IJETST- Volume||01||Issue||08||Pages 1277-1282||October||ISSN 2348-9480 2014

Open access Journal International Journal of Emerging Trends in Science and Technology

Result Analysis for Data hiding in Motion Vectors of Compressed Video Based on Steganography

Authors

Deepika R.Chaudhari

M.E. Student, Dept.of Computer Engineering,

Matoshri College of Engineering, A.P.India

Email:*deeprahul1783@gmail.com*

ABSTRACT

This thesis apply steganography algorithm in a video. In earlier steganography method spatial or transformed domain is used for data hiding. But in future method we are using compressed video to hide the secrete message; we use motion vectors to encode and reconstruct both the forward predictive (P)-frame and bidirectional (B)-frames in compress video. Motion vectors are calculate by means of macro block guess mistake, which is different from the approaches based on the motion vector attributes such as the magnitude and phase viewpoint, etc. A greedy adaptive threshold is look for for each frame to achieve robustness while maintain a low prediction error level. Secrete information bits are replace with the least significant bits of motion vectors. This algorithm was experienced on special types of videos. The future method is establishing to perform well and is compare to a motion vector attribute-based method from the writing.

Index Terms—*Data hiding, Motion vectors, Motion Picture Expert Group (MPEG), Steganography*

1. INTRODUCTION

The widespread of the Internet and World Wide Web has changed the way digital information is handle. The easy access of imagery, harmonious documents and movies has modified the development of data hiding, by placing emphasis on official document protection. Data hiding deals with the ability of embed data into a digital cover up with a least amount of perceivable degradation, i.e., the embedded data is invisible to hear to a human observer. Data hiding has two sets of data, that is the cover medium and the embedding data, which is called the message. The digital medium can be text, audio, picture or video depending on the size of the message and the approaches were proposing still image watermarking capacity of the cover. Near the beginning video data hiding techniques extended to video by hiding the message in each frame independently [1]. Methods such as spread spectrum be used, where the basic idea is to distribute the message over a wide range of frequencies of the host data. Transform domain is generally preferred for hiding data because, for the same robustness as for the spatial domain; Thus result is nicer to the Human Visual System .For this purpose the Discrete Fourier Transform .The Discrete Cosine Transform and the Discrete Wavelet Transform are commonly employed [2-4].

Modern video data hiding techniques are alert on the characteristics generated by video compressing standards. Motion vector based schemes have been proposed for MPEG algorithms. Motion vectors are calculated by the video encoder in order to remove the temporal redundancies among frames. In these methods the original motion vector is replaced by another locally optimal motion vector to embed data. Only few data hiding algorithms considering the properties of H.264 standard [8-10] have recently appeared in the open literature. In a separation of the 4*4 DCT coefficients is modified in order to achieve a robust watermarking algorithm for H.264 [8]. In the blind algorithm for copyright protection is based on the intra prediction type of the H.264 video coding standard [6].

This Paper targets the First the video is divided into blocks and next themes age is came in to existence therefore the message is encoded in the least significant part of the block and is exacting as 16*16, 16*8, 8*8, 8*16,4*4 in that order, thus here in this scenario the data hiding is not a major task and also the data decoding is also not a major task but the main thing we are thought to concentrate is on the clarity level or the mean square error that is noise and also the loss of the data and both come under the artifact. Now and again we may also call as a quantization error therefore quantization is nothing but the setting the predefined values or may also be defined as the rounding off making it to the nearest value respectively. Therefore here is no problem at the time of the quantization at the encoding stage but the main challenge is at the receiver end at the time of the decoding of the information that is nothing but the dequantization of the data at the decoding stage so these comes under the quantization error. Due to this there is a lack of pixels and may lead to clarity loss etc.

The rest of the paper is structured as follows: in Section II we overview the terms of video compression and decompression. The problem definition is specified in Section III along with the evaluation criteria used in the paper. Our proposed method is specified in Section IV followed by the results and analyses in section V. Section VI specified the result. Finally, the paper is concluded in Section VII.

