, image separation technology has become a more important direction, and image recognition is the most important field in AI research. Image recognition is also a part of shape recognition. This technology can separate the pre-processed images and extract their features, and then classify them using a neural network, as shown in Figure 3. In addition, image recognition can correctly classify images according to the training set.

4.2 Ultra-definition video data acquisition

Yi (2019) showed that the acquisition of ultra-clear image quality video is obtained through camera shooting. Because of the high resolution of ultra-clear image quality, the horizontal angle of view is greater than the standard resolution, and the depth generated is certainly lower. Therefore, when shooting at a high resolution, in order to obtain an ultra-clear image, the depth must be adjusted before and after shooting to make the brightness of the object higher. In order to select shots, high-resolution shots are based on movie shots. The image is smooth, with high resolution, small field of view depth, strong stereoscopic sense and high lens transmittance. During the recording process, the requirements for high-resolution video recording must be strictly followed. Especially when recording high-speed moving surfaces, image stability, accurate understanding and clarity are very important. After recording, the data of the memory card can be directly transferred to the computer's hard disk through the data line or the card reader. The processing of ultra-clear video data faces a large amount of data in post-production. When selecting video materials, editing movie programs and printing and rendering movies with high-quality materials, people need to pay attention to format specifications. The video format of the output movie must meet the video quality standard of ultra-clear images. Users who need the full resolution format can directly export and render the format, or select an auxiliary format. The format compression method compresses high-definition video into a high-definition format to meet the needs of users.

4.3 Reconstruct the ultra-high-definition video

If necessary, image restoration settings such as cutting, moving, rotating angle and white balance can be used in non-linear editing to correct errors such as incorrect composition of the previous shot. At the same time, various special processing of materials can be carried out according to the needs of the project. This is the unique advantage of ultra-clear video. It is usually edited according to the needs of the film content, which is achieved by extending the viewfinder to a part of the image. In short, CV technology has brought new opportunities to the film and television industry. In CV, the data volume of ultra-high-definition video can be ranked at the front of the unit data volume. Higher reproduction and editing requirements provide more space for post-production films and television programs. Ultra-high-definition video is the future trend, and the use of CV technology to collect and process video data is the future development direction. Especially, the video equipment of CV technology has a strong vibration when processing video programs. At this stage, the quality of Ultra High Definition (UHD) video captured by the full High Definition (HD) video data not only adapts to the main development, but also meets the requirements of the current full HD practical work. At the same time, it has accumulated rich video data and program materials for the popularisation of the UHD video program, which is the most sensible choice at present, as shown in Figure 4.

Figure 3 Application of DMVI processing technology in image analysis (see online version for colours)

