Image Signal Processing Based on Image Sensing Technology

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Abstract: with the Rapid Development of Computer Technology, Image Processing Technology is Also Rising and Has Been Applied in Many Fields. with the Dual Support of Computer Technology and Network Technology, the Current Video Surveillance System Has Developed into an All-Digital Surveillance Era Based on Ip Network and Entered the Third Generation of All-Digital Network Video Surveillance Era. All Digital Image Signal Processing Equipment, Such as Video Monitoring, Which We See in Our Daily Life, Will Be Limited and Affected by Weather, System Itself and Other Factors, and the Image Signal Processing Effect is Often Not the Best. People Have Higher and Higher Requirements for the Quality of Monitoring Image. to Improve the Practical Value of Monitoring Image Has Become a New Requirement for the Whole Monitoring Industry. in This Paper, the Basic Functions and Features of Image Signal Processing under Image Sensing Technology Are Analyzed, and Some Basic Technical Realization is Discussed.

1. Introduction

With the Dual Support of Computer Technology and Network Technology, the Current Video Surveillance System Has Developed into an All-Digital Surveillance Era Based on Ip Network and Entered the Third Generation of All-Digital Network Video Surveillance Era [1]. Although These Technologies Have Improved the Image Signal Processing to Some Extent, the Effect of Image Signal Processing is Often Not Up to the Ideal State Due to the Limitations of Weather Factors, Monitoring System Equipment Factors and Technical Conditions [2]. the Application of Digital Image Signal Processing is More and More Extensive. the Main Function of Digital Signal Processing is to Perform Post-Processing on the Signals Output by the Front-End Image Sensor. Its Basic Functions Include Linear Correction, Noise Removal, Bad Point Removal, Interpolation, White Balance, Automatic Exposure Control, Automatic Focus Control, Etc. [3]. People Have Higher and Higher Requirements for the Quality of Monitoring Images. Promoting the Practical Value of Monitoring Images Has Become a New Requirement for the Whole Monitoring Industry [4]. Intelligent and High-Definition Speeds Up the Development of Digital Image Processing Technology, and Image Signal Processing Technology is Constantly Evolving under Such Market Demand. These Digital Products Are Limited by the Harsh Weather and the Technical Conditions of the Monitoring System. the Video Images Often Fail to Achieve the Desired Results. the Unstable Image Quality Causes Difficulties in Operations Such as Identification, Forensics, and Event Analysis, and the System Cannot Be Properly Applied [5]. Therefore, the Research and Application of Image Signal Processing Technology is of Great Significance in the Field of Security.

2. Basic Function Analysis

2.1 Automatic Exposure

Too many scenes are often encountered when taking pictures, which will bring bad influence on the beauty of the imaged picture and have negative effect on the real imaging effect. The working conditions of image sensors are affected by various factors, such as the environmental conditions in image acquisition and the quality of sensor components themselves. During the actual

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photographing process, some scenes will be overexposed. When CMOS sensors do not know the change of light source, they still carry out the corresponding exposure according to the indoor picture, which will lead to overexposure [6]. The human eye can adjust the size of the pupil through the iris to control the amount of light entering the eye to achieve self-regulation. When people walk indoors to the outside, they feel that the light is very glaring, but once they adapt to the external environment, they will feel that the outdoor objects are not much brighter than the indoor ones. The automatic exposure technology can effectively solve the problem of excessive scenes. Its principle is to use a specific algorithm to first count the images that have been taken, and then use this as a basis to determine whether there is a strong change in light during shooting.

2.2 Noise Removal

Noise is the main factor affecting image quality, so it has always been the focus of image signal processing technology. The main source of noise is in the process of acquiring and transmitting signals, so in order to remove noise, a reasonable removal method must be formulated after the source is clear. Mean filtering can effectively smooth noise, but at the same time it will blur the edges [7]. In order to remove noise, the signal transmission process must be clearly defined, and then a reasonable removal method must be formulated. To remove noise, a more traditional method can be used for processing, such as average filtering. Although noise can be smoothed, the periphery of the image will not be blurred [8]. The bilateral adaptive filter not only has good filtering ability for all kinds of noises, but also can keep the details in the image well. The sliding window center pixel used in median filtering is the median of all pixels, which will also cause edge blurring and loss of smaller linear features. Some new bilateral automatic filters can be used, only the two-dimensional degree of the image can be processed, which not only has very good filtering effect, but also can save some details in the image.

For signals, due to band limitation, signal energy is mainly distributed in the low frequency region. Therefore, for noisy signals, the proportion of noise energy is small in the low frequency region and large in the high frequency region. Therefore, the focus of denoising should be on the high frequency region. Figure 1 is a structure of a digital image analysis system.

