Technology Opportunity

Active Noise Cancellation for Communications Microphones

NASA seeks to transfer the Active Noise Cancellation for Communications Microphones technology to private industry for use in commercial applications. This system was developed at the John F. Kennedy Space Center to overcome corrupted voice transmissions in noisy environments during Space Shuttle operations.

This invention implements a novel noise reduction algorithm for voice microphones. The design uses adaptive spectral subtraction, which learns the noise profile and then subtracts it out of each voice transmission. The result is clear voice communication in environments with loud background noise.

Potential Commercial Uses

• Auto racing
• Fire trucks and emergency response vehicles
• Mining operations
• Construction equipment operations
• Power-generating stations
• Military applications, including aircraft carrier deck operations, mobile fighting vehicles (tanks and armored personnel carriers), and aircraft engine test facilities
• Aviation and airport operations
• Manufacturing
• Oil and gas drilling

Benefits

• The device provides a high degree of ambient noise reduction for the talk path of communication circuits.
• Maintenance of this unit consists of replacement of an easily removable, rechargeable battery.
• The device is a lightweight portable unit that is inserted between the communication microphone and the communication device itself.
The Technology

Noise or noise-corrupted speech enters the adaptive noise-suppression subsystem through a microphone. The microphone’s output is sent through a high-gain amplifier and an anti-aliasing low-pass filter. An analog-to-digital converter samples the output of the filter. At this point, the Digital Signal Processor (DSP) suppresses noise by executing a spectral subtraction algorithm that pre-emphasizes specific frequency components of the signal and incorporates a dependence on the signal-to-noise ratio (SNR).

The algorithm used by the DSP pre-emphasizes the frequency components of the input signal that contain the consonant information in human speech. Each frame is then examined to determine whether it is a voiced or unvoiced frame.

An estimate of the noise is obtained during each unvoiced frame. A running average of the noise is then computed and used to approximate its expected value. The algorithm then determines the SNR and adjusts the proportion of spectral subtraction accordingly.

De-emphasis filtering is then performed through a digital-to-analog converter, followed by a smoothing/voice-band filter consisting of a band-pass filter with low and high 3-dB roll-off frequencies of 300 Hz and 3 kHz, respectively. The resulting analog signal without the high ambient noise interference is modulated and transmitted by the communication system.

This noise canceling system would be vital to precise communication in noisy environments with loud background noise such as racetracks, manufacturing facilities, emergency response, avionics, drilling and mining, and construction and demolition.

Options for Commercialization

This technology is part of the NASA Technology Transfer Program. The program seeks to stimulate development of commercial applications from NASA-developed technology. The software was designed and tested and is being used at KSC. NASA seeks qualified companies to license and commercialize this technology.

For more information

If your company is interested in the Active Noise Cancellation for Communications Microphones technology or if you desire additional information, please reference case no. KSC-11937 and contact:

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Commercialization Checklist

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Seeking industry partner for further codevelopment