reNOVAtor™

High Resolution Audio Repair Processor

for soundBlade

User Manual

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Chapter 1.....Introduction

The ReNOVAtor™ option for soundBlade allows localization, identification and very precise removal of unwanted audio events without affecting the audio material you want to keep. The removed sound is replaced by a signal re-synthesized from the surrounding material. ReNOVAtor does not make deep gaps in your sound track when eradicating a disturbing sound event. Rather, it's an exactly tailored hole in the spectral representation of the processed signal that can be removed and replaced. The interpolation may even be restricted to certain gain ranges within the selected area, which is very useful if only a certain part of the signal needs to be treated (e.g. one specific harmonic). The reNOVAtor window is fully resizable for increased accuracy and optimal compatibility with all screen resolutions.

Working with reNOVAtor is easy and intuitive. ReNOVAtor loads the requested part of audio material you've chosen and analyzes it. The result is displayed as a 3D spectrogram with time on the horizontal axis, frequency on the vertical axis and amplitude of the spectral components color-coded. The color assignment follows the order of the rainbow: red and yellow for low energy; green and blue for middle energy; and finally purple and white for high energy. After getting some experience, this 3D spectrogram representation allows a good feeling for localization and identification of sudden unwanted acoustical events. The spectral area of interest can be precisely marked with a resizable rectangular window. A Play button allows you to hear selected parts of the processed signal.

1.1 Main Features

- up to 384 kHz sampling rate, thus perfectly suitable for DSD post-production
- extraordinary results compared to any other cleaning method, due to selective treatment of spectral representation of the signal and not its waveform.
- enormous time savings when repairing critical live recordings
- easy-to-learn identification and localization of unwanted audio events
- efficient removal of unwanted audio events and their replacement by signals
- re-synthesized from the surrounding audio material
- resizable and zoomable spectrogram window for sound repairing with surgical precision
- multiple selections of harmonics and automatic identification of tones and clicks
- audition of any selected area before and after processing
- multiple undo functions
- gain selective signal treatment
- different types of interpolations
- replacing one spectral region by another (copy & paste)
- no audible changes in desired signal and ambience after removing typical discrete audio disturbances

1.2 Typical Applications

- Removing unwanted noises like sneezing, chair squeaks, coughing, car horns, fallen coins and keys, ringing of a mobile phone, etc.
- Correcting instrumental tracks by removing scratches from stringed instruments, wrong notes, rustle of sheet music, keyboard pedal noise, vocalist's breathing, lip smacks and microphone pops
- Restoring old recordings by removing scratches and dropouts
- Cleaning up environmental noise on location recordings for film and television

Chapter 2.....SetUp

2.1 Installation

Normally you will receive a key file for reNOVAtor in an e–mail or downloaded as a zip file containing the key file and the Operator's Manual in PDF format. Unpack the zip file or copy the respective files to your Mac. Always store a copy of the key file in a safe place as a back–up.

To install your reNOVAtor option, open soundBlade. Then, select File > Update Key file… and select your new key file containing the reNOVAtor option. soundBlade should respond with an "Update Successful" dialog. Then, quit the application and re–launch.

Note that your key file is link to a specific iLok USB Smart Key. Other iLok Smart Keys will not enable your paid options.

2.2 System Requirements

The system requirements are highly dependent on the amount of data to be treated and the window size used.

Minimum configuration for a standard 600x400 window and a 20 second track:

- soundBlade base configuration — G5 or newer, running 10.4.3 with 1 GB RAM

The recommended system for larger resolutions and longer files:

- soundBlade recommended configuration — G5 or newer, running 10.4.3 with 2 GB RAM or more

Chapter 3..... Getting Started

3.1 Overview

Start reNOVAtor by click–dragging a time region selection in a Project's Panel. Then, select NoNOISE® > Nova… to start the processor. After you have selected a wav file to be processed, the reNOVAtor window pops up and shows the spectrogram of the left channel (left).

