

AI (Artificial Intelligence) Can Help!

Jim Edmondson, N5JGE

This month's article will highlight an application of AI (Artificial Intelligence) to ham radio. Most modern ham radio transceivers and receivers have built-in DSP (digital signal processing) capabilities. One of the most useful implementations of DSP is for noise reduction. The analog RF, IF (intermediate frequency) or AF (audio frequency) signals are converted to digital signals and various filters are applied in an attempt to identify and separate noise from the signal. This results in a better signal-to-noise ratio and "cleaner" sounding audio. In many cases, this is necessary to copy a weak signal especially during times of high atmospheric noise or on the lower HF bands.

Unfortunately, older rigs do not include DSP's or, if they do, the implementation is not particularly effective. For these rigs, several manufacturers (West Mountain Radio, bhi, etc) make physical audio DSPs that work quite well. Those, of course, cost money, take up desk space and unless firmware updates are offered, they are what they are when bought.

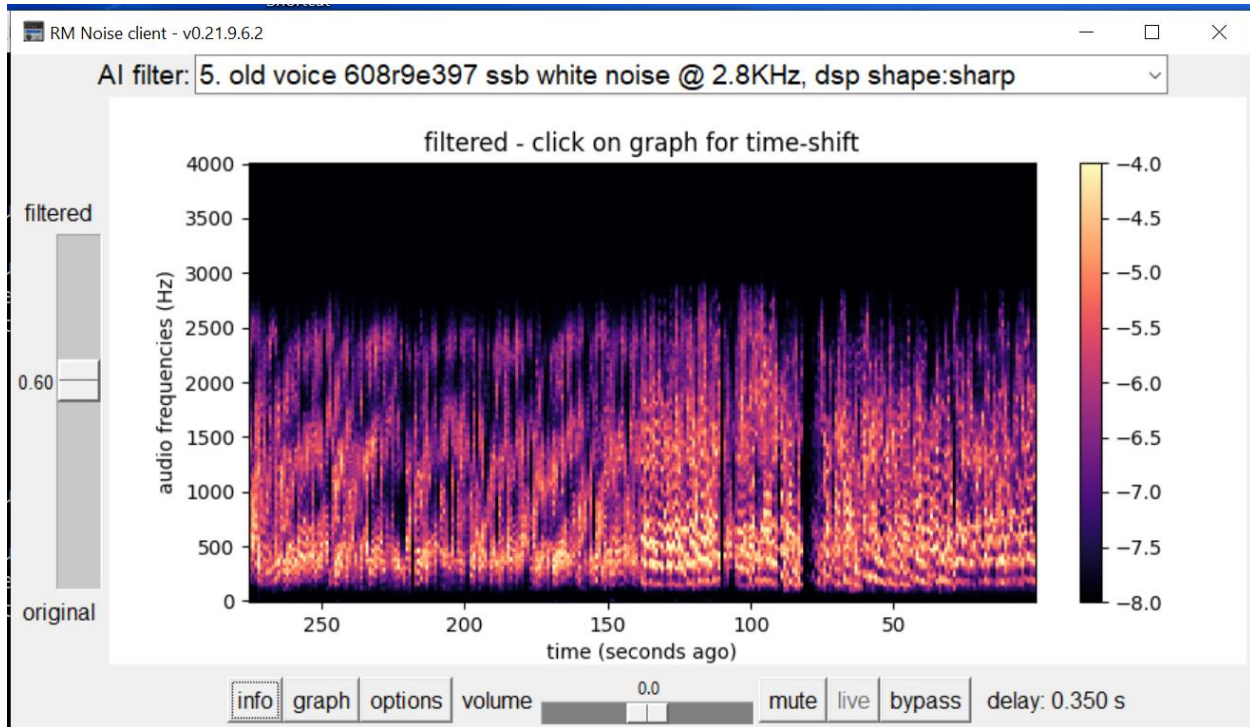
Another option that I recently discovered is a software application named "RM Noise". This application is not only software-based, but learns over time due to its artificial intelligence engine. One user claimed that RM Noise works better than the DNR (Dynamic Noise Reduction) of his FTdx101MP! I have the little brother of the 101 (FTdx10) and it has an awesome DNR function, so that is some high praise. It is important to note that RM Noise is strictly a filter to improve the signal-to-noise ratio. It does not improve selectivity or sensitivity to the received signals, these must be optimized using the radio controls before employing RM Noise.