2. BACKGROUNDS ANDSOME NOTATIONS

The summarize of the lossy video compression to define our notation and valuation metrics. At the encoder, the intra-predicted (I)-frame is encoded using regular image compression techniques similar to JPEG but with different quantization table and step; hence the decoder can reconstruct it independently. The I-frame is used as a reference frame for encoding a group of forward motion compensated prediction (P)- or bi-directionally predicted (B)-frames. In the commonly used Motion Picture Expert Group (MPEG-2) standard , the video is ordered into groups of pictures (GOPs) whose frames can be set in the sequence is [I,B,B,P,B,B,P,B,B]. The method temporal redundancy between frames is broken using block-based motion estimation that is applied on macro blocks Bijof size[b x b]. In P frame or B frame and searched in target frame(s). In general, the motion field in video compression is assumed to be translational with horizontal component d^x and vertical component d^y and denoted in vector form by d(x) for the spatial variables are x=(x,y) in the underlying image.

$$d^x \text{ and } d^y \in [-2^{n-1}-1, 2^{n-1}-1]$$

$$[-2^{n-2}-1/2, 2^{n-2}-1/2]$$

The search window is constrained by assigning limited n-bits for d ; in other words, both which corresponds to Pixels if the motion vectors are computed with half-pixel accuracy. An comprehensive search in the window of size $b+2^n \times b+2^n$ can be done to find the optimal motion vector satisfying the search criterion which needs many computations, or suboptimal motion vectors can be obtained using expeditious methods such as three steps search, etc.; this is based on the video encoding device processing power, the required compression ratio, and the reconstruction quality. Since d does not represent the true motion in the video then the compensated frame P using **(x+d(x))** must be associated with a prediction error **E(x)=(P-*P)(x)*** in order to be able to reconstruct **P=*P*+*E*** with minimum distortion at the decoder in case of a P-frame. Similar operation is done for the B-frame but with the average of both the forward compensation from a previous reference frame and backward compensation from a next reference frame E is of the size of an image and is thus lossy compressed using JPEG compression reducing its data size. The lossy compression quantization stage is a nonlinear process and thus for every motion estimation method, the pair (d,E) will be different and the data size D of the compressed error E will be different. The motion vectors d are lossless coded and thus become an attractive place to hide a message that can be blindly extracted by a special decoder.

The decoder receives the pair (d, Ê) applies motion compensation to form $\grave{P}$ or $\acute{B}$ and decompresses Ê to obtain a reconstructed Er. Since E and Erare different by the produce of the quantization, then the decoder in unable to reconstruct identically but it alternatively reconstructs Pr=P+Er. The reconstruction quality is usually measured by the mean squared error P-Represented as peak signal-to-noise ratio (PSNR), and we denote it by .$\mathfrak{R}$.

3. PROBLEM DEFINITION

Here nowadays in the present scenario that too in the present context we are going to deal with the data hiding process that is both the combination of the encoding and the decoding process where the primary issue is data hiding and the secondary issue is effects which is used for the corruption of the true data.

Now in the primary situation that is data hiding scenario the original video or a frames of sequences before the encoding process are represented as (d, E) and after the message is hidden in the following vectors are got tampered due to the encoding or due to the quantization and are replaced by the vectors (d^h, E^h) respectively here these notation denotes the data concealed with which message is hidden in the video frames. And of the information we are going for the compression process or termed as the quantization process. And at this time we are going to lossy compression rather than the loss less compression in order for the strong data hiding process and protected from the third party or the hacker. After completion of the primary scenario that is the data hiding scenario the last or the second consideration is data accuracy is nothing but the restoration of the tamper data accurately as near to zero. And these restorations is considered and calculated by the following terms as mean signal to noise ratio and bit error rate respectively. Signal to noise ratio is nothing by the interference of the external disturbance or the external noise that is termed as the tampered data and the original quality is lost by the help of this interference of the external trouble and bit error rate is the next scenario in which the loss of the original data nothing but the loss of the pixels in the original image or the frame sequences at the time of the quantization that is compression and at the time of transmission of the data takes place and can be shown with the following figures. So at this time we may face two scenarios one is reduced quality in the video frames and the other one is increased data rate.

Increased data rate leads to the high payment of the price take place that is cost effective. And the second one is the reduced quality as peak signal to noise ratio and the bit error rate. Therefore these are reduced as near to zero for good accuracy and the successful implementation of the algorithm.