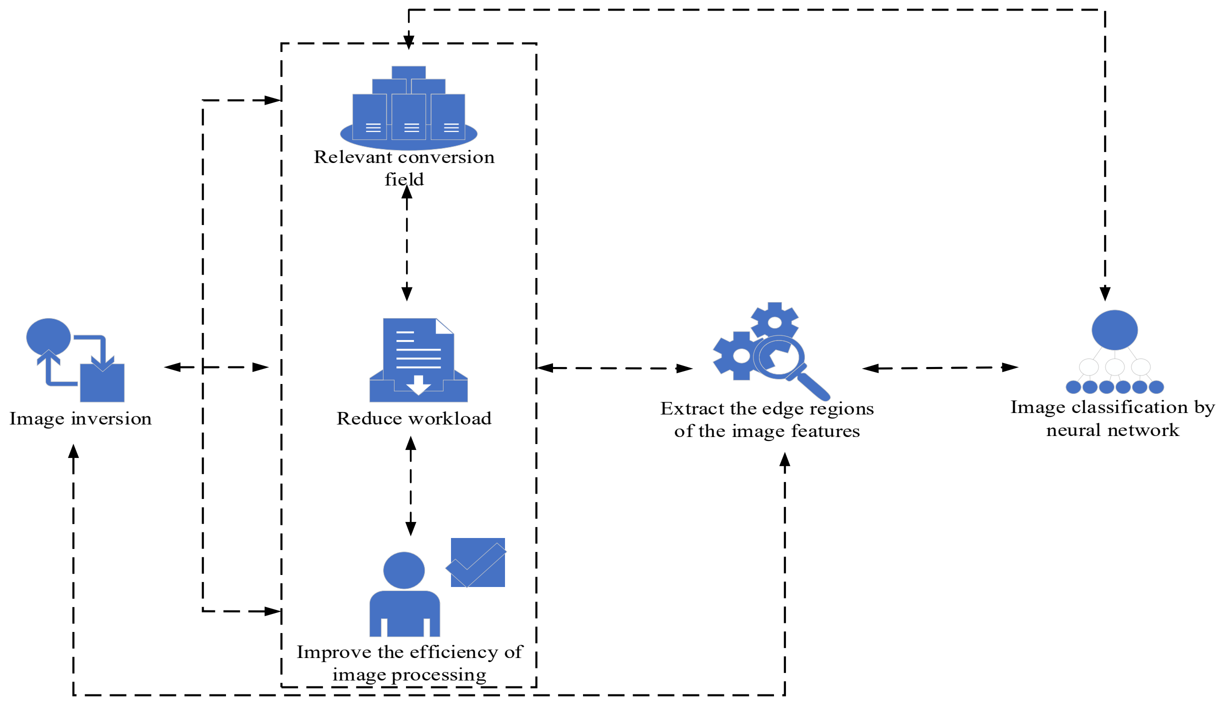
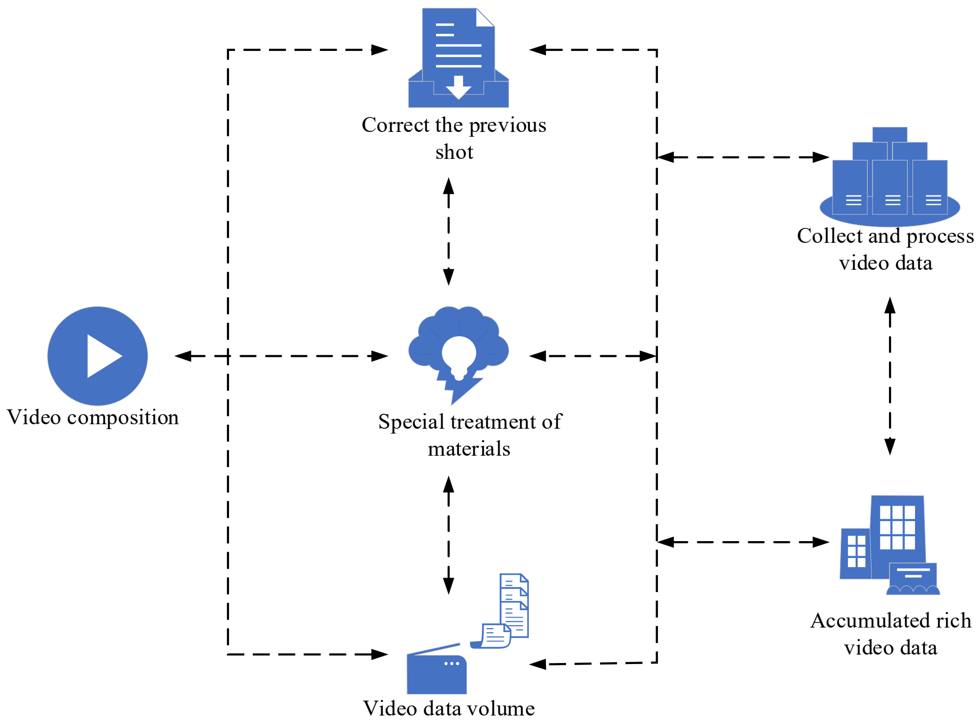


Figure 4 Recomposing the ultra-clear definition video (see online version for colours)



5 Evaluation of the application direction of CV technology in DMVI data processing

5.1 Evaluation of IP Technology in CV

The application of IP technology in CV can produce good results. IP technology includes IP and graphic analysis, and IP includes low-level, intermediate and advanced processing. The low processing level includes image noise, focusing on resolution pre-processing and image contrast. The middle layer processing is to divide the image into multiple areas to customise the edge contour and other attributes of the image. Advanced processing integrates vision and execution into image understanding. Wiley and Lucas (2018) showed that applying IP technology to IP would improve image quality and allow data conversion, which requires image enhancement, geometric image conversion, image colour, etc.