The details of getting audio from your radio into the PC is beyond the scope of this article. Briefly, if your radio does not have a built-in soundcard, you can use a line-level analog output if available or create an interface (attenuator) from an external speaker or headphone jack to input to the PC mic input.

At time of writing this article, the latest version of RM Noise is 0.21.9.6.2 and can be downloaded from ([RM Noise](#)). RM Noise has only been tested on Windows 10 and 11 (Windows 7 is no longer supported). You must register and activate an account with RM Noise (full name, email, callsign required). The installation is straightforward and automatically uninstalls any previous versions. When started, the program opens a Windows Command window and then the user interface. The Command window identifies available audio devices so that you can select appropriate input and output devices for filtering and monitoring.

The user interface is shown below followed by the options window. The first thing to do is to open the options window (3rd button from left at bottom of user interface) and select the radio audio stream for raw audio input and the output device to monitor the filtered audio. In my options window below, those are "2-USB Audio CODEC" and "Poly BT700", respectively. Once the devices are selected, click on the "activate settings" button and you should hear the radio audio from your listening device and begin to see a signal trace on the main user interface graph. The trace on the graph should be between -5.0

and -5.5 (right-hand axis). If not, use the Windows sound device level control to adjust to that range as shown in my display below.



The screenshot shows the 'Options - RM Noise' dialog box. It has several sections: 1. Input/Output selection: 'filter signal at the server from INPUT DEVICE:' with a dropdown set to 'MME: Microphone (2- USB Audio CODEC)', and 'listen to my signal on the OUTPUT DEVICE:' with a dropdown set to 'MME: Headset Earphone (Poly BT700)'. There is also a field for 'or listen to other signal by id:' and a 'windows api:' dropdown set to 'MME', with an 'activate settings' button. 2. Recording settings: 'RECORDING description' field, 'minutes' set to 30, and a checkbox 'start a RECORDING and send it to the server. typically this is a PURE NOISE recording'. 3. Buffer settings: 'max audio buffer (ms)' slider set to 200, with '(default 200 ms)' text. 4. Playback settings: 'play a recording:' section with a 'choose the file' button, 'no recording is playing' text, 'file position' set to 0.00, and a slider.

At the top of the user interface is a dropdown box. Various filters can be selected from the list. Currently, filters are available for SSB, CW and FM. At the left-hand edge of the user interface, is a slider that adjust the “% filtering”. That is, RM Noise mixes the filtered and unfiltered signals at the selected percentage. With this control “0.00” is the “original” audio (completely unfiltered) and “1.00” is “filtered” (completely filtered). This control is useful to optimize noise reduction and fidelity of the signal.

At the bottom of the user interface, are a series of convenience controls. The “info” button opens a window which displays a graph of technical aspects of the signal processing (delay, latency, packet loss, etc.). I did not find a description of the “graph” button. It appears that the button averages out the signal level to aid in adjusting the radio audio level to -5.0 to -5.5. We discussed “options” above. “volume” and “mute” are self-explanatory. “live” is grayed-out on my display because there is a lag between the radio audio and output audio. You can see the “delay” at the far right of the row of controls. The graph opened with the info button shows a 90-second history of the delay. Finally, the “bypass” button provides a quick and dramatic way to determine filter effectiveness without changing the slider setting.

I have tested RM Noise on my IC-7300 which has a built-in DSP with noise reduction, noise blanking, etc. I find that RM Noise performs every bit as good as the hardware noise reduction of the rig. In several respects, it is more flexible than the rig controls to fine tune noise reduction with minimal impact on audio quality. The mute function is also nice if you have multiple audio streams that you may want to switch among on the PC. I have only used RM Noise for receive and have not made any QSO’s as yet. I think that the audio delay is short enough that it will not affect timing of the back and forth. I have never seen the above 2.5 seconds and it is usually much lower. RM Noise is great for older rigs and can even improve audio of newer DSP rigs.

Here are some additional links that provide more information on RM Noise:

[G5 STU Video](#)

[RM Noise Documentation](#)

[RM Noise Home](#)

[RM Noise Groups.io](#)