CLAIMS:

We claim:

1. An acoustic processing network, comprising:

a digital signal processor operating at a first frequency, the digital signal processor configured to receive a noise signal from one or more microphones, at least one microphone being a feed forward microphone, and generate a noise filter based on the noise signal; and

a real-time acoustic processor operating at a second frequency higher than the first frequency, the real-time acoustic processor configured to receive the noise signal from the one or more microphones, receive the noise filter from the digital signal processor, generate an anti-noise signal based on the noise signal and the noise filter for use in active noise cancellation, 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.

2. The acoustic processing network of claim 1 wherein the real-time acoustic processor 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 real-time acoustic processor further includes a compression state register to store compression states, the compressor circuit further configured 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 of the anti-noise signal.

6. The acoustic processing network of claim 2 wherein the digital signal processor is further configured to:

receive current compression states from the real-time acoustic processor,

determine new compression states based on the noise signal and the current compression states, and

forward the new compression states to the real-time acoustic processor to support controlling the adjustable amplifier.

7. The acoustic processing network of claim 1 wherein the real-time acoustic processor includes one or more programmable biquad filters to implement the noise filter from the digital signal processor 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 configured to amplify the sample prior to quantizing the sample and then attenuate the sample.

9. The acoustic processing network of claim 1 wherein a latency between receiving a noise signal sample from the one or more microphones and forwarding a corresponding anti-noise signal sample to the speaker is less than one hundred microseconds.

10. The acoustic processing network of claim 1 wherein the digital signal processor is further configured 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 real-time acoustic processor is further to:

receive the audio signal from the digital signal processor,

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.

11. The acoustic processing network of claim 1 wherein the real-time acoustic processor is further configured to forward the anti-noise signal to a digital to analog converter amplifier

controller to support adjusting a digital to analog converter amplifier based on anti-noise signal level.

12. A method for real-time acoustic processing, comprising:

receiving a noise signal at a digital signal processor operating at a first frequency, the noise signal received from at least one microphone;

generating a noise filter at the digital signal processor based on the noise signal;

communicating the noise filter from the digital signal processor to a Real-Time Acoustic Processor operating at a second frequency higher than the first frequency;

receiving the noise signal from the microphone at the real-time acoustic processor;

generating an anti-noise signal at the real-time acoustic processor based on the noise signal and the noise filter for use in Active Noise Cancellation;

applying an ambient awareness filter at the real-time acoustic processor 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.

13. The method of claim 12 further comprising:

employing current compression states at the real-time acoustic processor to control an adjustable amplifier to adjust the anti-noise signal;

communicating the current compression states from the real-time acoustic processor to the digital signal processor;

determining new compression states at the digital signal processor based on the noise signal and the current compression states, and

communicating the new compression states from the digital signal processor to the real-time acoustic processor to support controlling the adjustable amplifier.

14. The method of claim 13 wherein the current compression states and the new compression states include a peak signal estimate, an instantaneous gain, a target gain, a root mean square of the anti-noise signal or combinations thereof.

15. The method of claim 12 wherein the anti-noise signal is generated at the real-time acoustic processor by configuring one or more programmable biquad filters to implement the noise filter from the digital signal processor.

16. The method of claim 15 wherein the biquad filters are further configured to amplify a sample of the anti-noise signal, quantize the sample of the anti-noise signal, and attenuate the sample of the anti-noise signal.

17. The method of claim 12 further comprising forwarding the anti-noise signal to a digital to analog converter amplifier controller to support adjusting a digital to analog converter amplifier based on anti-noise signal level.

18. A method for real-time acoustic processing, comprising:

receiving a noise signal at a digital signal processor operating at a first frequency, the noise signal received from at least one microphone;

generating a noise filter at the digital signal processor based on the noise signal;

communicating the noise filter from the digital signal processor to a Real-Time Acoustic Processor operating at a second frequency higher than the first frequency;

receiving the noise signal from the microphone at the real-time acoustic processor;

generating an anti-noise signal at the real-time acoustic processor based on the noise signal and the noise filter for use in active noise cancellation;

generating an audio signal at the digital signal processor based on audio input;

generating an expected output signal at the digital signal processor based on the audio input and a frequency response of an acoustic processing network;

communicating the audio signal from the digital signal processor to the real-time acoustic processor;

mixing the audio signal with the anti-noise signal at the real-time acoustic processor; 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.