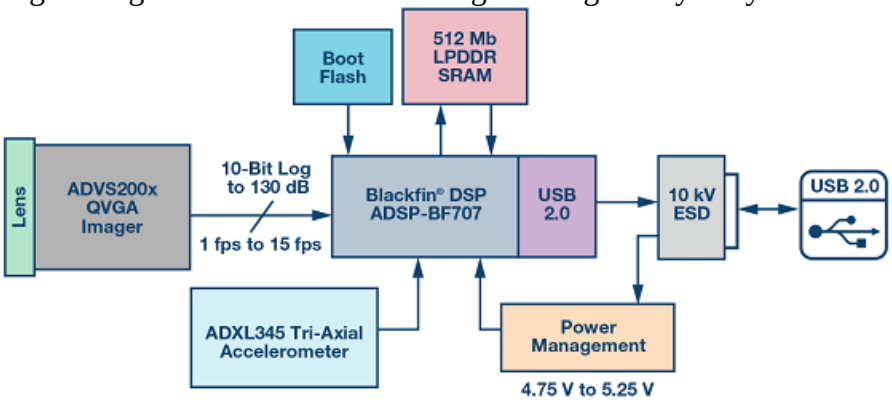

Fig.1 Digital Image Processing Analysis System Structure

3. Performance Analysis of Image Signal Processing Function

In the image noise reduction algorithm, according to the key points of time domain noise reduction, a new 3D noise reduction mode is formed by combining the two methods on the basis of space domain. The 3D noise reduction mode enables CMOS HD cameras to obtain some high-quality images in some low-light environments, and is closer to the actual effect seen by human eyes. Image content has strong correlation between frames. In the time domain, matching blocks are simultaneously searched in the previous frame and the following frame of the current frame based on motion estimation. Because the scene and content of the video sequence are all changing, the fast moving scene brings certain difficulties to focus, which may eventually lead to focus failure. If the motion intensity is small, time domain filtering is performed; if the motion intensity is too large, spatial domain filtering is performed on the current block. Through this combination of time

domain and spatial domain, noise in video images is effectively eliminated, thus obtaining smooth and rich texture details.

In fact, the scene and content of the video sequence are all changed, and it is very difficult to focus when the scene moves rapidly, and sometimes the focus fails. Therefore, in order to enhance the reliability of the focus, it is necessary to ensure that the video focus algorithm is good enough [9]. There are two combinations of multiple digital image windows: series and parallel. The adopted method is a control mode in which a proportion link and a plurality of digital image links are connected in parallel, and each digital image link tracks and controls a signal with a frequency. The system also takes into account the influence caused by the non-linearity of the inverter. The inverter parameters are shown in Table 1.

Table 1 Driver Power Inverter Parameters

Parameter	Numerical value
Modulation carrier period (μs)	130
Modulated carrier frequency (kHz)	12
Delay time (μs)	5
Flywheel diode voltage drop (v)	2

Under some strong contrast, the wide dynamic algorithm is used to compress the original data into a dynamic range. In this process, it should be ensured that there is no problem with the wide dynamic image original data. Because wavelet transform has zoom function and time-frequency localization, it can remove noise and preserve the details of the image, so it can reconstruct high-quality images. Analytic hierarchy process is used to comprehensively evaluate the perceived risks. The relative importance of each factor in the same level with respect to the same factor in the previous level is compared and a pair comparison matrix is constructed. The statistical results are shown in Table 2.

Table 2 Perceptual Layer Risk Comparison Data Results

	Residence time	Arrival rate	Views
Residence time	1	0.32	0.78
Arrival rate	0.87	1	0.59
Visits	0.66	0.45	1

During the shooting of the video, it is assumed that there is some fog, which leads to unsatisfactory image quality. At this time, the fog in the video is removed by real-time video fog penetration. In order to remove the fog from the video and improve the image quality, the fog penetration algorithm can be used. Using non-model image enhancement technology, the contrast of the image is improved to meet the requirements of visual clarity. Excellent video auto-focus algorithm is the basic condition to ensure successful focus and enhance focus reliability [10]. The convergence speed of the focus should be fast and accurate. During the focusing process, the clarity of the image should be ensured to change in one direction. From the perspective of application effect, the original image processing was carried out when the image was collected. After comparing with back-end video recording equipment and other equipment, it was found that the back-end equipment had better processing effect. For a specific backlighting scene, the wide dynamic processing algorithm uses short exposure in strong illumination areas and long exposure in low illumination areas, and combines short exposure data and long exposure data with relevant algorithms. For ultra-long exposure backlight, there will be some obvious saturation degree. When reaching a certain range, its backlight will be submerged at the bottom of noise, thus accurately evaluating the scene range.

4. Conclusion

Image signal processing technology has been applied to many industries. Although it has been applied in many aspects and achieved good results, there are still some problems in practice. Digital image signal processing technology is the most basic application unit of intelligence and high definition. Its performance directly affects the quality of the entire video monitoring system. The

research and application of image signal processing technology in monitoring industry is still in the primary stage, and the objective environment is complex and changeable. People have higher and higher requirements for the quality of monitoring images. Promoting the practical value of monitoring images has become a new requirement for the whole monitoring industry. From the perspective of application effect, the original image processing is carried out when the image is collected. After comparing the back-end video recording and other equipment, it is found that the back-end equipment has better processing effect. In the current trend of intelligent and high-definition monitoring, digital image signal processing technology is the most basic application unit of intelligent and high-definition, its performance directly affects the quality of the entire video monitoring system. When video surveillance is developing towards intelligence and digitalization, image signal processing should keep up with the trend of the times, and make more efforts to get an accurate result.

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