



B22 Quantitative Comparison of Frame Extraction Methods for Motion JPEG Video

Jeffrey M. Smith, MS, 2857 S Steele Street, Denver, CO 80210; and Catalin Grigoras, PhD, 1020 15th Street, Ste 81, Denver, CO 80202*

After attending this presentation, attendees will understand some principles in digital image analysis, digital video processing, and quantitative analysis.

This presentation will impact the forensic science community by providing various methods for the quantitative comparison of frames that should be identical or as close to identical as possible. These methods can be used in a forensic lab when evaluating software or processing options during the development of Standard Operating Procedures (SOPs).

The fundamental principle of forensic science and in the handling of digital and multimedia evidence is to ensure the integrity of evidence through the collection and analysis stages of an investigation. Safeguards such as write-blocking media and hashing copied data are integral to this principle. However, it is universally understood that this is not always possible, such as in the lifting of fingerprints or with the live analysis of a computer. When circumstances arise which require a change to evidence, those changes should be necessary, understood, documented, and explainable in a report or to a jury.

In the processing and analysis of forensic imagery, changes to evidence are common in order to clarify details that may be obscured due to poor lighting, compression artifacts, system resolution, etc. Digital enhancement or clarification of imagery has long been acceptable in court so long as the processing steps taken are documented and the original imagery is available. However, minute changes to digital imagery can occur during the extraction and preparation of material that are often times unavoidable, albeit unnoticeable, such as in the common procedure of extracting video frames uncompressed from compressed video sources. This study will present the results of a quantitative comparison of extracted uncompressed frames from a motion JPEG video where a ground truth video frame is available. In this particular situation, the minute changes derive from implementation of the DCT decoding algorithm necessarily employed to process JPEG images. The ground truth JPEG frame, available by carving its data from the JPEG video stream, represents unchanged evidence and can be compared pixel-to-pixel to frames extracted through various means. This shows which method will change the evidence frame the least; an important consideration not only when respecting the aforementioned fundamental principle but also since it is necessary to maintain as much original detail as possible when analyzing and interpreting evidence.

Two methods will be demonstrated for quantitative evaluation of extracted frames where a ground truth is known. The first will use Photoshop® and probably be a more comfortable approach for image analysts while the second approach will employ MATLAB to derive more thorough statistical information for evaluation.

Media Forensics, Image Analysis, Forensic Video Analysis