

Active Noise Control of Speech in Headphones

using Linear Prediction

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Acoustics and Audio Technology - Fall 2016
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Agenda

Active Noise Control of
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Linear Prediction
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What is Active Noise
Control (ANC)
Present consumer
headphones

Methods

Adaptive Filtered-x least
mean squares FIR
algorithm
Wiener filtering

Results

Simulation

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Computation

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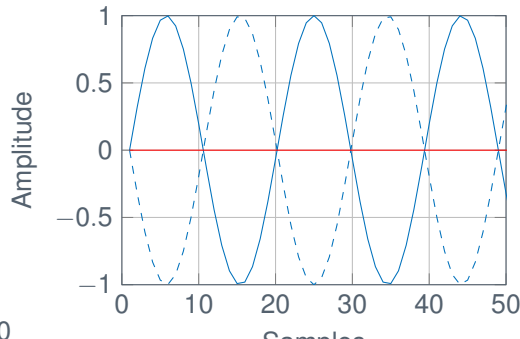
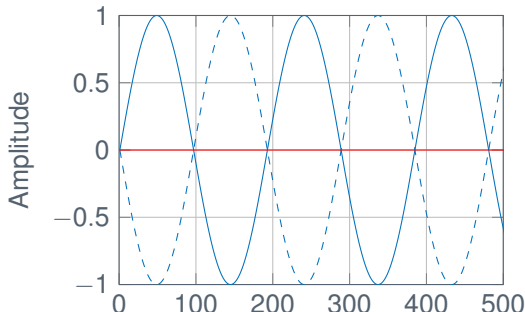
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► The basic theory of ANC

- 250 Hz
- 2500 Hz

— Original signal
- - - Counterphase signal
— Error



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How does ANC work

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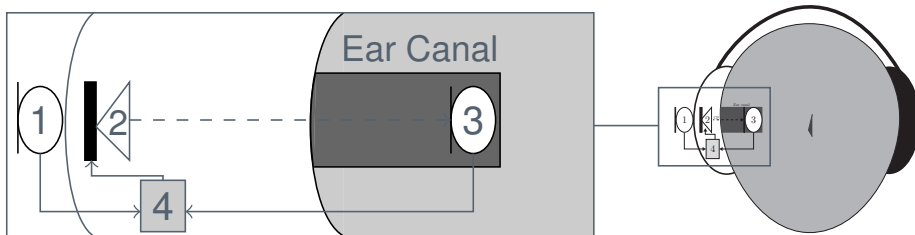
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► Feedforward system

- 1: Reference microphone
- 2: Headphone loudspeaker
- 3: Error microphone
- 4: Digital signal Processor (DSP)



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Problem of ANC

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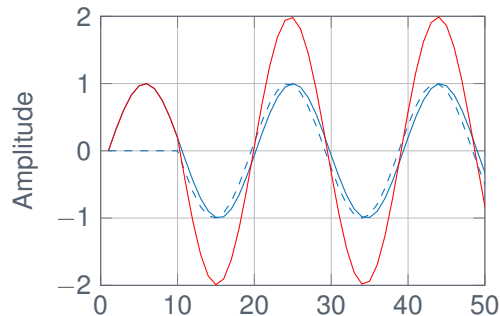
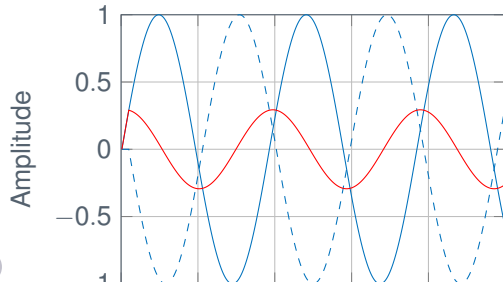
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- ▶ Counter phase signal delayed 10 samples
 - ▶ 250 Hz
 - ▶ 2500 Hz

— Original signal
- - - Counterphase signal
— Error



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Stationary vs non-stationary signals

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► Conversion delay

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Present consumer headphones

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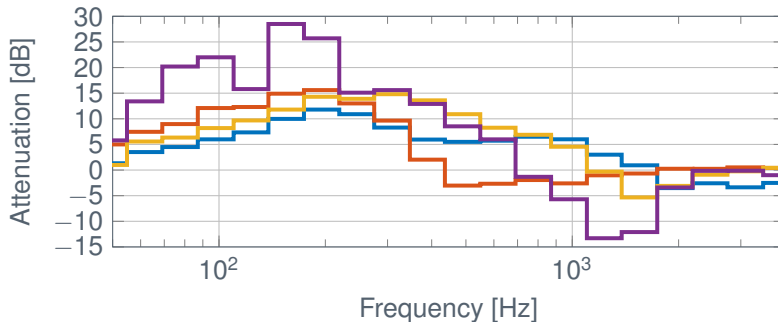
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► How well does the consumer headphones attenuate?

- Denon AH-GC20 2.200 kr (2016)
- Bose QC25 2.799 kr (2016)
- Bose QC15 2.696 kr (2011)
- B&O H8 3.495 kr (2016)





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A solution for the problem

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