Intelligent Hearing Aid Project

Beckman Institute
University of Illinois at Urbana-Champaign

Douglas Jones

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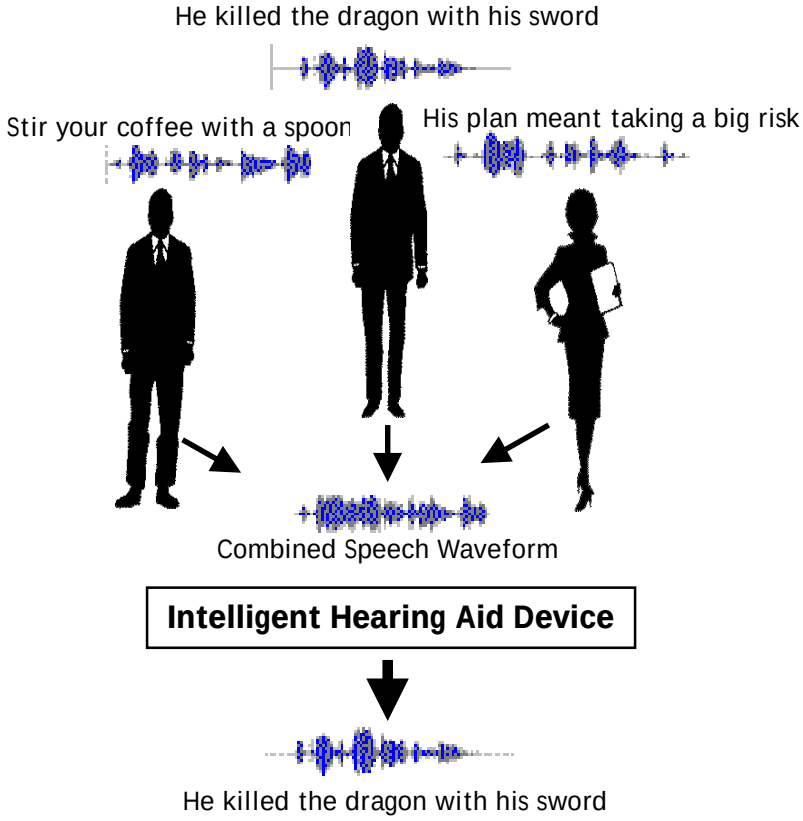

Goal:

Develop high performance auditory processors which can effectively extract a desired speech signal in the presence of multiple competing sounds.

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13. SUPPLEMENTARY NOTES
DARPA, Air-Coupled Acoustic Microsensors Workshop held on August 24 and 25, 1999 in Crystal City, VA., The original document contains color images.

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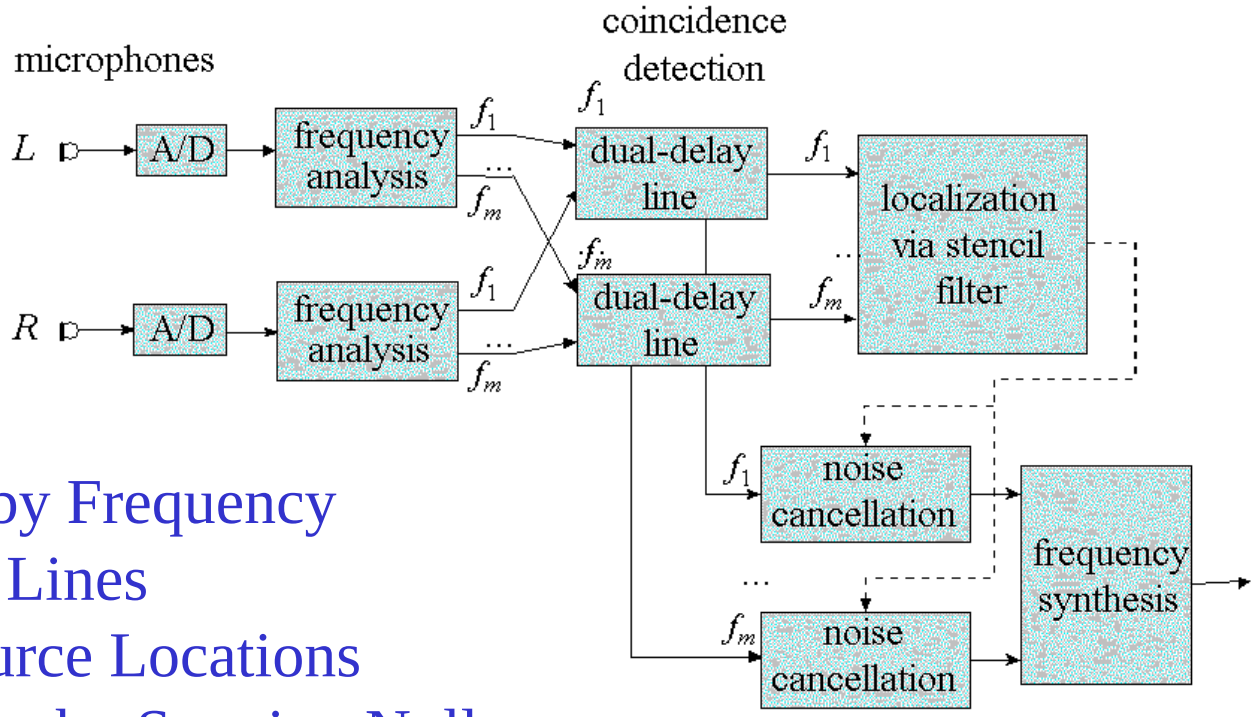
Algorithm 1:
Localization and Cancellation



