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Efficient Design of Frame Based Recovery Technique for Corrupted Video Files

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Abstract: In digital forensic recovery of data from corrupted video files is an essential requirement in criminal case solving issue. Video frame is meaningful measure of video data. This paper presents a novel approach of recovery of video files using frame based recovery technique. Many existing technique uses file restoration rather than frame restoration. This paper proposed the video restoration using a fragmentation technique. The fragmented video is first extract and then it is attached to make it in playable form. if in case a target video file is overwritten then video recovery using this approach may get fail, for a corrupted video file contain overwritten segmenting this proposed technique can recover most of the video contents in non-overwritten segment of the files. This paper presents a frame-based recovery technique of a corrupted video file using the specifications of a codec used to encode the video data.

Keywords: Video file restoration, file fragmentation, frame based recovery, corrupted video data.

I. INTRODUCTION

Year by year, the number of computers and other digital devices being used is increasing. The recent Pew Research Center Globalization Review [7] showed that 26 of the 36 countries surveyed had increased their computer usage. This increase is occurring simultaneously with an increase in usage of other digital devices, such as cell phones. In fact, in the United States alone 81% of the population now owns a cell phone, which is a 20% increase compared to 2002. Some countries, including Russia, have shown upwards of a 50% increase in cell phone ownership. Computers are now one of many devices where digital data is stored. Devices such as cell phones, music players, and digital cameras all now have some form of internal storage or else allow data to be stored to external devices like flash cards, memory sticks, and solid-state devices (SSDs). With this huge increase in digital data storage, the need to recover data due to human error, device malfunction, or deliberate sabotage has also increased. Data recovery is a key component of the disaster recovery, forensics, and e-discovery markets. Digital data recovery can consist of both software and hardware techniques. Hardware techniques are often used to extract data from corrupted or physically damaged disks. Once the data has been extracted, software recovery techniques are often required to order and make sense of the data. In digital forensics, recovery of a damaged or altered video file plays a crucial role in searching for evidences to resolve a criminal case**,** a large amount of video contents have been produced in line with wide spread of surveillance cameras and mobile devices with built-in cameras, digital video recorders, and automobile black boxes. Recovery of corrupted or damaged video files has played a crucial role in digital forensics. In criminal investigations, video data recorded on storage media often provide an important evidence of a case. As an effort to search for video data recorded about criminal, video data restoration and video file carving has been actively studied. The increase in computer-related crime has caused law-enforcement agencies to seize digital evidence in the form of network logs, text documents, videos, and images. However, this digital evidence which is stored in the form of digital files can easily become fragmented and often requires reassembly to be useful. File fragmentation normally is an unintended consequence of deletion, modification, and creation of files in a storage device. Therefore, a forensic analyst investigating storage devices may come across many scattered fragments without any easy means of being able to reconstruct the original files. In addition, the analyst may not easily be able to determine if a fragment belongs to a specific file or if the contents of the fragment are part of the contents from a particular file type (image, video, etc.).Due to the huge application in various filed this project find the application in various field of forensic department as well as in the live video propagation in various technologies.

II. PREVIOUS WORK

Recovery of videos plays an important role in disaster management as well as criminal scene and in forensic department in order to have video evidence. Previously in order to recover a video file we use a file meta-information to recover the data from file. The file system meta-information contains the information such as the address and the link of a video file that can be used for file restoration. Garfunkel [3] utilizes additional information stored in the file to extend the idea to signature-based restoration techniques. For some files, file header may contain the information of file size or length. When the file footer does not exist, they can use this information to extract a file. A video file can be restored using Bi-fragment Gap Carving [4]. This method find a combination of the region containing the header and the footer to test if a video sample is valid. This computes the difference between the two data regions and check if the

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difference passes the predefined validation procedure. This procedure repeats until the gap passes the validation test.

However, this method can only be applied to a video file with two fragments and this technique has limitation when the gap between the two file fragments is large. Smart Carving technique was proposed to restore a file without being restricted by the number of fragments [5]. This technique, if it identifies the occurrence of fragmentation, combines the permutations of the fragment components and searches for the order of the fragments. They technique consists of three steps: preprocessing, collation, and reassembly. In the preprocessing step, they collect the called block part, which was not allocated to a file, using the file system information to reduce the size of the data to analyze. The collation n step categorizes the collected blocks in the preprocessing step according to a file format. Signature-based file restoration techniques search for the *start marker* (header) and the *end marker* (footer) to find valid connection of the regions containing the header and the footer [8]. To increase the accuracy of the connection of the header and the footer regions, they used other information such as maximum size, embedded length recorded in the header. The analysis of the signature may offer a low success rate in video file restoration, when there are many file fragments and when some of them are overwritten. Especially, in the case a portion of a video file is overwritten, restoration of the video data using the file unit can be almost impossible because validation of restored file is failed by partially overwritten of restored file.

Most of the video files restoration technique uses file unit for video restoration but file are restored when they are present. The file restoration technique uses basically three steps for restoring the video content of video files, they are

1. Identification of video files: to identify the video contents present in video files.
2. Validation of files: to validate that all video frames are present.
3. Validation by human expert: validation of video files by human expert so that all video files can be made in playable form.