Figure show the motion prediction

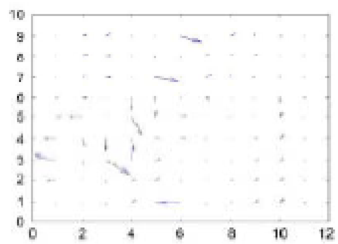

Figure shows the motion predictio

Figure shows the frame of original video

Figure shows the Error Prediction

4. PROPOSED CONCEPT

Our data-hiding algorithm is applied at the encoder side, uses the regular pair (d,E) produced, tampers d to become dh and thus replaces them by the pair(d^h,E^h) for each P and B-frame in the GOP as shown in Algorithm 1. The secret message is organized as a bit stream $m(k),\ 0 < k < K$ message length. A subset of d is selected to be the CMV. The selection of (line 6 of Algorithm 1) is performed if their associated macro block prediction error measured in PSNR is below an initial threshold value. The least significant bit (LSB) of both mechanism, are replaced by bits of the message. After data embedding (lines 7 to 13 of Algorithm 1), we validate the used value of by calling Algorithm 2. The algorithm tests the robustness of the hidden message to the quantization effect of the JPEG compression. For the prediction error E^h. It performs the compression by the encoder followed by the decompression performed by the decoder (lines 1 and 2 of Algorithm 2).

$$(10 \log_{10}(b^2/\textstyle\sum_{\mathfrak{B}_{i,j}} E_r^h(\mathbf{x})) < \tau_{\text{key}})$$

If the reconstructed prediction error E_r^h maintains the same criterion can be identified by the data extractor for the given value of τ_{key}. If any macro block associated with fails to maintain the criterion (line 5 of Algorithm 2), then will not be identified by the data extractor and the message will not be extracted correctly. Hence, we propose to use an adaptive threshold by iteratively decrementing $\tau_{\max}$ by 1 decibel (dB) for this frame until either the criterion is satisfied for all macro blocks or the stopping value $\tau_{\min}$ is reached for which we embed no data in this frame (line 19 in Algorithm 1). Since the threshold used for each frame is different, we hide their eight values for that GOP in the I-frame using any robust image data-hiding technique or sending them on a separate channel based on the application. Decreasing will decrease the payload and vice versa, thus Algorithm 1 tries to find the maximum feasible for each frame [9].

5. ALGORITHMS

Algorithm I: Data Hiding in GOP

Input: message bitstream m, GOP$(d, \tilde{E})$, k, $\tau_{\max}$, $\tau_{\min}$
Output: Data embedded in the Encoded GOP (d^h, E^h)
1 **foreach** P and B-frame in the GOP **do**
2 initialize $\tau_{\text{key}} = \tau_{\max}$;
3 Simulate the decoder: decompress $\tilde{E}$ to obtain E_r;
4 **repeat**
5   set $\mathbf{d}^h = \mathbf{d}$;
6   Obtain the candidate motion vectors: $\bar{\mathbf{d}}_{i,j}(\mathbf{x}) = \{\mathbf{d}_{i,j}(\mathbf{x}) : 10\log_{10}(b^2/\sum_{\mathfrak{B}_{i,j}} E_r(\mathbf{x})) \leq \tau_{\text{key}}\}$;
7   **while** $(k \leq K)$ & $\forall(i,j) \in \bar{\mathbf{d}}_{i,j}(\mathbf{x})$ **do**
8   replace the least significant bit $\text{LSB}(\bar{d}^x_{i,j}) = m(k)$, $\text{LSB}(\bar{d}^y_{i,j}) = m(k+1)$;
9    $k = k + 2$;
10   **if** B-frame **then**
11   replace for the backward compensation motion vectors the least significant bit $\text{LSB}(\bar{d}^x_{i,j}) = m(k)$, $\text{LSB}(\bar{d}^y_{i,j}) = m(k+1)$;
12     $k = k + 2$;
13   **end**
14    $\mathbf{d}^h_{i,j} = \bar{\mathbf{d}}_{i,j}$;
15   **end**
16   Compute associated $E^h(\mathbf{x})$ by suitable compensation using $(\mathbf{x} + \mathbf{d}^h(\mathbf{x}))$;
17   $[\text{KeyFound}, \tau_{\text{key}}] \longleftarrow$ validate $\tau(E^h, \tau_{\text{key}}, \bar{d})$;
18 **until** KeyFound or $\tau_{\text{key}} = \tau_{\min}$;
19 **if** not KeyFound **then**
20 $\tau_{\text{key}} = -1$
21 **end**
22 Hide τ_{key} in I-frame or send on a separate channel;
23 **end**