- Separation by Frequency
- Dual Delay Lines
- Identify Source Locations
- Cancel Noise by Steering Nulls

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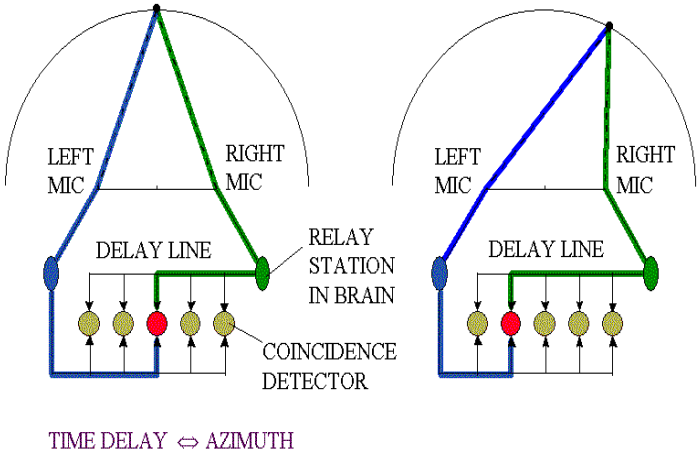
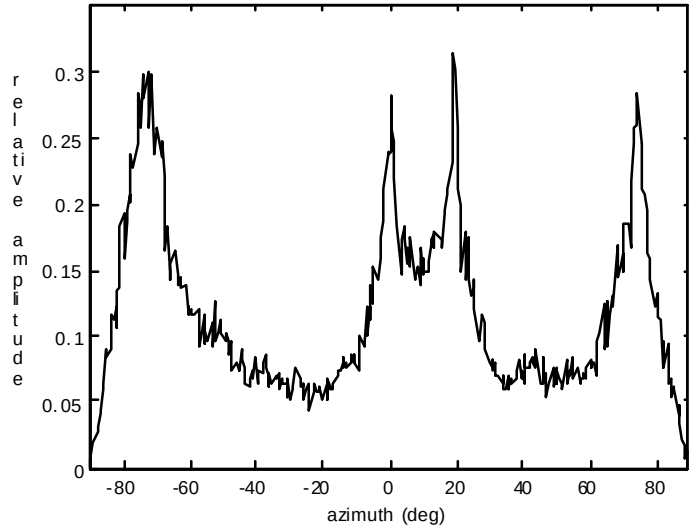
Algorithm 1:
Localization and Cancellation





Localization in the Brain

Localization by Computer
(measure of coincidence vs. azimuth)