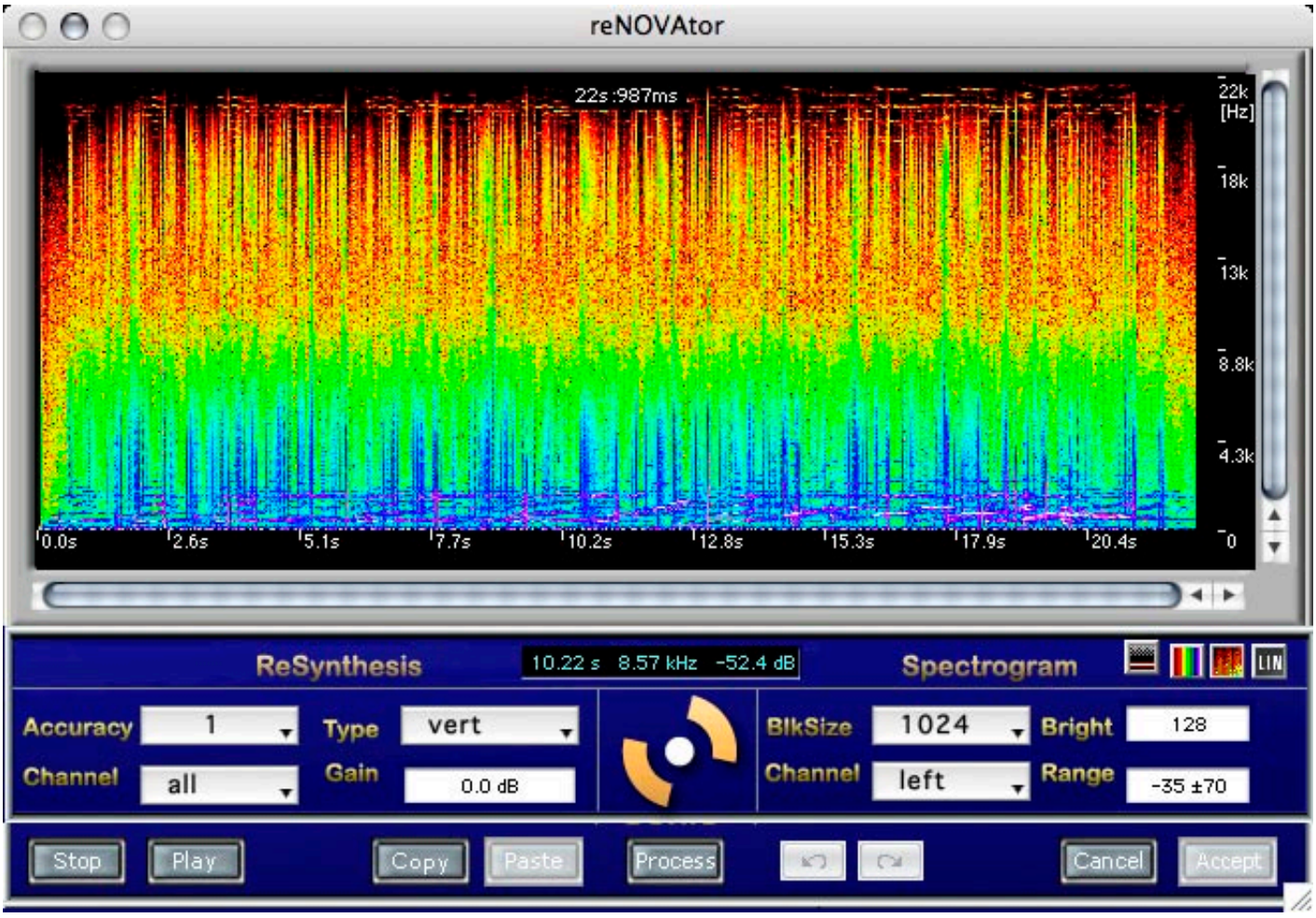

Figure 3.1: The main reNOVAtor window

Typically, files up to 10 minutes can be loaded all at once. The maximum length of audio files is dependent on your host's computational power and RAM complement, the required spectrogram resolution and sample rate for the source sound file. If you experience any performance problems with long files, cancel out of reNOVAtor and shorten the time region selection.

Though reNOVAtor processing is undo–able at any time, we recommend you always make a backup of your original audio material to have the opportunity to start again if, for any reason, the NoNOISE metadata, the ".cd" and ".rl" files, are lost.

Before you begin, remember that “tool tips” are available at any time to remind you of the function of a particular control. To see a tip for any control, simply locate your cursor over a control and hover there for a moment. A contextually appropriate tool tip will then pop up with a brief description of that control or feature.

To adjust the display color range to the material, click–drag on the Range field and move the mouse. Mouse movement along the y-axis, up and down, adjusts the middle position of the gain while movement along the x-axis, left and right, adjusts the overall gain range. As with all numeric fields in reNOVAtor, a double click in the field resets the gain parameter to the default value. In this case, -35 ± 35 dB.

To the right of the Spectrogram label, there are four buttons. The second button toggles between three color mapping schemes:

- “physical,” with red representing lowest energy, through yellow, green and blue to white, representing the highest energy
- “standardized,” with blue representing the lowest energy, through green and red to white, representing the highest energy
- monochrome, with black representing the lowest energy, through to white, representing the highest energy
- inverse monochrome, with white representing the lowest energy, through to black, representing the highest energy

To zoom in on an area of interest, first select the portion of the spectrogram by holding the left mouse button and drawing a selection or marquee. Then right-click to open the popup menu, as shown below. Finally choose one of the zooming operations (see Quick Reference for details).