5.2 Common IP methods in CV

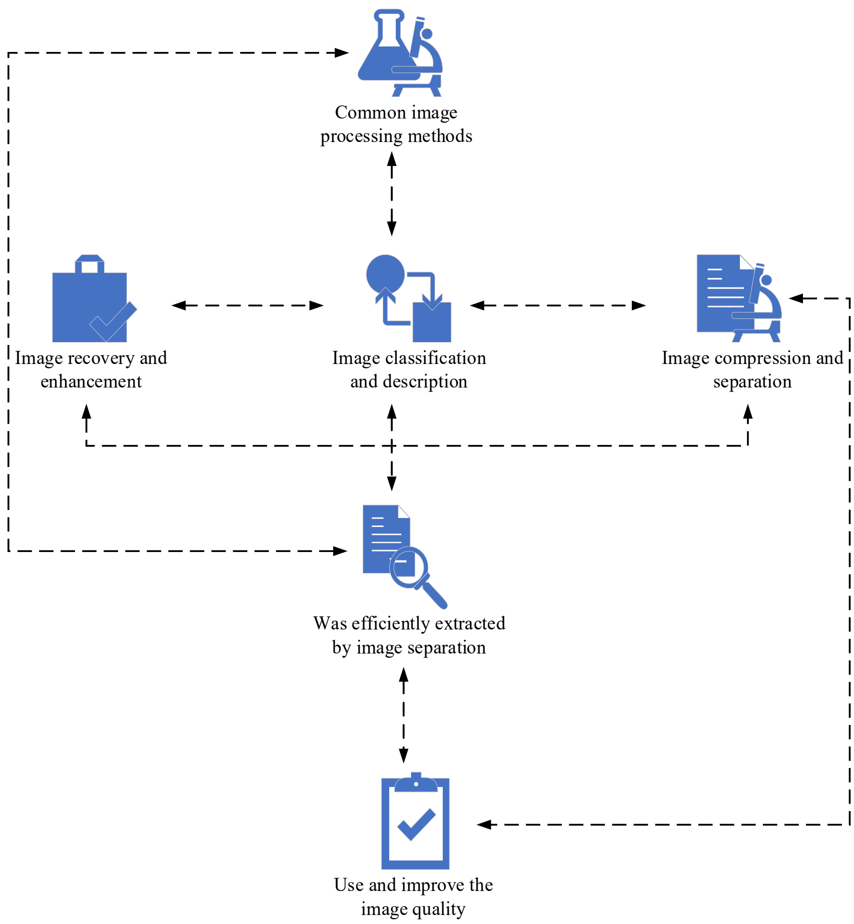
IP technology also needs effective processing methods, including image restoration and improvement, image classification and description, image compression and separation. These are all effective methods to improve IP results, including image conversion.

As a common processing method in IP, image description and classification are an important prerequisite for subsequent work, which directly affects the effect of IP. The existing image description includes a two-dimensional boundary and region description. If the image has a special texture, it can be classified according to its attributes. In order to ensure the efficiency of IP, appropriate compression methods must be selected to avoid affecting the image quality. The common image conversion methods are discrete cosine transform, Fourier transform, etc. This processing method can be applied to a large number of IP calculations and large matrices to increase the use of images and improve image quality, as shown in Figure 5.

5.3 Application scope of IP technology in CV

At present, the application scope of IP technology is gradually expanding, helping to improve people's quality of life, including the effective application of industrial production, biomedicine, communication technology, military security, culture and art and other fields. The application of IP technology in industrial production not only improves production efficiency, optimises and improves the quality of parts, but also ensures the safety of workers. Dhir et al. (2020) showed that the production parts are automatically classified and assembled by IP technology and undergo strict quality testing. If the production environment is not good and there are harmful gases, industrial research using IP technology can reduce work risks, and the application of IP technology in biomedicine can help doctors diagnose various diseases.

