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Research Article

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Forensics of Video Devices in Python and Java Script Programming Languages

Hažib Salkić*

CEPS – Center for business studies Sorrel

***Corresponding author:** Hadžib Salkić, CEPS – Center for business studies Sorrel.

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Abstract

Video forensics is key aspect in modern investigative actions, where necessary to determine authenticity and video integrity. This paper focuses on on simulation forensic video preview using Python and OpenCV and JavaScript with special in retrospect on detection manipulation in video material. The results research they show how to forensics techniques I can to use for identification and verification authenticity of video content.

Keywords: Cranberry, Agar well, Gram-Negative Bacteria

Introduction

In today's time, digital videos they play key role in communication and proof material in court processes. However, with progress technologies, manipulation of video material becomes everything easier, what requires advanced techniques forensics for determination authenticity and integrity of video content.

Methodology

Methods used in this research include detection change in video, analysis metadata, such as and analysis individual of the video frame. Python was used programmatically language together with OpenCV library for processing pictures.

Experimental Part

Preparing the Video

The first step is to upload the video and extraction individual frame works analysis.

Python Copy the code import cv2

```
# Loading videos
video_path = 'video.mp4'
cap = cv2.VideoCapture(video_path)

frame_count = int (cap.get (cv2.CAP_PROP_FRAME_COUNT))
fps = cap.get (cv2.CAP_PROP_FPS)
duration = frame_count / fps
print (f"Total number frames: {frame_count}")
print (f"Number frame by seconds: {fps}")
print (f"Length videos in seconds: {duration}")
```

Comment: Loading videos and calculation basic parameters like what are total number frame, number frame by seconds and total video length.

Extraction Frame

After video uploads, each the frame is extracted and analyze.

Python Copy the code import axis

```
# Creating directory for saving frame
if not os.path.exists ('frames'):
os.makedirs ( 'frames' )

frame_number = 0
while cap.isOpened ():
ret, frame = cap.read ()
if not ret:
break

# Saving individual frame
frame_filename = f'frames /frame _{frame_number:04d}. png '
cv2.imwrite(frame_filename, frame)
```

```
frame_number += 1

cap.release ()
cv2.destroyAllWindows()

print (f"Extracted {frame_number} frames.")
```

Comment: Each one frame from the video is being saved like separate image to the directory works further analysis.

Detection Manipulation

In this one part, detection manipulation is done through analysis the difference in between consecutive frame.

python

Copy the code

```
import numpy as np

previous_frame = None

for and in range (frame_number):
current_frame = cv2.imread(f'frames /frame_{i:04d}. png ', cv2.IMREAD_GRAYSCALE)

if previous_frame is not None:
# Calculation absolute differences in between the current one and the previous one frame
      frame_diff = cv2.absdiff(current frame, previous_frame)

# Application threshold on the difference works identification change
_, thresh = cv2.threshold(frame_diff, 25, 255, cv2.THRESH_BINARY)

# Showing the difference
cv2.imshow('Difference ', thresh)
cv2.waitKey(1)

previous_frame = current_frame

cv2.destroyAllWindows()
```

Comment: They are detected here differences in between frame, which can indicate on manipulation of video content. Absolute the difference in between consecutive frame enables identification suspicious change.

Results and Analysis

The results show that using described methods I can successfully to identify manipulation within the video. Differences in between consecutive frame clear indicate on changes which they do n't match with normal flows recording, what can to be indicator potential manipulations.

Forensic video editing represents a critical element in securing integrity digital video recordings. Through simulation in Python, it is shown how simple techniques like analysis the difference in between frame I can to use for detection manipulation. Future work could to focus on more advanced techniques, including analysis compression of artifacts and statistical methods for additionally promotion forensic video analysis. The memory has been updated Okay, write I will to you example in JavaScript using the library like what is ffmpeg.js for video processing. Then we will analyze success Python in relation to JavaScript for this one kind task.

Example in JavaScript

JavaScript is often using for video processing in web applications, and ffmpeg.js enables video processing directly in the browser.

