C14 Source Identification of High-Definition Videos — A Forensic Analysis of Downloaders and YouTube® Video Compression Using a Group of Action Cameras

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After attending this presentation, attendees will understand how YouTube® video compression works and how it can affect different types of high-definition video analysis.

This presentation will impact the forensic science community by teaching investigators how to interpret and analyze video when the origins are on YouTube®.

This presentation addresses the effects of YouTube® on source camera identification while seeking to quantify the amount of change that can occur during the conversion process. It is well understood that YouTube® re-encodes all video uploaded to the site, which has several implications for forensic authentication analysis.[1] The testing material described in this study was comprised of 11 different GoPro® cameras and three different downloader tools.

Video cameras are a large part of today's mainstream society, where many people feel the need to record and share their life's experiences. YouTube®, created in 2007, has become the most popular host of internet videos from around the world with an estimated one billion unique monthly users.[2] YouTube® is localized in 61 countries and across 61 languages. More than 100 hours of video are uploaded every minute. These videos can contain important information about a crime, or event, that might have occurred. For example, in September of 2014, the terrorist group called the Islamic State of Iraq and Syria (ISIS) released a set of videos on YouTube® that portrayed the beheadings of American and British citizens. These videos were called into question, and their authenticity needed to be determined. It is the job of the forensic investigator to determine if a particular video in question is a complete and accurate representation of what it purports to be.

This research describes a variety of established image authentication techniques used to determine the origin of a video. The underlying framework of YouTube® is addressed, including how it works, and the effects it can have on a video in question. The research then describes and compares three tools that can be used for downloading YouTube® videos in addition to how the test data was acquired. The structure and source identification techniques are presented using the test results.

If a video is called into question, and a reference video database is available, the examiner can look for a match. In a forensic case, it is recommended that a database collected over time, with thousands of cameras and videos, be built to help determine the origin of a video. Since a reference population was available in this research, a threshold and a conclusion can be determined. This is the same principle that should be applied in all forensic cases.

The techniques discussed in this presentation are limited in providing positive proof of camera identification since the number of possible combinations between cameras, their settings, and eventually digital edits and recompressions before uploading to YouTube® or other video hosting services is almost impossible to compute. Due to the number of different variables, a set of conclusions is proposed that can be used within a framework for forensic cases.

Reference(s):

1. van Houten W., Geradts Z. Source video camera identification for multiply compressed videos originating from youtube. *Digital Investigation*, issues 1- 2, pages 48-60, September (2008).
2. www.youtube.com

Video Analysis, YouTube®, GoPro®

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