The selected area can be moved or resized as indicated by the mouse cursor. Its length in seconds and milliseconds is displayed inside. The shading grade of the area can be controlled by the Bright parameter in the Spectrogram Parameter Group from darkening (as shown above) to brightening. A double left-click on the Bright resets it to the neutral position (192).

Another way to select the visible spectrogram portion is by resizing and moving the scrollbars beside the display. By left-clicking and moving the edges of the horizontal or vertical scrollbar, the visible spectrogram region can be zoomed in or out and moved. When the SHIFT-key is also held down, zooming is performed symmetrically. The length of the displayed signal is indicated in the upper part of the spectrogram.

The displayed audio channel can be toggled by left-clicking on the channel field (left, right, l+r). Block size applied to the spectrogram and interpolation is accessed by left-clicking on the Blocksize field, holding the button and selecting the value from the pop-up list (selectable values: 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384 and 32768). In general, interpolation of short disturbances (like clicks) requires smaller block sizes, while a frequency selective interpolation (like removal of discrete tone) requires larger block sizes.

The whole loaded audio material or any portion can be replayed at any time by positioning the white play cursor at the desired position and clicking the Play button. To place the play cursor, left-click at the bottom (black) end of the spectrogram where the mouse cursor changes to the play cursor , or --while holding ALT-key-- just click on any position in the spectrogram. A left-

click on the Stop button stops the audio playback. After stopping, the play cursor returns to its initial position.

To remove an unwanted disturbance, select an area around it and set up the desired parameters in the ReSynthesis Parameter Group. These are Accuracy, Channel, Type and Gain (see in Quick Reference for all setup possibilities). To remove clicks as shown in the example above, you will usually use the hor interpolation type to replace the selected area containing respective click with a new signal re-synthesized from the material surrounding the click along the time lime.

The interpolation types left or right can be used, if one side of the click is not suitable for proper interpolation (e.g., it includes strong percussive beats). However, the results in case of one-side interpolation are less accurate.

To perform the interpolation in a selected area, hit the Process button or select process from the drop-down menu. After processing has been done, you can immediately listen to the result directly from the PlugIn by resetting the play cursor and hitting Play button. The lower screen shot from the previous page shows the audio piece from the upper screen shot after click removal.

If you are not satisfied with the result, you may undo the interpolation with the button or by pressing ctrl-z. The maximal number of undo steps is limited only by the available computer memory. If you reach the memory limit you can clear the undo buffer by hitting the button. Once an undo step is performed, it can still be re-done by hitting the button or ctrl-y on the keyboard. However, after the reNOVAtor has been closed with Accept or Cancel, all pending redo steps are no longer accessible.

To finish your reNOVAtor session, hit the Accept button to accept the changes and write them back to the Pyramix track or hit cancel to exit the PlugIn and discard all changes.

For precise spectrum analysis the numerical display in the middle below the spectrogram is provided. It shows spectrum properties at the current cursor position: time, frequency and amplitude.

For precise spectrum analysis the numerical display in the middle below the spectrogram is provided. It shows spectrum properties at the current cursor position: time, frequency and amplitude.

Note that as long as you stay within a reNOVAtor session all processing steps are stored in the temporary memory and can be re-done. However, after closing the session with the Accept or Cancel button, all intermediate steps get lost.

All parameters, their settings, and remaining buttons are precisely described later in the Quick Reference.

Chapter 4..... Quick Reference

4.1 Inside the Spectrogram

4.1.1 Spectrogram Setup

To adjust the spectrogram color range of the material, click–hold in the Range field and move the mouse. Movement along the y-axis, up and down, adjusts the middle position of the gain while the movement along the x-axis, left and right, adjusts the gain range.

The  button toggles between four color mapping schemes:

1. physical with red representing lowest energy through yellow, green and blue to white representing the highest energy
2. "standardized" with blue representing the lowest energy through green and red to white representing the highest energy
3. grey scale with black representing the lowest energy through to white representing the highest energy
4. inverse grey scale with white representing the lowest energy through to black representing the highest energy

The  button activates smoothing of the spectrogram. The  button switches between linear and logarithmic frequency axis.

4.1.2 Spectrogram Resizing

In general, the entire reNOVAtor window is resizable. The spectrogram itself can be zoomed in or out. It can also be moved independently in both directions, horizontally and vertically, by resizing and moving the associated scroll bars. With the shift key held down, zooming is symmetrical. The length of the program portion actually displayed is indicated in the upper part of the spectrogram.

When clicking in the scroll bar area, but outside the bar, the zoom area moves 1/3 display toward the direction clicked. This can be useful for tracking the play cursor during playback.

