DSS™: A Breakthrough in Forensic Audio

The newest feature in DC LIVE/Forensics adds another tool to the arsenal of Forensic audio technicians eager to remove coherent noise from recordings. Here is a typical scenario:

A meeting takes place in a bar with an agent set up with a body wire. During the meeting, a stereo system is starting and is blaring music. On listening to the recording, it is found that the speech is not understandable due to the noise from the stereo. The speech can be heard, but the volume of the music is so high as to make it unusable.

In this common situation, DSS will allow you to recover this important speech.

Why it is unique:

Our DSS tools allows you to go back later to the location of the original recording and record a reference track containing the noise you would like to remove. This allows you to obtain good results even when unanticipated things happen during an operation that would otherwise make the resultant audio useless. There are several methods of obtaining a reference recording that are detailed in this document. This ability to "fix" recordings and recover speech even after an event is a prime and unique feature off the DSS tool in DC Live/Forensics.

How it works:

DSS works by performing a continuous and intelligent dynamic subtraction of one audio signal from another. Normally, with a Forensic recording containing speech masked by loud audio, you will require a reference recording containing just the audio that needs to be removed. The audio track containing the music or other audio to be removed is called the "Reference Track."

Recording a Reference Track

There are many ways that you can obtain a reference track. These examples should make this clear:

Real Time Methods*

1. Place two microphones in the venue. Place one near the target conversation and place the other near the source of the background audio source such as a TV, stereo system, jukebox, or a live band. Record these two signals with a stereo tape recorder or computer.
2. Wire the investigator with two microphones. Place one near the investigator's chest and place the other much lower on the investigators body, like down in his or her sock or shoe. Record both signals with a miniature stereo tape recorder.
3. Wire the room with a wireless microphone located near the sound source like the TV, Stereo, jukebox or live band. Wire the investigator with a wireless microphone located near his or her chest. Record both signals with a remote stereo recorder or computer.

Non Real Time Methods* ‡

1. Assume that you have a recording made in a bar or similar venue that was recorded with a monophonic pocket tape recorder. The jukebox or other interfering music source is covering over the targeted speech. You can go back later with the same recorder and record the same exact song that was being played. This will become your reference track for DSS decoding.
2. You have the same situation as stated above, but you have a second tape recorder on site that is recording only the noisy background environment.
3. You have the same situation as stated above, but you record the same music that had been playing at the venue from a commercial audio CD. This process can be performed in non real time back in your audio lab.

* Note 1: Digital Recorders produce better results than Analog recorders in DSS decoding applications due to their crystal controlled speed regulation. This may not be the case, however if the digital recorder uses "lossy" compression.

‡ Note 2: If the interfering source of audio was a radio or television, many broadcast stations maintain an archive of "airchecks." You may be able to access the required broadcast "aircheck" recording through either the use of diplomacy or a court order.

Obtaining a reference recording is an important step in removing loud coherent noise sources such as music. Using the Real Time Methods described above, technique number 1 will produce the best results. In the Non Real Time methods described above, number 2 will produce the best results since it will rely on a reference recording that closely resembles the noises that you will be attempting to remove from the target signal.
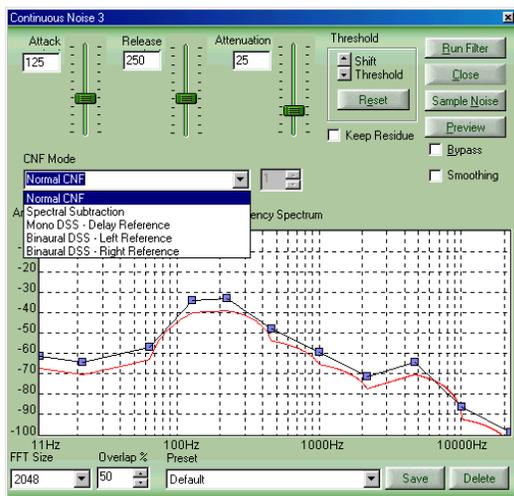
Location of DSS in DC Live/Forensics

There are 3 DSS modes of operation available in the product. To select one, drop the CNF Mode box as shown above.   As you see, you can select either the right or the left channel as the reference track.

If you have no reference track recording and cannot re-create one, you can try to use the setting called Mono DSS Delay Reference. This will attempt to attenuate the noise by comparing the audio at an instantaneous point in time and comparing it with a point at some other time before or after the comparison point. This has the effect of allowing the program to create its own reference signal.

Note: This method is inferior in comparison to any method utilizing a true reference track.

Creating a Stereo track from two discrete tracks in non real time situations: *

The audio file that you will actually clean up using DSS decoding is ideally going to be a stereo file that you recorded in real time. However, often that is inconvenient and non real time methods must be used. In these cases, one channel of the file will be the recording with the speech you want to recover (the Forensic recording) and the other channel will contain just the music or other non-random audio. These two recordings will have to be combined into a single stereo (binaural) recording. The easiest way to

accomplish this is to use the File Split and Re-Combine function under the Edit menu. Here's the procedure:

1. Take the two recordings (the Forensic recording and the reference recording) and convert both of them into monophonic files if necessary by using the File Converter Filter.
2. Use the File Split and Re-combine feature to merge these two mono files into a stereo (binaural) file
3. Time align these two files by either cutting a piece from the beginning of one of them or insert a piece of silence of appropriate length in front of one of them.   Note: Using the Markers and the Time Display feature is quite helpful to precisely measure the time displacement between tracks to calculate how much audio must either be cut or inserted to result in the proper time alignment. The two tracks should be time aligned to within +/- 25 milliseconds of each other for optimum results.

* Note: If the interfering audio came from a live performance, having the live performance re-created by the talent after the fact will not produce a useable reference track for DSS decoding

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