Preparation of the Project

First, you need to include the ffmpeg.js library in your project.

html

Copy the code

```
< script src="https://cdnjs.cloudflare.com/ajax/libs/ffmpeg.js/0.9.7/ffmpeg.min.js"></script>
```

Loading and Extraction Frame from the Video

javascript

Copy the code

```
const extractFrames = async (videoFile) => {

const ffmpeg = await createFFmpeg ({log: true});

wait ffmpeg.load ();

// Load video

ffmpeg.FS ( ' writeFile ', 'video.mp4', await fetchFile ( videoFile ));

// Extraction frame on every 1 second

wait ffmpeg.run ('- i ', 'video.mp4', '- vf ', 'fps=1', 'frame%d.png');

// Retrieve of all frame

const frames = [];

for (let i = 1; i <= 10; i ++) {

frames.push ( ffmpeg.FS (' readFile ', `frame${ and }. png `));
}

// Display frame

frames.forEach ( (frame, index) => {

const blob = new Blob ([ frame.buffer ], { type: 'image/ png ' });

const url = URL.createObjectURL (blob);

const img = document.createElement (' img ');

img.src = url ;

document.body.appendChild ( img );
});
};
```

Comment: The video is loaded, and then the frames they extract on every time one a second. Extracted frames are displayed in the browser.

Detection Manipulation

In this one step we can use the Canvas API in combination with ffmpeg.js for Detection the Difference in Between Frame javascript

Copy the code

```
const detectManipulation = (frames) => {
const canvas = document.createElement ('canvas');
const context = canvas.getContext ('2d');

flight previousImageData = null;

frames.forEach ( (frame, index) => {

const image = new Image ();

image.src = URL.createObjectURL (new Blob ([ frame.buffer ], { type: 'image/ png ' }));

image.onload = () => {

context.drawImage ( image, 0, 0 );

const imageData = context.getImageData (0, 0, canvas.width , canvas.height );

if ( previousImageData ) {

// Detection the difference

const diff = context.createImageData ( canvas.width , canvas.height );

for (let i = 0; i < imageData.data.length ; i += 4) {

const r = Math.abs (imageData.data [ i] - previousImageData.data [ i]);

const g = Math.abs (imageData.data [ i + 1] - previousImageData.data [ i + 1]);

const b = Math.abs (imageData.data [ i + 2] - previousImageData.data [ i + 2]);

diff.data [ i] = r;
diff.data [ i + 1] = g;
diff.data [ i + 2] = b;
diff.data [ i + 3] = 255;
}

context.putImageData ( diff, 0, 0 );
document.body.appendChild ( canvas);
}

previousImageData = imageData;
};
});
};
```

Comment: This one the code compares pixels in between consecutive frame in order to detect potential manipulations. Differences are displayed on the canvas element in the browser.

Analysis Performance of Python vs. Java Script

Performance

- **Python:** Python is very efficient for video processing, especially in combination with libraries like what are OpenCV. His performance is optimized to work with big quantities data and complex algorithms processing pictures. Python too enables simple prototyping and testing codes.
- **JavaScript:** JavaScript, although popular for web applications, it is not so much optimized for video processing like Python. ffmpeg.js allows working with video files directly in the browser, but performance is limited because of nature of the web environment and requests to work in real time. Processing larger video files can to be slower and resourceful more intense.

Simplicity of Use

- **Python:** Python offers rich collection library for processing pictures and videos. OpenCV is good documented, which makes it easier the beginning of work even and for those who they don't have a lot experience in the field digital forensics.
- **JavaScript:** In JavaScript, ffmpeg.js provides strong tool for video processing, but requires more manual of work for achievement of the same results as in Python. Setup environment and writing code can to be more complex, especially for those who they are not get to know with working with videos in a web environment.

Flexibility

- **Python:** Python is more flexible for different types video processing. It's easy to do integrate with others tools and systems, which Mr does convenient for complex forensic analysis .
- **JavaScript:** JavaScript is limited to the web environment, which can to be advantage in sense availability, but limitation in sense performance and flexibility.

Conclusion

Python proved itself like superior tool for video forensics in terms of performance, flexibility and simplicity of use. JavaScript, though useful for web applications and simple tasks, it is not so much powerful nor efficient like Python for complex forensic video analysis.

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