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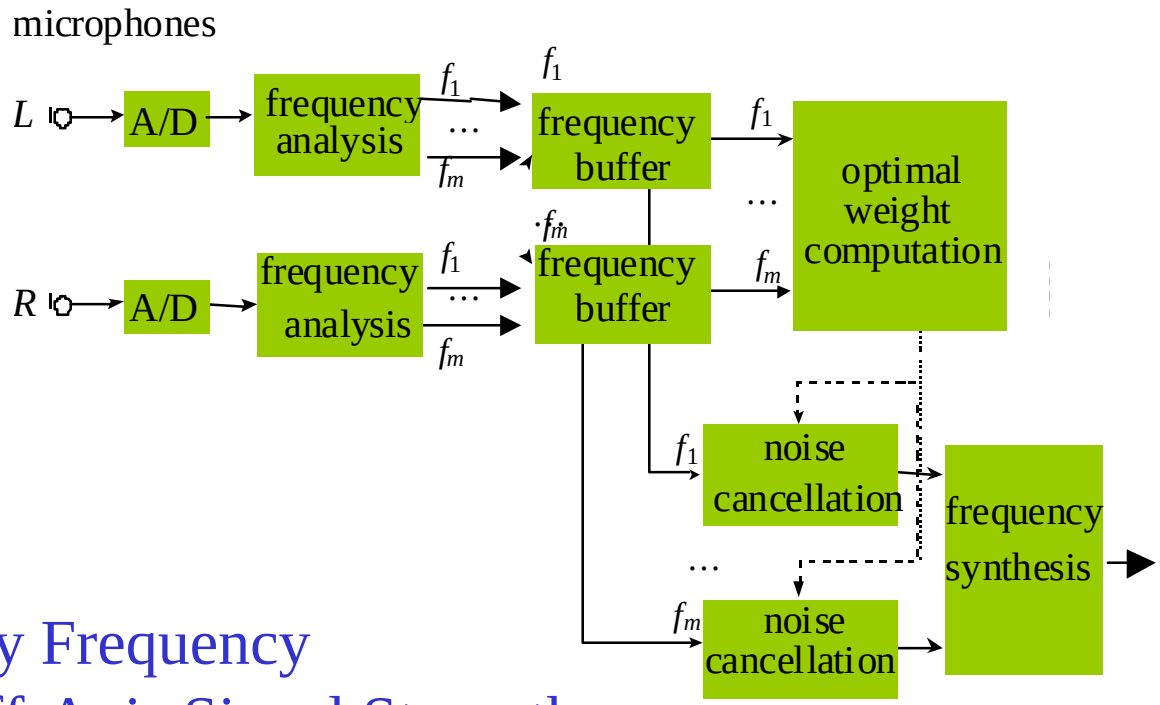
Algorithm 2:
Minimum Variance Cancellation



- Separation by Frequency
- Minimize Off-Axis Signal Strength

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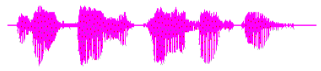
Experimental Examples

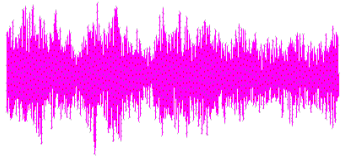
The old train was powered by steam

Target @ 0°

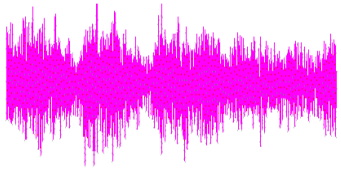


Twelve talker babble

Interferor @ 30°



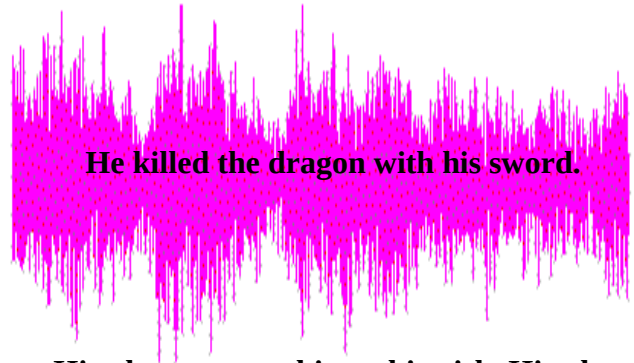
Combined Waveform



Reconstructed Waveform

Stir your coffee with a spoon. Stir your

Interferor @ 65°

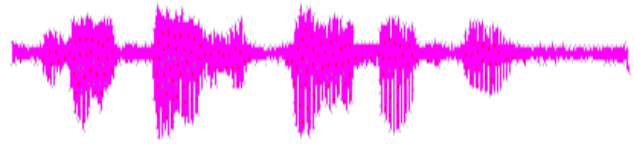


Target @ 0°

His plan meant taking a big risk. His pl

Interferor @ 22°

Combined Waveform



Reconstructed Waveform

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Experimental Summary

(ALGORITHM 2)

Expmt #	Position Attenuation	Position Attenuation	Position Attenuation	Position Attenuation	Average Gain
1	-75° 4.8 dB	Target: 0° 0.6 dB	20° 4.1 dB	75° 2.1 dB	6.2 dB
2	30° 6.3 dB	-45° 4.2 dB	60° 3.1 dB	Target: -10° 0.6 dB	6.7 dB
3	Target: 10° 1.1 dB	-80° 3.9 dB	-50° 2.9 dB	45° 2.7 dB	4.6 dB
4	-30° 6.3 dB	15° 0.9 dB	Target: 5° 0.9 dB	-60° 3.6 dB	5.3 dB
5	-25° 5.7 dB	Target: 25° 0.7 dB	-70° 4.3 dB	80° 2.9 dB	6.3 dB

Recordings made in a Conference Room

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Current and Future Work

- **Real-Time Implementation**
- **Microphone Compensation**
- **Dereverberation**

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