

CLAIMS:

We claim:

1. An acoustic processing network comprising:
 - a Digital Signal Processor (DSP) operating at a first frequency, the DSP to:
 - receive a noise signal from at least one microphone, and
 - generate a noise filter based on the noise signal; and
 - a Real-Time Acoustic Processor (RAP) operating at a second frequency higher than the first frequency, the RAP to:
 - receive the noise signal from the microphone,
 - receive the noise filter from the DSP, and
 - generate an anti-noise signal based on the noise signal and the noise filter for use in Active Noise Cancellation (ANC).
2. The acoustic processing network of claim 1, wherein the RAP includes:
 - an adjustable amplifier to amplify the anti-noise signal, and
 - a compressor circuit to control the adjustable amplifier to mitigate artifacts in the anti-noise signal.
3. The acoustic processing network of claim 2, wherein the RAP further includes a compression state register to store compression states, the compressor circuit further to control the adjustable amplifier based on the compression states.
4. The acoustic processing network of claim 3, wherein the compression states include a peak signal estimate, an instantaneous gain, a target gain, an attack parameter, a release parameter, a decay parameter, a hold parameter, or combinations thereof.
5. The acoustic processing network of claim 3, wherein the compression states include a Root Mean Square (RMS) of the anti-noise signal.

6. The acoustic processing network of claim 2, wherein the DSP is further to:
 - receive current compression states from the RAP,
 - determine new compression states based on the noise signal and the current compression states, and
 - forward the new compression states to the RAP to support controlling the adjustable amplifier.
7. The acoustic processing network of claim 1, wherein the RAP includes one or more programmable biquad filters to implement the noise filter from the DSP and generate the anti-noise signal.
8. The acoustic processing network of claim 7, wherein the biquad filters employ one or more poles to amplify portions of a sample of the anti-noise signal, one or more zeros to attenuate portions of the sample of the anti-noise signal, and a filter register to store a quantization of the sample of the anti-noise signal, the biquad filters to amplify the sample prior to quantizing the sample and then attenuate the sample.
9. The acoustic processing network of claim 1, wherein the microphone is a feed forward microphone, and the RAP is further to:
 - apply an ambient awareness filter to enhance a predetermined frequency band in the noise signal when generating the anti-noise signal, resulting in an enhanced predetermined frequency band, and
 - forward the anti-noise signal with the enhanced predetermined frequency band to a speaker for output to a user.
10. The acoustic processing network of claim 9, wherein a latency between receiving a noise signal sample from the microphone and forwarding a corresponding anti-noise signal sample to the speaker is less than one hundred microseconds.

11. The acoustic processing network of claim 1, wherein the DSP is further to:
 - generate an audio signal based on audio input, and
 - generate an expected output signal based on the audio input and a frequency response of the acoustic processing network, and wherein the RAP is further to:
 - receive the audio signal from the DSP,
 - mix the audio signal with the anti-noise signal, and
 - set the expected output signal as a reference point when generating the anti-noise signal to mitigate cancelation of the audio signal by the anti-noise signal.
12. The acoustic processing network of claim 1, wherein the RAP is further configured to forward the anti-noise signal to a digital to analog converter (DAC) amplifier controller to support adjusting a DAC amplifier based on anti-noise signal level.
13. A method comprising:
 - receive a noise signal at a Digital Signal Processor (DSP) operating at a first frequency, the noise signal received from at least one microphone;
 - generating a noise filter at the DSP based on the noise signal;
 - communicate the noise filter from the DSP to a Real-Time Acoustic Processor (RAP) operating at a second frequency higher than the first frequency;
 - receive the noise signal from the microphone at the RAP;
 - generate an anti-noise signal at the RAP based on the noise signal and the noise filter for use in Active Noise Cancellation (ANC).
14. The method of claim 13, further comprising:
 - employing current compression states at the RAP to control an adjustable amplifier to adjust the anti-noise signal;
 - communicating the current compression states from the RAP to the DSP;
 - determining new compression states at the DSP based on the noise signal and the current compression states, and
 - communicating the new compression states from the DSP to the RAP to support controlling the adjustable amplifier.
15. The method of claim 14, wherein the compression states include a peak signal estimate, an instantaneous gain, a target gain, a Root Mean Square (RMS) of the anti-noise signal or combinations thereof.

16. The method of claim 13, wherein the anti-noise signal is generated at the RAP by configuring one or more programmable biquad filters to implement the noise filter from the DSP.

17. The method of claim 16, wherein the biquad filters amplify a sample of the anti-noise signal, then quantize the sample of the anti-noise signal, and then attenuate the sample of the anti-noise filter.

18. The method of claim 13, further comprising:
applying an ambient awareness filter at the RAP to enhance a predetermined frequency band in the noise signal when generating the anti-noise signal, resulting in an enhanced predetermined frequency band, and
forwarding the anti-noise signal with the enhanced predetermined frequency band to a speaker for output to a user.

19. The method of claim 13, further comprising:
generating an audio signal at the DSP based on audio input;
generating an expected output signal at the DSP based on the audio input and a frequency response of an acoustic processing network;
communicating the audio signal from the DSP to the RAP;
mixing the audio signal with the anti-noise signal at the RAP; and
setting the expected output signal as a reference point when generating the anti-noise signal to mitigate cancelation of the audio signal by the anti-noise signal.

20. The method of claim 13, further comprising forwarding the anti-noise signal to a digital to analog converter (DAC) amplifier controller to support adjusting a DAC amplifier based on anti-noise signal level.