***Algorithm II:* Validate** $\mathcal{T}$

Input: E^h, τ_{key}, $\bar{d}$
Output: KeyFound, τ_{key}
Compress E^h using JPEG compression to produce $\tilde{E}^h$;
Decompress $\tilde{E}^h$ to obtain lossy E^h_r;
set KeyFound=True;
while KeyFound & $(i,j) \in \bar{\mathbf{d}}_{i,j}(\mathbf{x})$ **do**
  if $10\log_{10}(b^2/\sum_{\mathfrak{B}_{i,j}} E^h_r(\mathbf{x})) > \tau_{\text{key}}$ **then**
    KeyFound = False;
    decrement τ_{key};
  end
end

The decoder receives the pair (dh,Eh) and it can decode without loss and decompresses to obtain a lossy reconstructed version E^h_r. During normal operation for viewing the video, the decoder is able to reconstruct P^h_r or B^h_r by suitable compensation from reference frame(s) using $(\mathbf{x} + \mathbf{d}^h(\mathbf{x}))$ and adding to it. Acting as a new kind of motion estimation, Algorithm I will have two effects on the new compressed video: change in data size and reconstruction quality which are thoroughly analyzed. The data extractors operate to extract the hidden message as a special decoder and our proposal is straightforward, as shown in Algorithm III. After data extraction from the consecutive GOPs the hidden message m is reconstructed back by concatenation ofthe extracted bit stream.

Algorithm III: Data Extraction

Input: GOP $(d^h, \tilde{E}^h)$, k
Output: message bitstream m
Extract the thresholds τ_{key} for all frames in GOP from I-frame or use them from other channel;
foreach P & B frame in the GOP **do**
  Decompress $\tilde{E}^h$ to obtain E^h_r, and identify the candidate motion vectors: $\bar{\mathbf{d}}_{i,j}(\mathbf{x}) = \{\mathbf{d}^h_{i,j}(\mathbf{x}) : 10\log_{10}(b^2/\sum_{\mathfrak{B}_{i,j}} E^h_r(\mathbf{x})) \leq \tau_{\text{key}}\}$
  foreach $(i,j) \in \bar{\mathbf{d}}_{i,j}(\mathbf{x})$ **do**
    Extract 2 message bits $m(k) = \text{LSB}(\bar{d}^x_{i,j})$, $m(k+1) = \text{LSB}(\bar{d}^y_{i,j})$;
    $k = k + 2$;
    if B-frame **then**
      Extract from backward compensation motion vectors 2 message bits $m(k) = \text{LSB}(\bar{d}^x_{i,j})$, $m(k+1) = \text{LSB}(\bar{d}^y_{i,j})$;
      $k = k + 2$;
    end
  end
end

6. RESULTS

We implemented the hiding and extraction algorithms I,II and III integrated them to the MPEG-2 encoder and decoder operation. The parameters of our experiments, presented in this section, are: macro block size, motion vector representation bits. We used both the fast three-steps and exhaustive search motion estimation algorithms with half pixel accuracy. Each test video sequence is organized into consecutive GOP organized as [I,B,B,P,B,B,P,B,B]. The compression to the I-frame and the prediction error of the P- and B-frames are implemented using JPEG compression with a quality factor75, 70, and 30, respectively. We tested our algorithms on two standard test sequences: Video and image.

