

Acoustic Echo Cancellation During Doubletalk using Convolutional Blind Source Separation of Signals having Temporal Dependence

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Electrical and Computer Engineering

Abstract

The Acoustic Echo Cancellation offers a novel method of echo cancellation using convolutional blind source separation. This method reduces distortion, like an echo or feedback, that may occur when an audio input device like a microphone is near an audio output device or speaker.

Problem

In conference phones and voice-activated devices, audio can be re-captured by a local microphone and sent back, causing delayed self-speech or an “echo”. Adaptive filters are used, but timing and efficiency need improvement.

Solution

Acoustic Echo Cancellation quickly separates speech from ambient sounds using blind-source separation, adapts to changing room acoustics, requires no training/calibration, and integrates easily to improve conference-call audio.

Value Proposition

An adaptive learning algorithm that delivers faster, more effective noise cancellation, simplifies integration into existing audio systems, and enables reliable hands-free voice control for computers and other devices.

Benefit

In devices such as conference phones, sound from the far end is played on a local speaker and can be re-captured by the nearby microphone after passing through the room acoustics, producing a delayed self-voice or “echo.” Voice-controlled devices face the same problem because they may pick up their own speaker output as well as user speech. This can be a nuisance and disrupt the quality of audio conversations. Echo cancellation is typically treated using adaptive filters but improvements to timing and efficiency are needed.

The Acoustic Echo Cancellation technology separates out various audio signals — either from the person speaking or ambient noise — faster than typical filters, thus helping prevent any eerie feedback. It uses a process called blind-source separation, blind because it doesn't need to know where the acoustic signals are coming from to process them. This opens the possibility of tracking the separation as the acoustic transfer function changes. No training or calibration data is required for the algorithm, so it may be easily implemented into an existing audio communication system. It can improve the performance of conference phones and make for better conference call experiences.

This innovation features an adaptive learning algorithm that enables noise cancellation to adjust more readily than existing methods. It enhances acoustic performance for

audio communication devices while simplifying integration. The technology can be incorporated into current audio systems and plays a role in enabling reliable hands-free voice control for computers and other devices.

Market Application

This technology is ideal for audio communication, smart devices, voice control, and cellular phone software that want to improve the efficiency and quality of audio communication.

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Publications

- U.S. Issued Patent No. 10,939,205 issued April 19, 2019, entitled 'Echo Cancellation using Convolutional Blind Source Separation.

Intellectual Property

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