Literature Survey of Haze Removal of Secure Remote Surveillance System

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Abstract:-A reliable method for dehazing image and video was proposed. The goal is to achieve good dehazed images and videos with proper security at the receiver side. The image was dehazed by dark channel prior. The system based on fast single image dehazing and here the codecs used is joint photographic expert group which is based on key observation model. Then the compressed image is extended to compressed video, by using codecs H.264, the video was dehazed by block matching algorithm which is used to reduce the temporal redundancy between frames in video compression. Then by considering the dehazing effects before or after compression, the coding artifacts and motion estimation were investigated. Before compression produce better dehazing performance with fewer artifacts and better coding efficiency than after compression. By using the two algorithms, the thickness of haze and haze free images and videos can be estimated directly. Then a watermark is added for digital right management and the watermarked image and videos is encrypted with a fast and reliable light weight algorithm. This image and video is transmitted to the receiver side. At the receiver side, the use with correct key can decrypt the image and the image will be watermarked with watermark symbol the watermarked image can be used to trace illegal distribution. Thus this system produces a dehazed image and video with high secure and fast transmission.

Keywords:-Dehazing, Watermarking, Rate-distortion, Key-management.

I. INTRODUCTION

Haze is traditionally an atmospheric phenomenon where dust, smoke and other dry particles obscure the clarity of the sky. The inter-frame motion for dehazed images developed the technique based on dividing a frame into smaller rectangular blocks and finding the direction of minimum distortion (DMD) for each block [1].The efficiently assessing and subsequently reducing, the severity of blocking artifacts in compressed image bit streams are operate in the discrete domain transform. To reduce the blocking artifacts, the human visual system (HVS) method will be used [2].The most commonly used methods for image compression are closed-form expressions for compressed medical images. It require large amount of memory space [3].Gary level grouping (GLG) is a general and powerful technique and it used to apply to a broad variety of low contrast images and can be conducted with full automation at fast speeds [4].The extension of basic GLG algorithm used to break the gray scale into two or more segments and each segment perform the basic concept when to treat the X-ray images [5].

To enhance the contrast DCT domain, the simple, adaptive and easy to implement with great potential for enhancing the quality of medical images are used [6].MPEG is an industrial standard for video processing and is widely used in multimedia applications in the Internet. The selective encryption algorithm is used to secure those MPEG transmissions [7].The problems of the MPEG video encryption algorithm are discussed by using random permutation list instead of zigzag order within the MPEG compression [8].The two way selective encryption algorithm for the video is developed to compromise the security and speed in the process of encryption [9].To keep continuous security, key management is also an essential part of the system. In this system, that needs three kinds of keys which take the form of frame [10].A dark channel prior is used to remove the haze from single input image [11].The overview of H.264/AVC is used to achieve a significant improvement in rate distortion theory [12].The new motion compensation technique is used to overcome the large calculation of time complicated motion vector prediction algorithm [13].The adaptive fuzzy filter improves both visual quality and PSNR of compressed images and videos[14].The formation of a haze is contributed by direct attenuation and absorbed other directions [15].The scrambling key is used to conjunction and protecting the digital video streams from un authorized viewing [16].

II.LITERATURE REVIEW

A. Dark channel prior

K.He proposed a dark channel prior which is used to remove haze from single input image. It is a simple but effective image prior. The concept of dark channel is an arbitrary image J and its dark channel J^{dark} . The intensity of J's dark channel is low and tends to be zero. This is called by dark channel prior. The dark channel prior is based on the statistics of outdoor haze-free images. The statistics gives very strong support to the dark channel prior. Most local patches in haze free outdoor image contain some pixels which have very low intensity at least one colour channel. So the prior is used to directly provide an accurate estimation of the haze transmission. The processing steps to remove haze from single image

is calculate atmospheric light for input image, estimate transmission for images (DCP), refined transmission by using soft matting algorithm and get dehazed images.
The system may fail when the model is physically invalid, fail to recover the true scene radiance of distance objects and remains are bluish. These are some limitation of dark channel prior technique.

