International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2763
Issue 04, Volume 3 (April 2016) SPECIAL ISSUE www.ijirae.com

EFFICIENT STEGANOGRAPHY IN ENCRYPTED VIDEO STREAMS USING MOTION VECTOR DIFFERENCE

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ABSTRACT—Digital video sometimes are stored and processed in an encrypted format to maintain privacy and security. For the purpose of content notation, it is necessary to perform data hiding in these encrypted videos. In this way, data hiding in encrypted domain without decryption conserves the confidentiality of the content. In addition, it is more proficient without decryption followed by data trouncing and re-encryption. This study proposes a novel scheme of data hiding directly in the encrypted version of AVI video stream, which includes the following three parts, i.e., AVI video encryption, data embedding, and data extraction. By analyzing the property of AVI codec and the code words of motion vector differences are encrypted with stream ciphers. Then, a data hider may embed additional data in the encrypted domain by using codeword exchange technique, without knowing the original video content. Data taking out can be done either in the encrypted domain or in the decrypted domain. Furthermore, video file size is strictly conserved even after encryption and data embedding.

Keywords—Data hiding, encrypted domain, AVI, codeword substituting.

I. INTRODUCTION

Image Processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to- day life for various applications. Various techniques have been developed in Image Processing during the last four to five decades. Most of the techniques are developed for enhancing images obtained from unmanned spacecrafts, space probes and military reconnaissance flights. Image Processing systems are becoming popular due to easy availability of powerful personnel computers, large size memory devices and graphics software. As an effective and popular means for privacy protection, encryption converts the ordinary signal into unintelligible data, so that the traditional signal processing usually takes place before encryption or after decryption. However, in some scenarios that a content owner does not trust the processing service provider, the ability to manipulate the encrypted data when keeping the plain content unrevealed is desired. For instance, when the secret data to be transmitted are encrypted, a channel provider without any knowledge of the cryptographic key may tend to compress the encrypted data due to the limited channel resource.

II. LITERATURE REVIEW

The most watermarking schemes for copyright protection, a seller usually embed a watermark in multimedia content to identify a buyer [1]. When an unauthorized copy is found by the seller, the traitor's identity can be traced by the embedded watermark. However, it incurs both repudiation issue and framing issue. To solve these problems, some buyer seller watermarking protocols have been proposed based on watermarking scheme in the encrypted domain. The enhanced scheme increases effective watermarking capacity, avoids additional overhead and overcomes an inherent defect that watermarking capacity depends on the probability distribution of input watermark sequence. Based on the security requirements of buyer–seller watermarking protocols, a new watermarking scheme in the encrypted domain with flexible watermarking capacity is proposed. It improves the robustness of watermark sequence against image compressions and enables image tampering detection. Watermark extraction is blind, which employs the same threshold criterion and secret keys as watermark embedding.

The secure and authenticated discrete reversible data hiding in cipher images deals with security and authentication [2]. In the first phase, a content owner encrypts the original uncompressed image using an encryption key. Then, a data hider may compress the least significant bits of the encrypted image using a data hiding key to create a sparse space to accommodate some additional data. With an encrypted image containing additional data, if a receiver has the data hiding key, receiver can extract the additional data though receiver does not know the image content. If the receiver has the encryption key, can decrypt the received data to obtain an image similar to the original one.

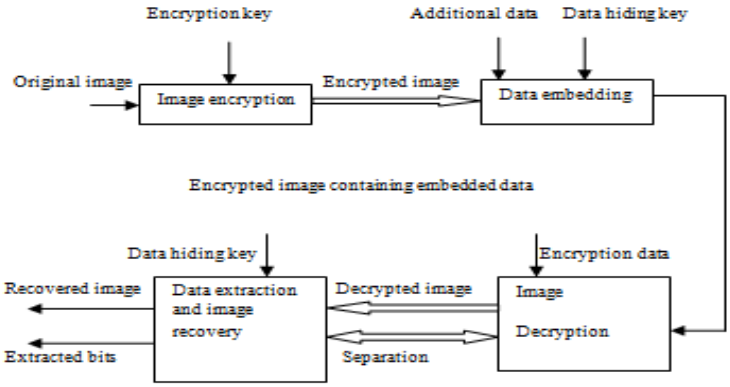
If the receiver has both the data hiding key and the encryption key, can extract the additional data and recover the original content. The data hacking is very challenging problem in today's internet world. There are number of techniques to secure the data [3]. So, the data hiding in the encrypted image comes into the picture, but occurrence of distortion at the time of data extraction is a main problem. So Reversible Data Hiding (RDH) in encrypted image is used. With this method original cover can be recovered. In this paper, they proposed a novel method by reserving room before encryption with a traditional RDH algorithm, and thus it is easy for the data hider to reversibly embed data in the encrypted image. This method provides improved PSNR ratio and recovers image with its original quality.

The image watermarking, which is finding more and more support as a possible solution for the protection of intellectual property rights [4]. To this aim, many techniques have been proposed in the literature over the last few years, and many commercial products are already available. It is possible to state that the most important features a watermarking technique to be used for IPR protection should exhibit are unobtrusiveness and robustness. This paper mainly focus on watermarking of compressed-encrypted JPEG2000 images, where the encryption refers to the ciphering of complete JPEG2000 compressed stream except headers and marker segments, which are left in plaintext for format compliance. According to H.264/AVC specific codec architecture, an efficient watermarking scheme for H.264/AVC video is proposed [15]. The watermark information is embedded into quantized residual coefficients by slightly modulating the coefficients with specific symbol encoding, instead of directly adding the watermark to the quantized coefficients. It is not necessary to fully decode H.264/AVC compressed stream both in the embedding and extracting processes. Experimental results show that the proposed scheme can preserve high imperceptibility while achieving enough robustness against various attacks such as re-quantization, transcoding, AWGN, brightness and contrast adjustment.