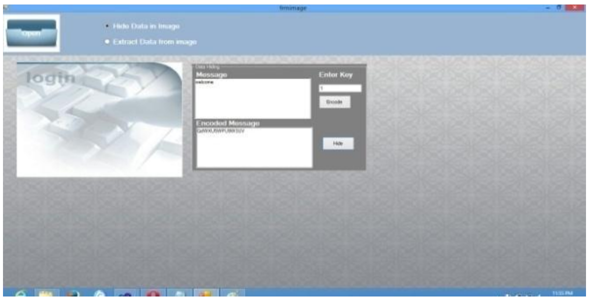

Figure1.Hide data in image

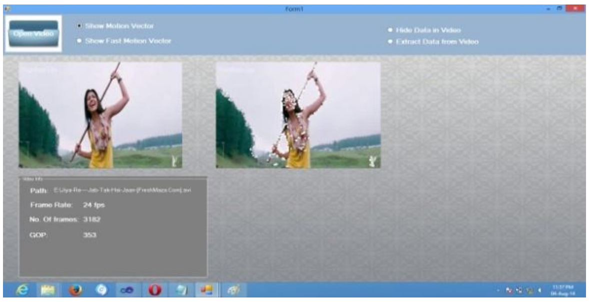

Figure 2.Hide data in video using Motion Vectors

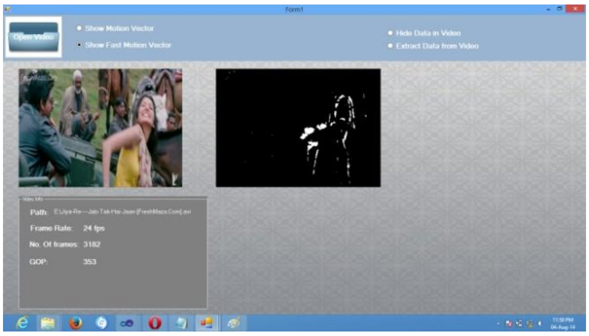

Figure 3.Hide data in video using Motion Vectors through fast motion vectors.

7. FINALISED CONCLUSION

Now to finish moving towards the conclusion point of view this is one type of method relates to the data hiding in which as before we have many algorithms but it is completely different from the older data hiding algorithms in which here the message is protected from the third party users or the hackers point of view and by overcoming drawbacks of the ste analysis where the protection is less comparable to the complete techniques. So in the above scenario video is providing the protection for the message from the third party users or simply the hackers as said early? So this is the quite different technique compare to the older methods here the main thing is pertinent features are collected from the motion in between the frames as in the form of the vectors in association with macro blocks and depending on the motion message is going to be hidden. The macro blocks are in such a way that is one different procedure for the selection of the macro blocks we are going for the thres holding method where the CMV is corresponded. And after completely working on the encoding and decoding process the next step is we are supposed to concentrate is on the errors after the decoding process at the receiver followed by the encoding process at the transmission side. Therefore mainly two things are under the consideration or giving a quite more importance one is the secured data transmission in the video and also by the by maintaining the clarity of the video sequences respectively. Therefore we have dealt with the hiding but quantization at the encoder is nothing but the compression after the message is hidden the motion of the frames. The compression is into two types they are lossy compression and the loss less compression respectively, here in the above algorithm or implementation of the above paper we are going for the lossy compression rather than the loss less compression.

References

1. Hussein A. Aly ―Data Hiding in Motion Vectors of Compressed Video Based on Their Associated Prediction-Error, IEEE Trans On Information Forensics And Security, Vol. 6, No. 1, Mar 2011.
2. F. A. P. Petitcolas, R. J. Anderson, and M. G. Kuhn, ―Information hiding A survey,*Proc. IEEE*, vol. 87, no. 7, pp. 1062–1078, Jul. 1999.
3. J. Zhang, J. Li, and L. Zhang, Video watermark technique in motion vector,in*Proc. XIV Symp. Computer Graphics and Image Processing*, Oct. 2001, pp. 179–182.
4. C. Xu, X. Ping, and T. Zhang, Steganography in compressed video stream, in *Proc. Int. Conf. Innovative Computing, Information and Control (ICICIC'06)*, 2006, vol. II, pp. 803–806.
5. P.Wang, Z. Zheng, and J. Ying, A novel video watermark technique in motion vectors, in *Int. Conf. Audio, Language and Image Processing (ICALIP)*, Jul. 2008, pp. 1555–1559.
6. S. K. Kapotas, E. E. Varsaki, and A. N. Skodras, ―Data hiding in H.264 encoded video sequences, in *IEEE 9th Workshop on Multimedia Signal Processing (MMSP07)*, Oct. 2007, pp. 373–376.
7. D.-Y. Fang and L.-W.Chang, Data hiding for digital video with phase of motionvector, in *Proc. Int. Symp. Circuits and Systems (ISCAS)*, 2006, pp. 1422–1425.
8. X. He and Z. Luo, A novel Steganographic algorithm based on the motion vector phase,‖ in *Proc. Int. Conf. Comp. Sc. and Software Eng.*, 2008, pp. 822–825
9. *Generic Coding of Moving Pictures and Associated Audio Information: Video, 2 Edition*, SO/IEC13818-2, 2000.
10. B. Chen and G. W. Wornell, Quantization index modulation for digital watermarking a and information embedding of multimedia,‖ *J. VLSI Signal Process.*, vol. 27, pp. 7–33,2001.