4.1.3 Marking an Area

An area of interest can be click–dragging on the spectrogram and drawing a marquee or selection around it. The selected area can be moved or resized as indicated by the mouse cursor. Its length in seconds and milliseconds is displayed inside. The contrasting shading of the area can be controlled by the Bright parameter in the Spectrogram Parameters.

To move a marquee to another location, move the cursor to the center of the selection. The cursor changes to the Move cursor, a four quadrant arrow shape.

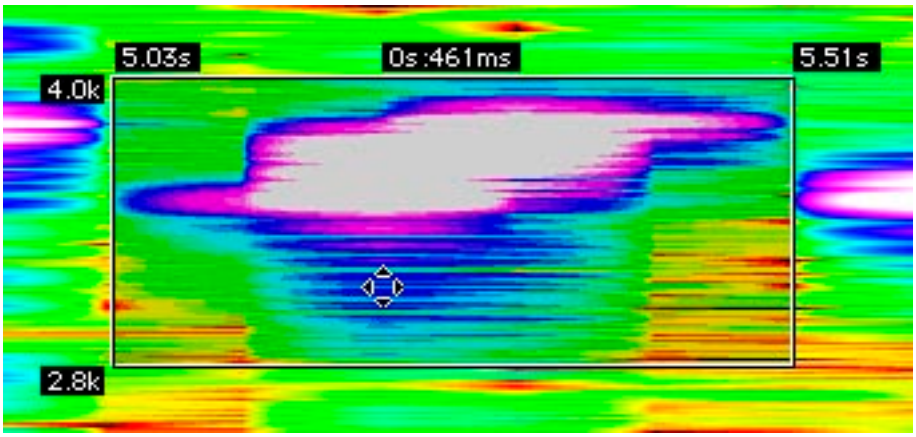

Figure 4.1: The Move cursor

Once you see the Move cursor, you can click–drag the marquee around the spectrogram. By holding down the shift key before dragging, you can constrain movement to only the horizontal or time axis.

4.1.4 Zooming a Selected Area

Zooming in a selected area can be performed in one of two ways. First, from the pop-up menu that opens after control–clicking in the spectrogram or by using shortcuts, see Chapter 7 below. The second way is to place your curson in the black, horizontal time scale or the vertical, frequency scale. The cursor changes to a magnifying glass, allowing you to zoom in on that axis. Holding down the shift key allows you to zoom out.

Note that resizing the spectrogram with scroll bars respectively changes the size of the selected area in the spectrogram, but its absolute length, in seconds and milliseconds, remains unchanged.

A option–clicking inside the spectrum display enters the zoom/move mode. Moving the mouse up and down zooms out and in. Move left or right to scroll. With this feature, it is possible to click into an area of interest and move the mouse down in order to zoom the spectrogram around the mouse cursor.

Additional zooming possibilities are provided by key equivalent. See Chapter 8 below for more information

4.1.5 Playback

The whole loaded audio material or part of it can be played back at any time by clicking in the spectrogram to position the white play cursor at the desired position. Clicking the Play button or tapping the space bar start playback. After playback has stopped, the play cursor returns to its initial start position.

Additional playback possibilities are provided by key equivalent. See Chapter 8 below for more information.

4.1.6 Copy & Paste

A selected area can be copied to another spectrogram position. After clicking the Copy button or selecting Copy Area from the contextual menu, it can be moved around with the mouse to the desired destination. As long as the copy mode is active, the field Type shows copy.

To paste the selected area into the desired location, click the Process button or, select Process from the contextual menu. The marquee changes from white to blue.

To exit the Copy mode, simply click outside the marquee. The ReSynthesis Type will switch back to its previous selection and the marquee changes back to white.

The copy and paste function can be restricted to the original position in frequency if the shift key is held down while relocating the marquee. This is very useful, when the area to be copied contains material, such as harmonics, that needs to be placed in exactly the same frequency region.

Chapter 5.....User Interface Details

5.1 Buttons

 - Undoes the interpolation (or ctrl-z).

The maximum number of undo steps is limited only by the available computer memory.

 - Redoes the last undo step (or ctrl-y); be aware that after the reNOVAtor has been closed with Ok or Cancel all pending re-do steps are no longer accessible.

 - Introduces the Automatic Selection of Harmonics mode (see a special chapter in the Manual). It allows selecting multiple harmonics belonging to a marked fundamental frequency. The fine tuning of the fundamental frequency and enabling or disabling each individual harmonic selection can be done in the Harmonics Selection window that pop-ups after clicking the harmonic selection icon.