III. OVERVIEW OF THE STUDY

This thesis proposes a novel scheme for classic data hiding in encrypted images or video files. In the first phase, a content owner encrypts the original uncompressed image /video using an encryption key. Then, a data-hider may replace the least considerable bits of the encrypted image using a data-hiding key to create a sparse space to accommodate some additional data. With an encrypted image or video containing additional data, if a receiver has the data-hiding key, receiver can extract the additional data however user doesn't know the image content. If the receiver has the encryption key, then the receiver can decrypt the received data to obtain an image similar to the original one, but cannot extract the additional data. If the receiver has both the data-hiding key and the encryption key, he can pull out the additional data and recuperate the original content without any error by utilizing the spatial correlation in natural image when the amount of additional data is not too large.

IV. ARCHITECTURE DIAGRAM



V. TECHNIQUES

The Motion Vector Difference (MVD) Encoding is carried out. In order to protect both texture information and motion information, not only the IPMs but also the motion vectors should be encoded. In AVI file, motion vector prediction is further performed on the motion vectors, which yields MVD.

The values of MVDs are taken. For Data Embedding, in the encrypted bit stream of AVI frames, the proposed data embedding is accomplished by substituting eligible code words of various Levels. Since the sign of Levels are encrypted, data hiding should not affect the sign of Levels. For Data Extraction scheme, the hidden data can be extracted either in encrypted or decrypted domain. Data extraction process is fast and simple. In addition, the given raw data is perturbed first, then encrypted with 3DES encryption and addition secure key is also embedded in the message. Then the data is embedded in video file. During decryption, the original video file as well as the decrypted data is retrieved. Then the data is decrypted and the perturbed data is found out. Then the original raw message is retrieved.

VI. EXPERIMENTS

In the following way the proposed scheme is designed and experimented and the results will be analyzed.

Add Video File

In this phase, the video file selection is carried out open file dialog control and the path is displayed in text box and the video is displayed in media player control. Then the video file record is saved into 'Videos' table.

Video File Selection for Enhanced Steganography

In this phase, the original video file selection is carried out and taken for Video Encryption. Then Encrypted Video is checked for playing in the player.

Text Data Input and Perturbation

In this phase, the text message is given as input. Two random characters are inserted between each two consecutive characters in the text message and the message is perturbated (confused).

Encrypted Data Embedding

In this phase, the text data is encrypted using TripleDES encryption and the bit sequences are taken for hiding. So, using the given data hiding key, the data embedding process is carried out with the given encrypted data. Finally, the encrypted data is made to hide inside the encrypted video.

Encrypted Data Extracting and Decryption

In this phase, the encrypted video with the hidden data is selected. For data extraction, Data-hiding key is given and the data is first extracted and then decrypted. Then with the video decryption key (same as encryption key), the video is decrypted and original video is obtained. The operation may be carried out in two types. A) First data extraction followed by Video decryption or B) Video decryption followed by data extraction.

VII. PROPOSED ALGORITHMS

A) Video File Parsing

In this process, the video file's number of frames is found out and extracted using AviFil32.dll methods. The frames are saved in a folder.

B) Text Data Input and Perturbation

i) Text message selection.
ii) Two random characters are inserted between each two consecutive characters in the text message and the message is perturbated (confused).

C) Encrypted Data Embedding

- Text data is selected.
- Key for TripleDES encryption is given
- Bit sequences of the perturbated data is taken for hiding.
- Frame data of the video is encoded with different pixel values.
- Using the given data hiding key, the data embedding process is carried out with the given encrypted data.
- The encrypted data is made to hide inside the frames in the least significant bits.

D) Encrypted Data Extracting and Decryption

i) The encrypted video with the hidden data is selected.
ii) For data extraction, Data-hiding key is given and the data is first extracted and then decrypted.
iii) Then with the video decryption key (same as encryption key), the video is decrypted and original video is obtained.
iv) The operation may be carried out in two types.

A) First data extraction followed by Video decryption or
B) Video decryption followed by data extraction.

VIII. CONCLUSION

The reversible data hiding in encrypted image is examined. Most of the work on reversible data hiding focuses on the data embedding and extracting on the plain spatial domain. But, in some applications substandard subordinate or a channel administrator hopes to tag on some bonus message, such as the foundation information, image notation or validation data, within the encrypted image though user does not know the original image content. And it is also hopeful that the inventive content should be recovered without any blunder after image decryption and message pulling out at receiver side.

A content owner encrypts the original image using an encryption key, and a data-hider can embed supplementary data into the encrypted image using a data-hiding key while the user does not know the actual content. With encrypted image containing additional data, the receiver may first decrypt it with the encryption key, and then extract the embedded data and recover the original image with the data-hiding key. In this scheme, the data extraction is not distinguishable from the content decryption. In other words, the supplementary data should be hauling out from the decrypted image, so that the crucial content of original image is uncovered before data pulling out, and if someone has the data-hiding key but not the encryption key, they can't haul out any information from the encrypted image which containing additional data.

IX. FUTURE ENHANCEMENT

In this study, data hiding is completed entirely in the encrypted domain and the method can preserve the confidentiality of the content completely. With the encrypted video contains the hidden data, the data extraction can be carried out either in encrypted or decrypted domain. In this experimental study video taken in the avi file only. In future various kinds of file formats can be taken for the entire process. Also, the data hiding process with no degradation in video quality can be carried out.

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