In this paper we are working on recovery of video files using frame based technique rather than file unit so the drawback of file unit that when some of the files are overwritten then it's impossible to recover the video content, by using a frame based recovery technique we can recover the video files by using frame unit.

III. RECOVERY OF VIDEO FILES USING VIDEO CODEC SPECIFICATION

Video frame of a stored video file depends on the video codec used to encode the video file. And the video file that is encoded by codec also stored the decoding header information in start or end of video file. So that, the proposed method restores the video file using combination of frame data and decoding header information. The proposed technique can be applied to MPEG-4 and H.264 video coding scheme these two standards are most widely used in CCTV and in mobile devices. The proposed method present two methods for recovering video frames.

Extraction Phase: The data are extracted from corrupted video files using the frame by frame. The extracted frames are then analyzed in order to recover it. The figure below show the frame extraction from the video sample. The meaningful measure for video is frame. The number of frames that been extracted depend on the user requirement. The frames which have been extracted are then converted into gray scale images in order to make analysis easier. By applying histogram equalization technique the more smoothing of the images is done.

Connection Phase: The codec and file specifications are used to connect the frames verified in previous phases. Based on the extracted frame sets, the length information of each frame recorded in the files is used to connect frame sets that are restored into a connected picture.

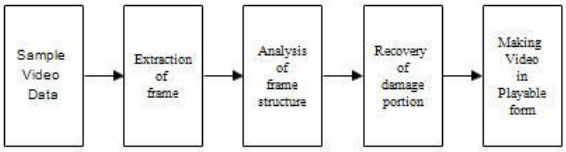

Fig.1: Processing steps of recovery of corrupted video files

IV. EXPERIMENTAL RESULT

A. Extraction of Video Frame

A video file consists of sequence of number of frames, if one the frame is absent then video will not be played as well if the frame is corrupted then also its becomes impossible to play video smoothly. In this method we are going to extract the frames from a video file. The video file akiyo_cif.avi file is chosen for analysis in which a frame structure is performed and every frame is selected for analysis and check for verified frame. The extracted frame has original image and process image, process image are pass through a wiener filter mask to have a brighter view of the pixel density. The original frame contains a color image and then RGB to gray scale image is perform on color image wiener filter of 5 by 5 is perform on gray scale image and histogram equalization of image is also perform to have more smoothing of the frame structure.

Fig.2: Extracted frames from video sample

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The Fig.2 shows the extracted frames from a video files using coding technique perform on video file. The video frame that has been extracted is process further for improvement of quality of images by applying histogram equalization technique. The frames which have been extracted is now check for corrupted portion, the portion of the frame which is been corrupted is then taken for analysis and processing of that frame is perform

B. Recovery of Corrupted Video Frame

The next step of recovery of corrupted video frame is performed using an image recovery technique; the frame which is corrupted is taken for analysis. The input image of the frame is considered and its co-ordinates is determined, after determining the co-ordinates image is recognized as color or gray scale image. The image segmentation gives the more details structure of portion of damage area. Using the co-ordinates system of neighboring of pixel we have recover the damage image portion of video frame.

Fig.3:Recovery of damage portion

The Fig. 3 show damage portion of the corrupted frame, after performing the recovery technique the orignal image is obtained.

To evaluate the result we have tested the video file akiyo_cif.avi then by using coding technique the video is extracted into 6 frames and the quality of image is improved by applying histogram equalization as shown in Fig 2. In next step frame feature is extracted and frame sequence is identified, if one of the frame is corrupted then damage portion of image is analyze by neighboring of pixel Technique and corresponding image is recover as shown in Fig 3. In next phase of video recovery we have tested the video sample from any camera recording device and corrupted the small portion of the video sample and then we try to recover the damage portion by applying recovery algorithm. The recovery rate which was mention earlier in the paper [1] was 90% which also got improved and we have recovered almost all corrupted video frame and our video restoration rate is 100%. To evaluate the performance of the proposed technique, the restoration ratio was evaluated by following equation.

$$\text{Ratio (\%)} = 100 * \frac{No.of\ Restored\ Video\ Frames}{No.of\ Total\ Video\ Frames}$$

The number of restored frames is the number of frames extracted from the video sample using the proposed technique, and the number of the original video frames is the number of the original video frames that were used in the experiment. If all the frames of the original video were restored, the restoration ratio would be 100%; and if none was restored, the restoration ratio would be 0%. The experimental results which were carried out are all tested on .avi video sample and we got 100% recovery rate from damage video portion.

V. CONCLUSION

This paper presents a novel approach for recovery of corrupted video files. The proposed method recovers almost all data according to minimum meaningful frame unit. Therefore, the proposed method restores almost frames in damaged or corrupted video files without being affected by sequence of the frames. Experimental result shows that sample video is converted into the frame structure and analysis of damage portion is performed as well it is recovered, also the recovery rate got improved we have recovered almost all of the corrupted video frames.

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