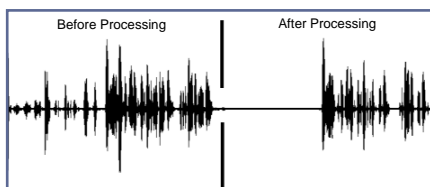


ClearSpeech technologies -
a suite of signal processing
algorithms, hardware and
technical expertise for enhancing
voice communications.



**Background echo removed
from near end send signal**

Operation

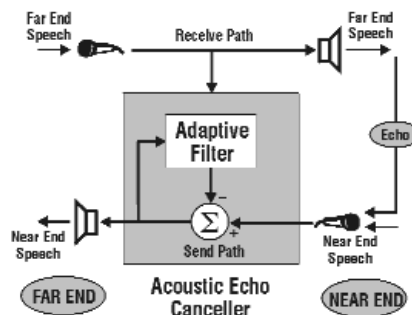
ClearSpeech® Acoustic Echo Cancellation (Time Domain), AEC(TD) is an algorithm designed to reduce the echo caused by acoustic coupling between loudspeaker and microphone in compact communication devices.

As communication headsets, Mobile and Handheld Devices have decreased in size, the echo caused by direct acoustic coupling between the loudspeaker and microphone has increased, necessitating the use of echo reduction techniques.

AEC(TD) has been specifically designed to meet the short echo span, memory-critical requirements of these compact, communications devices. By reducing the echo, AEC(TD) effectively improves the clarity of the communication system.

Block Diagram

As illustrated below, an echo canceller can remove acoustic echo produced by the acoustic coupling between the loudspeaker and the microphone in a compact communications device.



Performance Characteristics

- Convergence time < 1 second
- average ERLE ~20-40dB depending on parameter set chosen

Implementation

AEC(TD) is an adaptive, time domain LMS algorithm designed as a re-entrant module, with adjustable input-output block processing.

Available versions:

- 8 to 32ms echo span, 80-sample block length, 8kHz sampling rate
- Optional telephony bandpass filter
- 4 user-selectable parameter sets

Details of the platforms supported can be found on our website.

Software Requirements

For 8kHz sampling rate, 80-sample block length, bandpass filter not selected, running on the Texas Instruments TMS320VC5510 DSK:

V 1.0		
Echo Span (msec)	8	32
MIPS	11.7	37.3
Program Memory (words)	1.6k (24 bit words)	1.6k (16 bit words)
Data Memory (words)	0.6k (16 bit words)	1.2k (16 bit words)

Demonstration Platforms Available

- For customers wishing to process their own wavefiles a fixed point C PC executable will be available soon.
- For customers who wish to undertake their evaluation in real-time, a Program Image for the Texas Instruments TMS320VC5510 DSK is available.



Other ClearSpeech Products

AEC(TD) is part of the ClearSpeech suite of algorithms for enhancing voice communications by removal of unwanted noise. Other algorithms in the suite are:

Acoustic Echo Cancellation (Frequency Domain), which removes unwanted echo from hands-free communications.

Adaptive Speech Filter, which removes background 'stationary' noise from microphone signals.

Adaptive Speech Filter II, which removes unwanted broadband 'stationary' noise from speech.

Referenced Noise Filter, which removes noise where a reference signal from the noise producing source is available.

Intelligent Squelch Filter, which reduces unwanted signals such as pops and pre-speech noise experienced in some radio communications.

Speech in Noise Detector, a noise-robust voice activity detector producing a binary value and an audio output for which non-speech segments have been muted.

Line Echo Cancellation, which removes electrical echo caused by 2-4 wire hybrids in telephone networks.

Adaptive Noise Suppressor, which reduces signals that are below a given threshold.

For Additional Information

Contact sales@nctclearspeech.com.