B. Rate-distortion efficiency

Thomas Wiegand, Gary J. Sullivan, Gisle Bjontegaard and Ajay Luthra proposed an overview of the technical features of H.264/AVC, which is used to achieve a significant improvement in the rate-distortion efficiency. It is the newest international standards. The main goals of the H.264/AVC standardization effort have been enhanced compression performance and provision of a "network-friendly" video representation addressing 'conversational' (video telephony) and "non conversational (storage, broadcast, or streaming) applications. H.264/AVC encoder design consist two main layers, such as video coding layer and network abstraction layer.
Video Coding Layer (VCL)
Video coding layer design is based on conversational block-based motion-compensated hybrid video coding concepts. This is designed to efficiently represent the video content. The video coding layer provides the majority of the significant improvement in compression efficiency in relation to prior video coding standards. It is rather a plurality of smaller improvements that add up to the significant gain.
Network Abstraction Layer (NAL)
This formats the video coding layer representation of the video and provides header information in a manner appropriate for conveyance by a variety of transport layers or storage media.

C. Motion vector prediction

Sheng-Zen Wang, Ting-An Lin, Tsu-Ming Liu and Chen-Yi Lee proposed the new motion compensation design, which is used to overcome large calculation time of complicated motion vector prediction (MVP) algorithm and high motion resolution in H.264/AVC. It can efficiently reduce memory access and increase data reuse probability. The proposed motion compensation is composed of three different parts. They are motion vector predictor, interpolator and reconstruction part.
Firstly, motion vector predictor generates the prediction value according to motion vectors of neighboring blocks, which is stored in shift registers and motion vector buffer units motion vector prediction is the smallest block element in later prediction is 4x4 and each sub-block or macro block can be decomposed to several 4x4 blocks with the same motion vector. Then the interpolator fetches the proper samples from external reference frame memory according to the address calculated from address generator. These interpolated data add to residual data which is generated from entropy decoder, rescaling and IDCT. Finally, the reconstructed data restores to external frame memory after de blocking filter. Two frame memories are exploited to keep current frame and previous frame reciprocally.

D. Artifacts reduction

Dung T. VO, Troung.Q Nguyen, Sehoon Yea and Antony Vetro proposed adaptive fuzzy filter which is used to reduce artifacts in compressed images and videos. To avoid the blurring effect of linear filters a fuzzy filter is implemented. Fuzzy filter is a special case of bilateral filters. Fuzzy filters help de-noising the artifacts while retaining the sharpness of real edges. For JPEG images, the fuzzy spatial filter is based on the directional characteristics of ringing artifacts along the strong edges. For compressed video sequences, the motion compensated spatiotemporal filter (MCSTF) is applied to intra-frame and inter-frame pixels to deal with both spatial and temporal artifacts. The adaptive fuzzy filter improves both visual quality and PSNR of compressed images and videos. In image and video compression, the artifacts such as blocking or ringing artifacts are spatially directional and flickering artifacts are temporally directional.
Ringing artifacts in JPEG images are prevalent long strong edges and the filter strength should adapt to the edge direction. For real images with more complicated edges, the strongest filtering is applied to the direction perpendicular to the edge. So the edge based directional fuzzy filtering is proposed. In this technique the pixels can be classified by two types. They are edge pixels and non edge pixels.
For compressed video sequences the directional fuzzy filter is extended for artifacts reduction. To increase the correlation between pixels, the surrounding frames are motion compensated before applying the motion compensated spatiotemporal filter. The chroma components are first up sampled to the same size of the luma component. To obtain more accurate motion vectors, each frame is enhanced by an isotropic spatial fuzzy filter before the motion estimation phase. Next, the adaptive fuzzy filter coefficient for the surrounding pixel at the location from the pixel of interest and parameter such as the spread and scaling factor mentioned. The artifacts are appear as spurious signals near sharp transitions in a signal.