 -Toggles between four color mapping schemas: (1) physical with red representing the lowest energy, over yellow, green, blue to white representing the highest energy; (2) “standardized” with blue representing the lowest energy, over green, red to white representing the highest energy and (3) monochrome from black representing the lowest energy, over gray to white representing the highest energy and, (4) an inverse monochrome mode.

 - Activates smoothing in the spectrogram; it should normally be on; to switch it off makes sense if we need to precisely see the borders of very sharp spikes.

-Toggles between linear and logarithmic frequency axis.

5.2 Cursor Callout

if the mouse cursor is located within the spectrogram, the cursor callout indicates the properties of the spectral component at the current cursor position: time, frequency and amplitude.

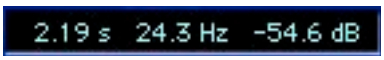

Figure 5.1: The cursor callout

5.3 Menus

A contextual menu opens after control-clicking on the spectrogram.

Figure 5.2: The spectrogram's contextual menu

- Zoom + – This choice zooms in the selected area to the maximum dimensions, limited only by the display size and spectrogram resolution.
- Zoom – – This choice zooms out from selected areas.
- Zoom Hor – This choice zooms in on the selected area horizontally only.
- Zoom Ver – This choice zooms in on the selected area vertically only.
- Copy Area – This choice copies the contents of the selected area, allowing you to move it to another location in the spectrogram for later processing or pasting. This is equivalent to the Copy button.

  Once copied, the marquee changes from black to blue, and the entire selected areas can now be dragged around to relocate it in the spectrogram. To limit movement of the copied area horizontally, to accurately paste harmonic content for instance, hold down the *shift* key before dragging.
- Process – This choice carries out the interpolation. This is equivalent to the Process button or hitting the P key on the keyboard.

5.4 Main Buttons

– Starts playback from the current cursor position

– Stops playback and returns the play cursor to initial position

– Carries out the interpolation in the selected area

– Discards all signal modifications and exits the option

– Accepts all signal modifications and modifies the source sound file with a processed region

5.5 ReSynthesis Parameters

Accuracy, Channel and Type can be selected from their respective menu that appears after clicking in the field. Gain can be adjusted by click–dragging the mouse up or down in the field.

Accuracy – Accuracy [1, 2, 4, 8] sets up the time resolution of the interpolation process and the spectrogram while maintaining the frequency resolution determined by the Blocksize field. The higher the number, the greater the accuracy in time. This doesn't mean that the highest number is always best, since it depends on your audio material.

Normally, for vertical interpolation, 1 or 2 works optimally. For horizontal interpolation, higher values might be more advantageous. Changing the Accuracy parameter results in recalculation of the whole spectrogram, which can take considerable time and memory. Therefore, make changes only when a smaller piece of audio is loaded, no more then a few minutes.

Channel – Channel [all, current, left, right] selects the channel on which the interpolation will be performed.

Type -Type [hor, vert, left, right, top, bottom, 2-dim, Gain, Copy] selects the kind of interpolation to be applied to your selection. All interpolation types, with the exception of Gain, perform a two step operation. First, they remove the signal from the marked area and subsequently fill the spectral hole with a replacement re-synthesized from the surrounding audio material. The name of the interpolation type explicitly describes the "context,' what part of the surrounding audio material is used for the re-synthesis.

The Horizontal (hor) interpolation type is most suitable for removing transient disturbances like clicks while Vertical (vert) is recommended for removing longer tones or harmonics. The interpolation types Left or Right are a special form of Horizontal, and should be used if one side of the impairment is not suitable as interpolation context. An example would be a strong percussive beat just after an impairment. A left interpolation would use only earlier material as the re–synthesis context, avoiding a flam effect or partial duplication of the later percussive event from inclusion in the resynthesis.

Similarly, the top and bottom are special forms of vertical interpolation and should be used if one "side" adjacent to the impairment includes strong tones or harmonics. However, be aware that the results of one-sided interpolations are not as accurate as in symmetrical Horizontal or Vertical choices.

The 2-dim or Two Dimensional interpolation is a special combination of both horizontal and vertical interpolation and is recommended for removing small "square" shaped disturbances.

The Gain interpolation type, see below, does not remove the original material from the selected area like all the other interpolation types. It simply reduces or amplifies existing spectral components in the selection, according to the Gain parameter in the ReSynthesis Parameters.

After selecting either Copy Area in the conxetual menu by control-clicking on the spectrogram, Copy is enabled in the Type field and persists during the copy procedure. It can not be selected directly from the Type field.

Gain –The Gain field provides two functions. For the Gain interpolation type, it controls the gain applied to the signal components in the selected area and, for all other interpolation types except copy, the value acts as an intelligent threshold. The range is -60 +20 with a default value of 0 dB. As with all numeric fields, a double click on the field resets the value.

