



Digital & Multimedia Sciences Section – 2011

B18 Quantifying Phase Changes in Audio Authenticity Examinations

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The goal of this presentation is to present testing results of manual and automatic methods for detecting phase changes in forensic audio recordings when conducting audio authenticity examinations.

This presentation will impact the digital and multimedia forensic science community by defining the limitations of using phase change as an analysis tool in audio authenticity examinations. Phase changes by themselves may not provide insight as to whether an event is an alteration or not, but shows promise as a method to correlate multiple events. If the accuracy of detecting phase changes is unreliable, this will also impact the value of it being used as potential method for forensic audio authentication.

Hypothesis: To determine whether a phase change in a forensic audio recording can accurately be identified as an alteration or edit and develop criteria or parameters classifying the event as such.

Synopsis: A series of test recordings that include various digital and analog formats, which are both altered and unaltered with discrete reference tones recorded at various amplitudes will be used to test manual and automatic methods for a change in phase. Testing results provide answers to the question: Is a phase change in an audio file synonymous with alterations?

The use of changes in phase is not a new analysis method for forensic audio authenticity examinations. Interest in expanding its role to detecting edits in digital recordings has increased in the last several years. Several concerns accompany this increased interest. Automatic detection of phase shifts can help speed a cumbersome time-consuming process of manually locating events, but accuracy and the thresholds of such detection methods are not widely known. Even if events are detected accurately there is not any specific criteria to determine whether the phase shift is the result of an alteration or naturally occurring event during the time of recording.

Test recordings will be produced to include reference tones at various amplitudes to determine if changing the amplitude of the reference tone will directly impact the accuracy of automatic phase detection systems. The test recordings will also contain a range of naturally occurring events and files with various alterations. The use of several common digital formats that represent the type of audio being received for examination and the method in which they are recorded may show that some formats may or may not maintain phase. An automatic detection system may falsely identify phase changes that may be inherent to the recording process, format, or recording environment and not necessarily the result of an edit or alteration. It may also identify phase changes where they do not exist or not identify them at all. Being able to accurately account for the number of phase changes detected or not detected is important.

The second part of this presentation will attempt to clarify what a phase change means to the authenticity of an audio recording. Even if the detection of phase changes is accurate, what correlation does a phase change have to an alteration or edit? Examination of known events may help correlate phase changes caused by edits or naturally occurring ones. Criteria for establishing which phase changes are the result of an alteration and which ones are not is lacking. This problem is similar to identifying events as pause or voice-activated for analog recorders. Both of these events are caused by stopping the transport of the recorder without disengaging the record and erase heads. A pause event is generally associated with a potential alteration, where as a voice- activated event is generally not. Often the events are identified through testing the operation of the analog recorder, these methods do not translate to digital recorders.

Statement: Phase changes by themselves may not provide insight as to whether an event is an alteration or not, but shows promise as a method to correlate multiple events. If the accuracy of detecting phase changes is unreliable, this will also impact the value of it being used as potential method for forensic audio authentication.

Audio, Authenticity, Data Analysis