Figure 5 Common IP methods used in CV (see online version for colours)



6 Enhanced DMVI data processing based on five-dimensional light field function algorithm

With the development of ultra-clear image data processing technology, traditional image processing methods often face some challenges when processing high-resolution images, especially in terms of image detail recovery, clarity enhancement and noise removal. In order to effectively solve these problems, this paper proposes an enhanced Digital Media Video Image (DMVI) data processing method based on a five-dimensional light field function algorithm. This method uses the five-dimensional spatial characteristics of the light field function to finely reconstruct and enhance the image data, thereby effectively improving the image's spatial resolution, colour depth and detail retention capabilities.

The core idea of the five-dimensional light field function algorithm is to describe the colour and position relationship of the image in five-dimensional space so that the image data can be reconstructed more accurately in multiple dimensions. The key to this process is to couple each pixel in the image with its spatial position and colour information through a five-dimensional coordinate system to obtain a more complete image expression. Assume that the image is represented in five-dimensional space as $f(x, y, z, \theta, \phi)$, where $(x, y,)$ z are the spatial coordinates, θ and ϕ is the direction angles of the light. This five-dimensional coordinate system can effectively capture the tiny spatial and colour changes in the image, thereby avoiding the information loss in traditional three-dimensional or two-dimensional image processing methods. With the help of the five-dimensional light field function, we can construct a high-precision reconstruction model of image data. Formula (1) shows the basic form of the model.

$$f(x, y, z, \theta, \phi) = I(x, y, z) \cdot L(\theta, \phi) \tag{1}$$

Among them, $I(x, y,)$ z represent the brightness value of a point in space, $L(\theta, \phi, \phi)$ and represent the distribution of light direction at that point. By performing this multi-dimensional modelling on the image data, we can perform more refined processing at different depths, colour levels and texture levels of the image. Through further algorithm optimisation, we can use high-speed rotating two-dimensional projection technology to slice the light field, thereby converting the five-dimensional light field into a two-dimensional image for analysis and reconstruction. Specifically, we use the following formula (2) to achieve slice reconstruction of the light field.

$$f'(x, y, \theta, \phi) = \int_z f(x, y, z, \theta, \phi)\, dz \tag{2}$$

The core of this formula is to obtain the light field slice of the image in a specific direction by integrating over the spatial coordinates, thereby restoring the high-definition image content. This five-dimensional light field processing method can effectively improve the image's temporal resolution, spatial resolution and pixel-level detail performance during the image enhancement process, and is particularly suitable for post-processing of ultra-high-definition images and video data.

In addition to enhancing the spatial and colour information of the image, the five-dimensional light field function algorithm can also further improve the recognition, classification and analysis accuracy of the image by introducing Computer Vision (CV) technology. In the process of image reconstruction and enhancement, CV technology can identify the target in the image and perform real-time image quality assessment, and improve the efficiency and accuracy of image processing by continuously optimising algorithm parameters.

Figure 6 Reconstruction and enhancement of images based on the five-dimensional light field function algorithm (see online version for colours)

In summary, the enhanced DMV data processing method based on a five-dimensional light field function has shown its unique advantages in the field of image processing. It can not only improve image quality but also effectively reduce information loss in the image processing process, especially in the acquisition and post-processing of ultra-high-definition video data, which can greatly improve the visual effect and detail fidelity of the image. With the continuous development of light field technology and computer vision technology, this method will play an increasingly important role in the field of digital media image processing in the future.

7 Based on the five-dimensional light field function algorithm and experimental investigation and evaluation

In the evaluation experiments of this study, multiple representative data sets were used to ensure the breadth and accuracy of the algorithm evaluation results. The selected data sets cover different types of Digital Media Video Images (DMVI), including high-resolution images, video frames and damaged images with noise and blur. These data sets can comprehensively examine the performance of image processing algorithms under different image qualities and complexities, especially in the scenario of ultra-clear image data processing. The selection of data sets not only takes into account the clarity and detail level of the image but also includes various interference factors in the image, such as noise, blur and low-contrast areas.