E. Real-time dehazing

Xingyong Lv, Wenbin Chen, I.Fan Shen proposed a new method for real-time and video dehazing. The formation of a haze image is contributed by two terms. First term is the direct attenuation, scene light passing through the scattering medium is absorbed or scattered to other directions. The attenuation depends on medium and scene depth. The second term is the air light, which is contributed by light scattered from other directions. To prevent this, refine the transmission using across-bilateral filter, and finally the haze free frame can be restored by inversing the haze image model. It provides similar or better results with much less processing time. The proposed method can be obtained as a by-product of following steps. They are extracting the transmission using dark channel prior, refine the transmission using cross-bilateral filter, recover the haze-free image, and estimate the air light.

F. Scrambling scheme

Wachiwan Kanjnarin and athumrongrat Amornraks proposed a new scrambling scheme and key distribution scheme. The scrambling scheme is used in conjunction with ordinary encryption techniques, for protecting the digital video streams from unauthorized viewing. Hash function and a pseudo-random number generator are used to prepare the video stream before being encrypted. The proposed scheme helps reduce computational time and complexity while providing the same level of security as encrypting the entire video stream. In addition, the propose secure key distribution scheme can be used with any scrambling scheme e.g. with our scrambling scheme. Scrambling is a cryptographic algorithm on video information using a secret key, called scrambling key (sometimes called "control word"). There are two kinds of encryption that are commonly used. They are block encryption and stream encryption.

III.PROPOSED WORK

A. Haze removal

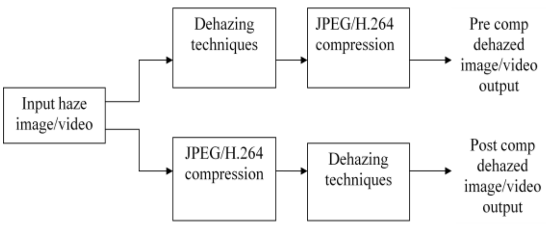

Fig 1.Haze removal on image and video coding

The block diagram representation for haze removal of image and video has been shown in figure 1. Here the Input of image/video is in the form of haze. Then the dehazing applied two different methods. First approach is pre compression; it means the dehazing technique applied after compression. Dehazing techniques are dark channel prior and median dark channel prior. Then the result applied to compression standards for image in JPEG and video for H.264. The post compression is first input image/video applied to dehazing techniques before compression. The ringing and blocking artifacts can be reduced by choosing a lower level of compression. They may be eliminated by saving an image using a lossless file format. So, the pre compression is gives better performance and fewer artifacts than the post compression.

In dehazing techniques, the dark channel prior is simple but effective image prior. The concept of dark channel is an arbitrary image J and its dark channel is J^{dark} is given by,

$$J^{dark} \min_{y\in\Omega(x)} \left(\min_{c\in\{r,g,b\}}\right) J^{c}(Y) \tag{1}$$

Where, J^c is the colour channel of J and Ω(x) is a local patch centred at x. the intensity of J's dark channel is low and tends to be zero: $J^{dark} \rightarrow 0$.This is called by dark channel prior. The DCP is constructed as,

$$\theta_D(m,n) = \min_{k.l\in\Omega(m,n)} \left(\min_{c\in(r,g,b)} \frac{\hat{x}(k,l,c)}{a(c)}\right) \tag{2}$$

But the DCP has the limitation of halo effects for not refining. So, the initial atmosphere scattering light through median filtering is included, to refine the transmission. Compared with DCP dehazing methods, the MDCP method could get a better dehazing effect at distance scene and places. The proposed MDCP is constructed as,

$$\theta_M(m,n) = \operatorname{med}_{k.l\in\Omega(m,n)} \left(\min_{c\in(r,g,b)} \frac{\hat{x}(k,l,c)}{a(c)}\right) \tag{3}$$

Two common measures of image quality are the mean square error and peak signal-to-noise ratio. The mean square error is defined as,

$$MSE = \frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j)-K(i,j)]^2 \tag{4}$$