The Gain interpolation type does not remove the original material from the selected area like all the other interpolation types. It simply reduces or amplifies original signal components in the selection, according to the Gain setting. In general, the higher the Gain value, the more of the original signal is preserved. This means that a deep interpolation, of any type, can be carried out only with a low Gain setting, such as -40 dB, while Gain or actually threshold above 0 dB preserves some parts inside the selected area which might be useful material. With Gain being too high, however, even the disturbances may partially remain. In such cases, lower the Gain until the expected result is achieved.

5.6 Spectrogram Parameters

As with the ReSynthesis Parameters, these parameters are either menus or numeric fields. As with all numeric fields, a double click on the Brightness or Range fields resets the value to the default.

Blocksize – Block Size [32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384, 32768], even though it resides in the Spectrogram parameters section, selects the signal analysis resolution for *both* the spectrogram and interpolation algorithm. In general, interpolation of short disturbances, like clicks, require smaller block sizes, while a frequency selective interpolation, like removal of discrete tones or harmonics, requires larger block sizes.

Block size allows you to locate specific impairments prior to effecting a repair. Because larger block sizes tend to visually isolate and repair areas at low frequencies, it allows you to avoid touching areas that should be left intact.

Channel –The Channel setting [left, right, l+r] shows the spectrogram of left, right, or a sum of both. The sum [l+r] allows the identification of all disturbances regardless of the channel in which they occurred.

Bright – Brightness [0 – 384] controls the contrasting brightness of the selected area from bright (192 – 384) to dark (191 to 0). It can be adjusted by click–dragging up or down on the field. A double click in the field resets the brightness to neutral.

Range – Range adjusts the spectrogram colors to the dynamic range of the audio material, with a middle value of -100 dB to + 40 dB, and a range of ± 10 to ± 70. A double click in the field resets the Range to the default values of -35 dB ± 35 dB.

Range can be adjusted by click–dragging vertically on the field, with up equating to higher sensitivity and down lower sensitivity for controlling the middle value. Click–dragging horizontally on the field controls the mapping range.

Be aware that the Range values are related to spectral components of the processed signal and not to the overall signal level. Therefore, prior to processing, they may look unusual.

Chapter 6..... Interpolation Alternatives

6.1 Copy and Paste

While interpolation is the preferred method of removing isolated artifacts from complex audio material, there are situations where this method suffers from adequate material around the artifact that could be used as context for the interpolation. An example of this would be where the artifact itself is surrounded by strong transients. In such cases, the copy and paste method can produce far superior results. With copy and paste, you can simply find another area that looks like it could "fit into the space" you want to interpolate and insert it. reNOVAtor copies an spectrum from one region to another.

To perform the area copy operation, click–drag to select a source area and click the Copy button. The selection can now be moved around with the mouse to the desired destination. As long as the Copy Mode is active, the Type parameter will show Copy. To paste the selected area into the destination location, either click the Process button or select Process from the contextual menu. To leave the copy mode, simply click somewhere outside the selection. The Type parameter switches back to its previous value.

Copy and paste can, in desperate situations, be used to pitch correct material. First, locate and mark the fundamental. Then, copy and paste that region and test the result. If it acceptable, then move up the "chain" of harmonics, pasting them in at the desired locations. Once you have achieved the desired result, localized in time, then you may want to perform a more global horizontal or 4-dim repair to smooth the result.

6.3 Automatic Selection of Harmonics

To accelerate removal of heavy hum or buzz as well as removal or shift of complete instrumental tones including thier fundamental and harmonics, reNOVAtor provides an automatic selection of harmonics associated with a selected fundamental. Of course, it's possible to remove an instrument tone just by drawing one big selection around the whole region covering both fundamental and harmonics. For longer tones, however, that approach will produce artifacts and reduce the integrity of your ambience. Using selection of harmonics, you keep much more of the spectrum surrounding your harmonics unprocessed. In case of continues and extremely heavy buzz, this is the only method to preserve at least a part of wanted signal. It is extremely useful in forensic applications, especially if the desired signal is so strongly masked by buzz that the signal-to-noise ratio drops even below zero. Also in a case when you need to distinguish two or more overlapping or mixed instruments playing different tones, the only chance to remove or delete individual tones is by using the Automatic Selection of Harmonics mode.

To activate Automatic Selection of Harmonics mode, mark the fundamental tone drawing a horizontal rectangular around it and press the the Automatic Selection of Harmonics button. The Harmonics Selection window pops up, allowing switching on or off each individual harmonic.