In addition, all data sets are standardised to ensure consistency and comparability in algorithm evaluation. The number and resolution of images in each data set are also carefully selected to simulate the challenges of image processing in real scenes. The data sets used in the experiment include public data sets and specially annotated data sets to ensure that the algorithm evaluation can cover a wide range of application scenarios. The diversity of these data sets provides a solid foundation for the evaluation of algorithm performance and ensures the objectivity and reliability of the evaluation results.

7.1 Image quality assessment

Image quality assessment is one of the important indicators to measure the effect of image processing technology. In order to evaluate the clarity and authenticity of the processed image, we use a combination of subjective and objective evaluation methods. Subjective evaluation is done by professionals visually scoring the processed image based on the sharpness, detail recovery and noise processing effect of the image. Objective evaluation calculates the image quality score through commonly used image quality assessment algorithms, such as Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity (SSIM) index. PSNR is used to measure the error of the image, while SSIM evaluates the similarity of the structural information of the image. Combining these two evaluation methods, the quality of image processing can be evaluated more comprehensively.

Figure 7 shows two parts of the image quality evaluation, comparing the performance of different algorithms using the two indicators of PSNR and SSIM. In the PSNR comparison bar chart on the left, the noise level gradually increases from 0.01 to 0.05. The data in the figure reflects that under different noise levels, the PSNR value of the five-dimensional light field algorithm has obvious advantages over the traditional CV algorithm and frequency domain filtering method, indicating that the algorithm can maintain higher image quality under noise interference. The increase in PSNR value means that the image is less different from the original image after processing and has better quality. The SSIM comparison line chart on the right shows the performance of the five algorithms on 10 test images. The SSIM value of the five-dimensional light field algorithm is generally higher, especially when the image ID is 1, 6 and 10, showing more significant image structure similarity, showing the advantages of the algorithm in detail recovery and image structure preservation. These results are consistent with the theme of the article, indicating that the application of the five-dimensional light field algorithm in ultra-clear image processing can effectively improve image quality and detail retention, especially in a noisy environment.

7.2 Time efficiency evaluation

Time efficiency is an important indicator to measure the performance of image processing systems, especially when processing high-resolution images. In order to evaluate the time overhead of different algorithms in the processing process, we use the running time of the processing process as the main metric. In the experiment, we first calculate the average processing time of the system by recording the complete processing time from image input to output. In order to ensure the accuracy of the results, each image processing task is executed multiple times and the average value is taken to reduce the influence of accidental factors. By comparing the time with other image processing techniques, we can evaluate the efficiency and feasibility of this method in practical applications.

Table 1 shows the processing time and standard deviation of five image processing methods (five-dimensional light field, traditional computer vision CV, frequency domain filtering, deep learning and wavelet transform) at different resolutions. As the image resolution increases, the processing time of all methods shows a gradual increase. At 4K resolution, the processing time of the five-dimensional light field method is 1.05±0.15 seconds, while the processing time of deep learning is as high as 10.2±0.85 seconds, showing that the computational burden of deep learning methods at high resolution is relatively heavy. In contrast, the processing time of the five-dimensional light field and wavelet transform is shorter. At 8K resolution, the processing time of the five-dimensional light field is still 4.50±0.60 seconds, while the processing time of traditional CV and frequency domain filtering increases significantly, indicating that traditional methods are less efficient when processing high-resolution images. This data reflects the demand for efficient image processing mentioned in the article, especially the application advantages in the processing of ultra-high-definition images (such as 4K, 8K).