The PSNR is defined as

$$PSNR = 10.\log_{10}\left(\frac{MAX_I^2}{MSE}\right) \tag{5}$$

$$= 20.\log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right) \tag{6}$$

$$= 20.\log_{10}(MAX_I) - 10.\log_{10}(MSE) \tag{7}$$

B. Secure System

Encryption is used to select a Frame. It performs bitwise XOR for Key frame and selected frame to get encrypted frame. Then for more security transposition is also used. The watermark embedding is selecting a watermark image and converted into binary image (0's & 1's) for hiding and adds it to original Frame. The perform Bitwise XOR for watermarked frame and encrypted frame gives the modified key. Inverse transposition is done and encrypted Frame is obtained by using decryption process. It perform bitwise XOR for Key frame and considered encrypted frame to get decrypted Frame consider an encrypted Frame and perform bitwise XOR with Modified Key to get decrypted watermark frame. Then subtract the decrypted frame and decrypted watermark frame gives watermark image. It is future work for this project. It gives the final protected dehazed image and videos. This is shown in fig 2.

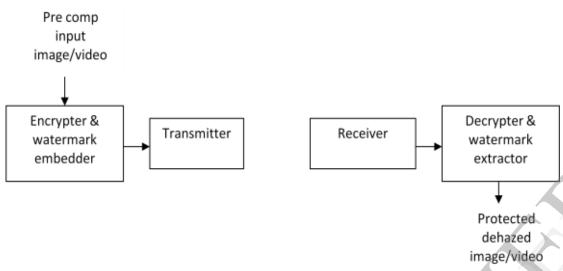

Fig 2. Secure remote surveillance system

IV.RESULT

A. Subjective Analysis

In this section we performed the dehazing for an image and video coding. The input image and video are in the form of haze. Haze is the atmospheric phenomenon. It reduced the quality of image/video.

Fig 3 Input Haze Image

Fig 4 Output Deahzed Image

Fig 5 Input Haze Video

Fig 6 Output Dehazed Video

Image and video dehazing is an important problem of common concern in image processing and computer vision areas. Recently, most researchers have adopted physical model based image dehazing to remove haze, where haze is an atmospheric phenomenon such as dust, smoke and other dry particles obscure the clarity of the sky. So the dehazing is necessary for hazy images and videos.

B. Objective Analysis

In this section the objective measures was performed and the PSNR for the image and video was calculated and represented in graphical form.

