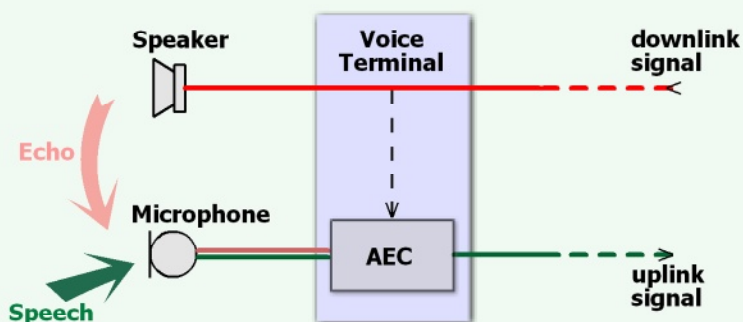# Acoustic Echo Cancellation

When part of a signal in a duplex (simultaneous two-way) communication returns back to the source, the returning part is called "echo". Even a small acoustic echo may be very annoying and even disrupting due to a significant roundtrip delay in long distance analog and almost all digital communication systems.

In a voice communication terminal acoustic echo is caused by acoustic coupling between the speaker and microphone and must be treated locally inside the device.

Acoustic echo cancellation in a voice communication terminal

Alango Acoustic Echo Cancellation (AEC) technology was designed to enable high quality, full duplex communication in mobile phones, hands-free car kits, speakerphones and other low cost applications. These devices characterized by several factors making development of AEC technology a real challenge:
• Small, low power and often overdriven speakers produce high level or non-linear distortions;
• They are often used in very noisy conditions;
• Limited processing delay allowed;
• Limited computational resources (MIPS and memory) due to minimized cost and power consumption.

Alango AEC solution is:
• Easily configurable to work optimally in all possible applications and environments;
• Capable to withstand problems associated with pure acoustic design and components quality;
• Having relatively small processing delay;
• Requiring modest computational resources on most computational platforms (DSP, MCU, host CPU);
• Having a wide dynamic signal range on 16 bit processors.

Alango Acoustic Echo Cancellation is seamlessly integrated with other Alango technologies into one Voice Communication Package (VCP). Besides echo cancellation it includes stationary and transient noise suppression, dynamic range compressor, automatic volume and equalization control, speech enhancement, (optional) adaptive dual microphone and several others.

Implementation

Alango Acoustic Echo Cancellation technology is currently available on several computational platforms:
• Blackfin DSP (Analog Devices),
• Teak CEVA-X DSPs (CEVA-DSP),
• ARM11, ARM9, ARM7,
• Kalimba DSP (CSR).
Porting to Freescale and Texas Instruments DSPs is planned in the near future.

Technical information

• Fast convergence (< 300ms) with no initial echo;
• Convergence in double talk and high noise;
• Robustness to speaker signal distortions;
• Echo canceller filter length up to 250 ms;
• Residual echo level: < -60 dB;
• Processing delay: 30 ms (for 32 bands), 22 ms (for 16 bands);
• Supported sampling rates: 8 KHz, 16 KHz;
• Full compliance with VDA specification.