

CEDAR's 'The Young Person's guide to Ticks, Clicks, Scratches, Thumps, and Crackle'

Contrary to common opinion, all forms of audio can suffer from impulsive noises such as clicks, pops and thumps. It doesn't matter whether a recording medium is analogue, digital, or even an optical soundtrack, clicks and thumps can be a major cause for concern. Live audio can be similarly afflicted, so CEDAR has developed a range of solutions to cope with every such eventuality.

Short Clicks and Ticks (1 – 20 samples)

You can eliminate very high densities (thousands of clicks per channel per second) of these problems using either real-time or off-line solutions.

The "Small" settings on CEDAR's dedicated DC-1 Declicker module and on CEDAR for Windows' declicker are ideal for this. You can also use the "Auto" mode of SADiE Declick to achieve excellent results with problems of this nature.

Long Scratches and Clicks (10 – 100 samples)

These are less common than clicks and ticks of short duration, but require greater processing power to detect and remove. Algorithms optimised to remove short clicks will not be successful removing longer scratches, and will often fail to remove the tail of the scratch. This will then become a low frequency "pop" or similar unwanted artefact.

CEDAR's "Large" setting is optimised for scratches of up to 100 samples duration. You can find this on the DC-1 declicker module and on CEDAR for Windows' declicker. Similarly, the "Auto" mode of SADiE Declick will achieve excellent results with problems of this nature.

Medium Clicks (1 – 100 samples)

Some material suffers from a combination of short and long duration clicks and scratches. In these cases, neither "Small" nor "Large" is adequate to remove all problems, and a composite algorithm is required.

CEDAR's "Medium" setting combines "Large" and "Small" algorithms, and will remove a small number of long scratches and a high number of shorter clicks in a single pass. You will find this on the DC-1 declicker module and on CEDAR for Windows' declicker. The CEDAR DCX declicker is also optimised for mixed long/short problems. Similarly, the "Auto" mode of SADiE Declick will achieve excellent results with composite problems of this nature.

Extended Scratches and Clicks

(up to 2,000 samples)

If unwanted signal disturbances exceed 100 samples it is unlikely that they will be adequately corrected by any of the real-time or "auto" methods described above. In these cases, it is necessary to mark the start and end points of the problem using the waveform display of a suitable storage medium such as SADiE. You can then invoke the "Manual" declick mode of SADiE Declick to remove the damaged signal and replace it with a suitable interpolation based on the surrounding, undamaged signal.

Low Frequency Thumps

(up to 50,000 samples)

You will occasionally encounter extended thumps that can not be corrected by any of the declick and descratch methods outlined above. Unlike ticks, clicks, and scratches, these often retain real signal information throughout their durations, and a suitable algorithm can use this to interpolate extreme lengths of damaged signal.

SADiE DeThump is the only process of this nature. Like "Manual" declick, this requires that you mark the start and end points of the problem using the waveform display. You can then invoke "DeThump" to remove the damaged signal and replace it with an interpolation based on the retained good information within the thump, plus information within the surrounding, undamaged signal.

Crackle (1 – 25 samples)

Crackle is frequently confused with clicks and ticks. This is not surprising, given that it too comprises many short-duration impulsive signal disturbances. However, a conventional click detector will often find it difficult or impossible to detect the damage that leads to crackle, so a dedicated method must be used. CEDAR produces three decrackle algorithms that are also effective at removing many forms of impulsive buzzes as well as some amplitude distortions.

• Crackle 1 (CEDAR CR-1 Decrackler and CEDAR for Windows)

This is optimised for "well defined" crackle that is often characterised by a strong high-frequency content.

• Crackle 2 (CEDAR CR-1 Decrackler and CEDAR for Windows)

This is optimised for "grungy" crackle that may lack high frequency content and which sounds more deeply embedded within the desired signal.

• Decrackle (CEDAR CRX decrackler)

This is analogous to the "Medium" setting described above, and copes well with a wide variety of crackle problems.

CONFIGURING A SUITABLE SYSTEM

An ideal system will be able to cope with all the impulsive disturbances it encounters, including thumps, scratches, clicks, and crackle. You can create this using a combination of SADiE DeThump, SADiE Declick, plus two CEDAR for Windows modules: Declick and Decrackle.

If for any reason this system is not suitable, you can achieve an excellent compromise using SADiE DeThump, SADiE Declick, plus CEDAR for Windows' Decrackle module. In this case you may find that you can not correct extreme densities of fine clicks and ticks, although multiple passes of SADiE Declick and CEDAR for Windows Decrackle should overcome this. The limitation is, therefore, the loss of CEDAR's real-time capabilities, not a loss of restoration quality.

If no thumps or crackle present themselves, you will not need the DeThump and Decrackle modules, and you can then select the declicker that is most suitable for your purposes. In general, the trade-off will then be between speed of use and cost. However, if your material exhibits long scratches (>100 samples) you will be constrained to consider SADiE Declick because there is no equivalent real-time process.