B27   Framework for Authenticity Analysis of Digital Audio

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After attending this presentation, attendees will better understand the authentication process for digital audio, using ways in which various analyses can be combined into a robust framework.

This presentation will impact the forensic science community by providing a logical and scientifically sound process for digital audio authentication.

Digital audio authentication is a complex process of establishing the provenance of a questioned recording to determine whether it is consistent with an original one or if there is evidence of tampering. It also must follow the basic principles of forensic science that include five stages: (1) occurrence of the crime (or acoustical event); (2) seizing of evidence (no material contamination of media support and no digital contamination of the data); (3) analysis; (4) interpretation; and, (5) presentation. This paper presents the organization of several techniques in a logical manner for the authentication of digital audio. Special attention has been given to interpreting results from individual analyses and incorporating them into a holistic view of a recording's authenticity where a finding can be corroborated against the results of other analyses. Only in this way can an examiner present a conclusion with confidence and assurance that all possible hypotheses have been exhausted in the execution of this important endeavor. The proposed digital audio authentication framework involves accurate, repeatable, reliable, unbiased, and scientific analyses that come from peer-reviewed publications in order to meet the *Daubert* standard, the NAS Report recommendations, and/or appropriate criteria of international legal systems. A forensic lab should also not accept tasks that their facilities, methods, software, databases, equipment, or specialist's background, training, and experience are not equipped to perform.

The task of digital audio authenticity can be separated into two main categories: container analysis and content analysis. The container relates to the file structure, metadata (either stored in the file itself or generated by a software or operating system), etc. Renaming of the container may not necessarily affect the integrity of the contents, but may alter and/or damage the media support or wrapper. This would raise doubts about authenticity that require explanation and may make some types of analyses inconclusive. Content analysis involves checking for traces of previous signal processing or editing using various methods such as: critical listening, waveform analysis, spectrogram, signal's power, dc offset, long-term average spectrum, sorted spectrum, differentiated sorted spectrum, compression level analysis, electric network frequency, butt-splice detection, analog transfer of a digital recording, reverberates analysis, MP3 edits, phase of a mono signal, and phase of a stereo recording. It should be noted that mono signal phase has certain limitations due to clicks, pops, clippings, and other signals from the environment. Also, in many cases, such as phone-intercepted recordings, reverberates, and MP3 edit analysis have limited or even no application. It is important for an examiner to show how they arrived at their conclusions and present them in a way that neither overstates nor understates the scientific certainty. Not every case will employ every type of analysis because, for various reasons, some may not be applicable; however, as many analyses as possible should be used in order to corroborate results. While the proposed table cannot account for every possible authentication technique or alteration technique known to exist, it should be useful in forming a reliable, ultimate conclusion regarding authenticity. The types of individual analyses that an examiner performs could be modified, expanded, or substituted as the tools and accuracy of the science improve over time.

This presentation will demonstrate the proposed framework in which an examiner would start at the global level and continue to the local level based on the findings and needs of the particular case. The appropriate philosophy regarding media authenticity will be discussed as well, for example when it is not scientifically possible to say that a digital audio file is absolutely authentic, or to prove that it is a certain clone/duplicate or copy of an authentic file. Therefore, language implying 100% certainty should be avoided unless speaking about known alterations or deletions. Whenever it is necessary, the results should be presented separately for container and content analyses, in a clear and unbiased way.

Forensic Audio, Audio Authentication, Methodology