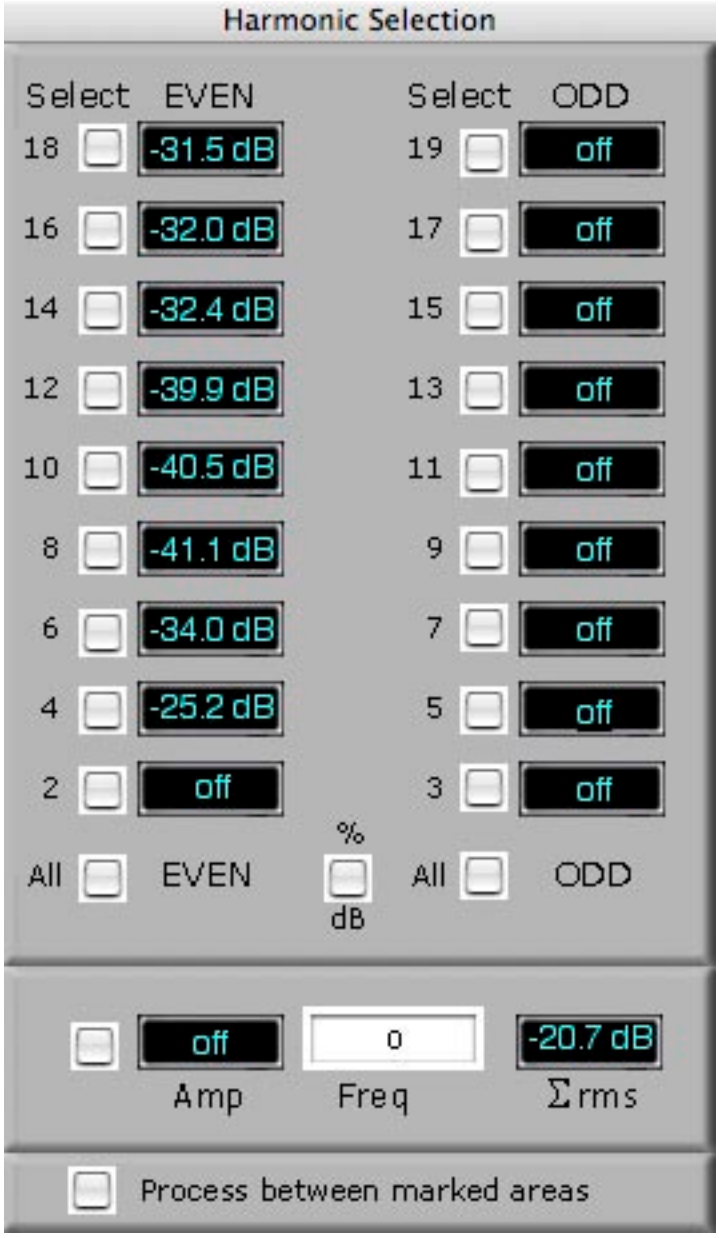

Figure 6.1: The Harmonics Selection window

This selection function automatically draws rectangles around each harmonic enabled in the interface. There are up to 19 individual harmonics and one fundamental which can be considered in the interpolation process. The Harmonics Selection window monitors levels of each individual harmonic belonging to the marked fundamental. The levels of harmonics, related to their energy, can be displayed in dB or in % relative to the level of fundamental. Observing these levels you can get a good feeling about weight of each harmonic. This helps also to estimate the correct position of the rectangles marking the harmonics. If only part of a harmonic is bordered, the displayed level is smaller.

The fundamental frequency originally selected on the spectrogram is numerically displayed in the Freq or Frequency field of the Harmonics Selection window. It can be fine tuned by click–dragging in this field up or down. This is a very important adjustment, because even small changes of the fundamental frequency determine the proper position of the resulting marking rectangles for harmonics. Alternatively, the frequency can also be fine-tuned by holding down the shift key while resizing the rectangle defining the fundamental. Each individual harmonic,

and the fundamental, can be enabled or disabled with their respective button. Also, all odd or even harmonics can be simultaneously switched on or off by using the buttons All EVEN or All ODD.

To the left and right of the Freq field, there are two additional fields. Amp or Amplitude shows the amplitude of the fundamental frequency, while Σrms shows the RMS energy of harmonics plus fundamental covered by all active selected areas.

The amplitudes of spectral components are normalized in such way that Σrms shows 0 dB when processing white noise having a maximum line level of 0 dBFs, and the marking rectangles covers the whole frequency range from 0 to maximum.

The “Process between marked areas” check box, at the bottom of the Harmonics Selection window, allows an interpolation which is complementary to the harmonic removal process. In this case harmonics are preserved and the space among them is cleaned. It is especially useful for cleaning sound samples used for keyboards and sequencers.