Figure 7 Compares the performance of different algorithms using the two indicators of PSNR and SSIM (see online version for colours)

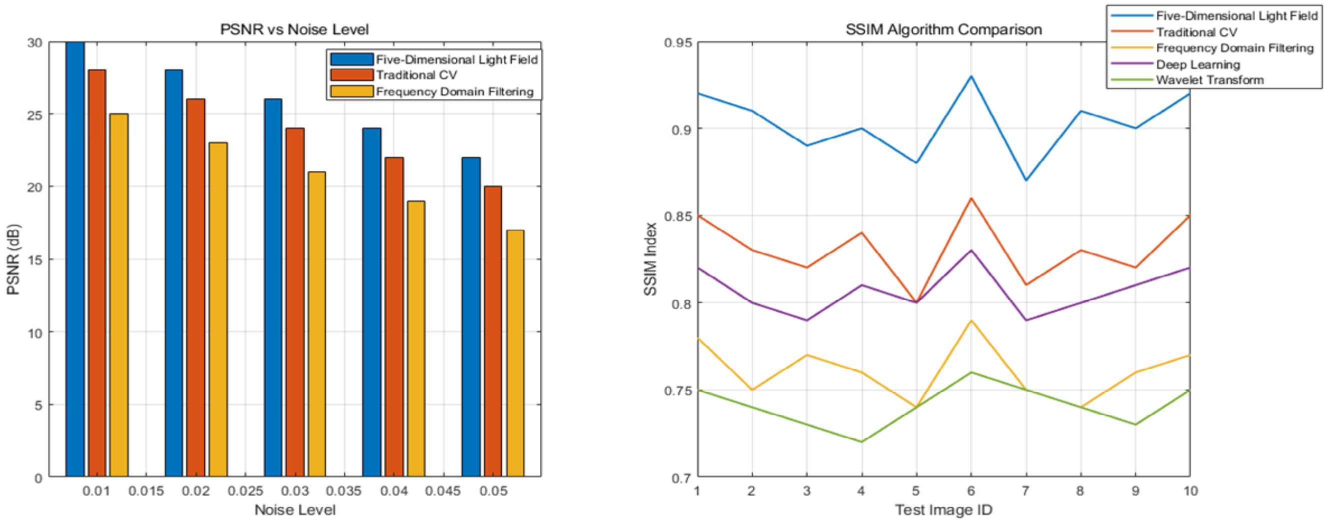


Table 1 Processing time and standard deviation of five image processing methods at different resolutions

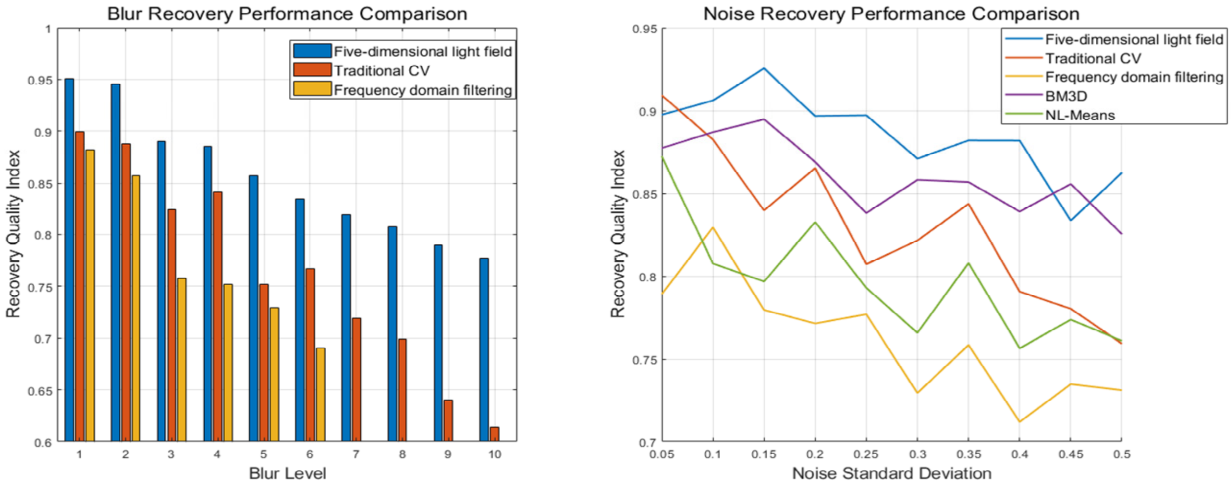
Resolution	*Number of images*	*Five-dimensional light field*	*Traditional CV*	*Frequency domain filtering*	*Deep learning*	*Wavelet transform*
480p	50	0.12 ± 0.02	0.28 ± 0.05	0.45 ± 0.08	1.85 ± 0.15	0.82 ± 0.10
720p	50	0.18 ± 0.03	0.42 ± 0.07	0.68 ± 0.12	2.30 ± 0.20	1.20 ± 0.15
1080p	50	0.25 ± 0.04	0.62 ± 0.10	1.05 ± 0.18	3.10 ± 0.25	1.75 ± 0.22
2K	30	0.48 ± 0.08	1.25 ± 0.20	2.10 ± 0.30	5.80 ± 0.45	3.20 ± 0.40
4K	30	1.05 ± 0.15	2.80 ± 0.35	4.50 ± 0.60	10.2 ± 0.85	6.50 ± 0.75
6K	20	2.20 ± 0.30	5.60 ± 0.70	8.80 ± 1.20	18.5 ± 1.50	12.8 ± 1.25
8K	20	4.50 ± 0.60	10.8 ± 1.25	16.5 ± 2.00	30.2 ± 2.50	22.5 ± 2.20