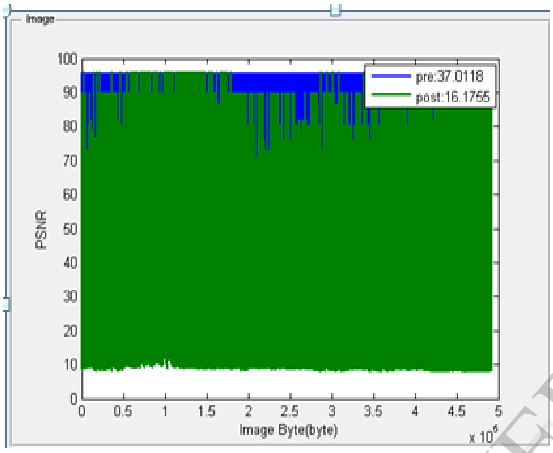

Fig 7 PSNR of Dehazed Image

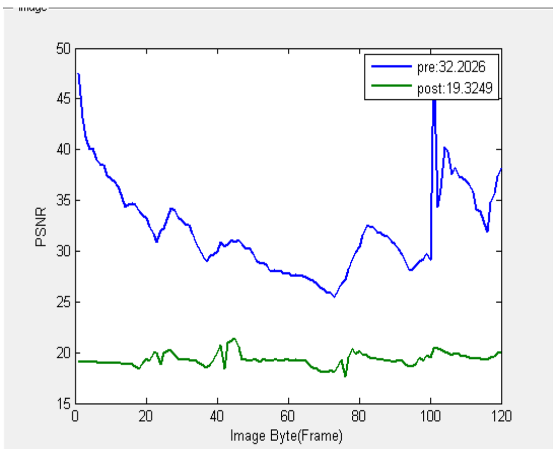

Fig 8 PSNR of Dehazed Video

V CONCLUSION

The dehazing performance for image and video coding system was discussed to decide Pre or Post method for enhancing and compressing video for a surveillance application where fog and haze are prevalent in the atmosphere. Then the proposed dehazing method produced very few artifacts, fast and better performance for image when JPEG compression and video coding method when H.264 video sequences is used. Then the simulated results confirmed the analysis. In next phase, the concept of watermark and encryption were added to this dehazed image and video for digital right management, by using a fast and reliable light weight algorithm. Finally the image and video can be used to trace illegal distribution. Thus the resulting system produces a dehazed image and video with high security and fast transmission.

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REFERENCES

[1] Agi,I.and Gong, L.(1996) "An empirical study of secure MPEG video transmission" in Processing of Symposium., pp. 137-144.

[2] Chaudhry.A, Iqbal.K, Khan.A and Mirza.A, (2006) "Enhancing Contrast of Compressed Images:Reducing Block Artifacts Adapivey" .Piscataway,NJ: IEEE Press, pp. 140-145.

[3] Chen.Z, Abidi.B. R,Page.D.L and abidim.a,(2006) "Gray-level grouping(GLG): "An automatic method for optimized image contrast enhancement-part:tha basic Method". IEEE trans. Image Process., vol.1, no.8, pp.302-2290.

[4] Chen.Z, Abidi.B. R, Page.D.L, and Abidi.M.A,(2006) "Gray-level grouping(GLG): "An automatic method for optimized image contrast enhancement-part ii: the Variations", IEEE Trans.Image Process.,vol 15,no.8,pp. 2303-2314.

[5] EuijinChoo,Jehyun Lee Heejo Le and Giwon Nam (2007). "SRMT light-weight Encryption scheme for secure real time multimedia transmission".MUE'07.InternationalConference, pp 60 – 65.

[6] He.K,(2009)"Single image haze removalusing dark channel prior," in proc.IEEE Conf.ComputVis.PattrernRecognit .,pp.1956 - 1963.

[7] Jain.J and Jain.A. (1981) “Displacement measurement and its application in interframe Image coding,”IEEETrans.Commun., vol.29,no.12,pp.1799-1808.
[8] Kanjanarin, W.; Amornrasaka .T.(2001) ”Scrambling and key distribution scheme for Digital television “.proceeding ninth IEEE International conference, pp 140 -145.
[9] Leow.M(2003).”Closed-form quality for compressed medical images:atatistical preliminaries for transform coding,” in Proc. 25th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc., pp.837-840.
[10] Lintian Qiao, Nahhrstedt.K, and Ming-Chit Tam (1997). “Is MPEG encryption by using random instead of zigzag order secure?” Proceeding of 1997 IEEE International symposium, pp 226-229.
[11] Liu.S , Zou LingLing, Xie Changsheng, Huang Hao (2006). “Two way selelctive encryption algorithm for MPEG video”. IWNAS ’06. Internatioanl Workshop.
[12] Bovik.A, (2002). “Efficient DCT-domain blind measurement and reduction of blocking artifacts,” IEEE Trans. Circiuts Syst. Video Technol., vol.12, no.12, pp.
[13] Vo.D, Nguyen.T, Yea.S and Vetro.A, (2009). “Adaptive fuzzy filtering for artifact reduction in compressed images and videos”, IEEE Trans. Image Process., vol. 18, no.6, pp 1166-1178.
[14] Wang.S, Lin.T and Lee.C, (2005). “New motion compensation designs for H.264/AVC decoder”, in Proc. IEEE ISCAS, pp.4558-4561.
[15] Wiegnd.T, Sullivan.G, Bjontegaard.G and Luthra.A,(2003). “Overview of the H.264/AVC video coding standard”,IEEE Trans. Circuits Syst. Video Technol.,vol.13,no.7, pp.560-576.
[16] Xingyong L, Weibin Chen, I.Shen. (2010). “Real time dehazing for image and video”, 2010 18th Pacific Conference, pp 62-69.