Note that the Automatic Selection of Harmonics tool can also be used for the Copy & Paste function. This is especially advantageous if you want to shift a tone, a fundamental with accompanying harmonics, while keeping the ambience integrity untouched. It also helps to correct the beginning of a tone if it has been not precisely played.

Chapter 7.....Application Tips

reNOVAtor is an easy to use tool, even if, at first glance, you may feel uncertain because of the unusual interface. However, after reading the Getting Started chapter, you will be able to carry out repairs with speed and quality you have never experienced before.

This manual gives you just an overview of the reNOVAtor functionality, but there are still a lot of tricks and "secrets," allowing previously impossible sound repair operations. Indeed, it is very difficult to formulate general statements on how to proceed. Every impairment, in connection with specific audio material you want to retain, creates a unique situation. We recommend you spend some time trying to localize and remove certain audible features, or copy audio events to other destinations. Together with all zooming, resizing and precise playback cursor-placing possibilities, you'll get a good feel for controlling reNOVAtor in a short time. Below are some additional remarks which may help to speed your learning process.

reNOVAtor repairs are always undo–able at any time by selecting NoNOISE® > Restore Click. However, before loading a sound file to be processed, we recommend you always make a backup of your original audio material to have the opportunity to start again if, for any reason, the NoNOISE metadata, the ".cd" and ".rl" files, are lost.

For removing transient disturbances like clicks, use the hor (horizontal) interpolation type and for removing longer tones or harmonics, use vert (vertical) interpolation type. The interpolation types left or right are a special form of hor and should be used if one side of the disturbing click is not suitable for proper interpolation such as when the material includes a strong percussive beat. Similarly, the top and bottom are a special form of vertical interpolation and should be used if one side of the impairment includes strong tones or harmonics. However, note that the results of one sided interpolations are not as accurate as symmetrical repairs.

Be aware of the proper selection of the blksize parameter. In general, interpolation of short disturbances, like clicks, requires smaller block sizes, while a frequency selective interpolation, like removal of discrete tones or harmonics, requires larger block sizes. In difficult cases, such as with loud, short duration sounds mixed with low-frequency reverberation, a step–by–step removal process works better. Instead of a wide, vertical area selection, begin with a narrow one to concentrate on the main energy and then a wider horizontal but vertically smaller selection to remove the reverberation part. In addition, for the first step select a smaller block size, such as 256, and for the second step, a larger one like 2048.

If the disturbance is a wideband signal that strongly overlaps with the signal you want to retain, it helps to mark and process carefully selected small regions, step–by–step, instead of drawing one big selection around the critical area.

In extremely difficult situations, especially if you do not have enough clean material surrounding the unwanted noise, we recommend using the copy and paste technique. This method is also ideal for correcting timing problems in instrumental or vocal performance. You can grab a whole tone and shift it a little bit backwards or forwards.

reNOVAtor is also a perfect tool for improving distorted signals. It can remove distortions caused by overdriving analog equipment and works as an excellent de-esser.

If you cannot locate the disturbance you hear, switch the spectrogram to a different Channel if possible. Also, try a different Blocksize and adjust the Range parameter to get proper amplitude-to-color mapping. It may also help to increase the Accuracy, since this will lead to a higher time resolution of the spectrogram while maintaining its frequency resolution, as determined by Blocksize.

Chapter 8..... reNOVAtor Key Equivalents

General

space bar	play
shift-p	process
command-z	undo
shift-command-z	redo
shift-c	copy selection
shift-v	paste selection
shift-drag	constrain selection in *f* (frequency)
` (grave accent)	toggles smoothing

Zoom

0	zoom to entire
1	zoom 10x
2	zoom 5x
3	zoom 2x
4	zoom 1x
5	zoom 0.5x
up arrow	zoom 0.5x
down arrow	zoom 2x
<	zoom *f* by 0.5x
>	zoom *f* by 2x
, (comma)	zoom *f* to top half
. (period)	zoom *f* to bottom half
; (semicolon)	zoom *f* to middle half
/ (forward solidus or slash)	zoom *f* to entire

Presets

^ (circumflex accent)	set preset 1
& (ampersand)	set preset 2
* (asterisk)	set preset 3
(	set preset 4
6	load preset 1
7	load preset 2
8	load preset 3
9	load preset 4

Play Cursor Placement

y	set play cursor before selection, 6 sec.
u	set play cursor before selection, 3 sec.
i	set play cursor before selection, 1.5 sec.
o	set play cursor before selection, 0.5 sec.

Accuracy

}	select next accuracy
{	select previous accuracy

Channel

shift-l	select left channel
shift-r	select right channel
c	select current channel
a	select all channels

Type

h	horz
v	vert
l	left
r	right
t	top
b	bottom
d	type 2-dim (2 dimensional)
g	gain

Block Size

=	select next block size
-	select prev block size