7.3 Data recovery capability assessment

The data recovery capability assessment focuses on the performance of the processing technology in restoring image details and reducing losses. The evaluation method mainly compares the differences between the original image and the processed image, especially the recovery of the detailed area. When using image restoration technology, especially in ultra-clear image processing scenarios, recovery capability is particularly important. In the experiment, we selected different types of damaged images, such as blur, noise interference, etc., and compared the restored image after processing with the original image, and used the image restoration quality standard to evaluate the recovery effect. Data recovery capability requires not only that the algorithm can handle the noise in the image, but also that it can restore the sharpness and colour information of the image to maintain a high visual effect.

Figure 8 shows the evaluation of data recovery capability, which is mainly divided into two aspects: blur recovery and noise recovery. The left figure shows the recovery quality index of different algorithms at different blur levels through a bar graph. The x-axis represents the blur level (1 to 10), and the y-axis represents the recovery quality index. The higher the value, the better the recovery effect. In terms of blur recovery, the five-dimensional light field algorithm performs best and the recovery quality index can be close to 1.0 at a lower blur level, while the performance of traditional CV and frequency domain filtering is relatively poor, especially at high blur levels, where the recovery quality index drops significantly. The right figure shows the recovery quality index (y-axis) of different algorithms under the noise standard deviation (x-axis from 0.05 to 0.5) through a line graph. The five-dimensional light field algorithm also performs well in noise recovery, and the recovery quality index gradually decreases from 0.90 to about 0.85, while the recovery quality of traditional CV and frequency domain filtering decreases more significantly, especially when the noise level is high. Overall, the data in the figure reflects the advantages of the five-dimensional light field algorithm in blur and noise recovery, which is in line with the research goal of the article to improve the processing capabilities of ultra-high-definition image quality data and demonstrates its potential in digital media image processing.

Figure 8 Evaluation of data recovery capability (see online version for colours)

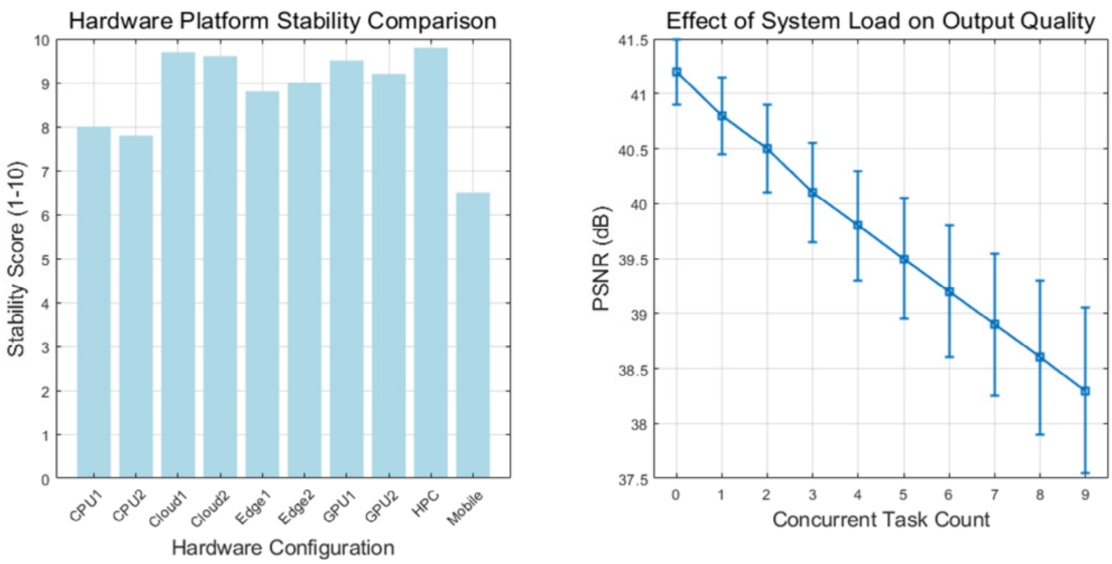


7.4 *Processing stability assessment*

The processing stability evaluation focuses on the stability and consistency of image processing technology in different environments and conditions. In the experiment, we repeatedly tested the performance of the algorithm under different hardware configurations, different data sets, and different processing conditions. The evaluation criteria include the stability, error range, and consistency of the processing results. During the experiment, the algorithm was run on multiple devices, and the output results were recorded. By comparing the performance differences on different devices, the adaptability and stability of the algorithm under different configurations were evaluated. In addition, through long-term processing tests, we observed whether the algorithm can maintain stable processing effects and output quality under long-term high-load operation.

Figure 9 shows the data processing stability evaluation under hardware platforms and load conditions, divided into two sub-figures. The left figure shows the stability of different hardware platforms, and the stability scores of 10 hardware configurations are shown in a bar chart. The hardware includes different models of GPUs, CPUs, cloud platforms and High-Performance Computing (HPC) systems. The stability scores range from 6.5 to 9.8, indicating the differences in processing performance between different platforms. GPU devices generally perform well, among which the HPC platform has the highest stability score, close to 10, while the stability of mobile devices is lower, only 6.5. The right figure shows the output quality stability of the system under different load conditions, which is mainly measured by Peak Signal-to-Noise Ratio (PSNR). As the load level increases, the PSNR gradually decreases, indicating that the processing quality of the system decreases with the increase in load. The mean of PSNR fluctuates under different loads, from 41.2 to 38.3 dB, and the standard deviation gradually increases, showing the impact of load on system performance. The figure shows that under high load conditions, the image processing quality will be affected to a certain extent, and the choice of hardware platform is crucial to processing stability.

Figure 9 Data processing stability evaluation under hardware platform and load conditions (see online version for colours)



8 Conclusions

In short, with the development of information technology, DMVI processing technology is also developing continuously. The development and application of new technologies can promote the development of DMVI processing technology to a certain extent. At present, the requirements for digital multimedia IP technology are getting higher and higher. The DMVI processing technology developed by experts has expanded the scope of application. The reliability and advantages of DMVI processing have been widely recognised. It not only provides people with clearer images and makes their lives and work easier, but also provides services for enterprises to meet people's needs. The development of IP technology can better meet and simplify such needs. This paper studies the construction and improvement of DMVI ultra-high-definition image data processing, expounds the construction of the DMVI ultra-high-definition image data processing system from multiple perspectives, applies CV technology to the construction of the image data processing system, and improves the image data processing system with a five-dimensional light field function algorithm, to make further contributions to image data processing. Experiments show that at 4K resolution, the processing time of a five-dimensional light field is 1.05±0.15 seconds, which is much better than deep learning (10.2±0.85 seconds). In noise recovery, the restoration quality index of five-dimensional light field drops from 0.90 to 0.85, while the decline of traditional CV and frequency domain filtering is greater. In addition, the five-dimensional light field performs better in both PSNR and SSIM indicators, and can maintain better image quality and detail retention under high noise conditions.

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Declarations

All authors declare that they have no conflicts of interest.

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