headsets and compared with that of traditional LMS algorithms. Acoustic measurements are made in a specially designed acoustic test cell which is based on the original work of Shaw, Brammer and co-workers and which provides a highly controlled and uniform acoustic environment. The stability and performance of the ANR system, including prototype communication headsets, are investigated for a variety of noise sources ranging from stationary white noise to highly nonstationary measured F-16 aircraft noise over a 20-dB dynamic range. Results demonstrate significant improvements in stability of Lyapunov-tuned LMS algorithms over traditional leaky or nonleaky normalized algorithms while providing noise reduction performance equivalent to that of the NLMS algorithm for idealized noise fields.

3:00

1pSP6. Real-time noise canceling based on spectral minimum detection and diffusive gain factors. Hyoung-Gook Kim, Klaus Obermayer (Dept. of Computer Sci., Tech. Univ. of Berlin, Franklinstr. 28/29, 10857 Berlin, Germany), Mathias Bode, and Dietmar Ruwisch (Cortologic AG, Berlin, Germany)

In this paper, we propose a very simple but highly effective psychoacoustically motivated real-time approach on the basis of spectral minimum detection and diffusive gain factors without a speech activity detector. The first processing step is the calculation of the short-time power spectrum of the noisy speech signal. Estimating the background noise, the system calculates diffusive gain values in real time being obtained in a two-layer structure: Each node of a layer is responsible for a single mode of the power spectrum. The first layer, called the ''minimum detection layer,'' holds the present noise level derived from the minimum of the input power spectrum which is detected within frames smaller than the FFT window. The minimum is transformed into a gain factor function using a signal-to-noise ratio control parameter. The diffusive gain factor interaction of neighboring modes is performed in the second layer, called the ''diffusion layer,'' in order to avoid ''musical tones.'' In the frequency domain, a filtering operation is performed by multiplying the noisy speech power spectrum by the diffusive gain factors to yield the filtered signal spectrum. This latter is transformed to the time domain by an inverse Fourier transform with original noisy phase.

3:15

1pSP7. An improved broadband active noise compressor. Hui Lan, Ming Zhang, and Wee Ser (Ctr. for Signal Processing, School of EEE, Nanyang Technolog. Univ., Singapore 539798)

As the extension of active noise equalization (ANE), an active noise compressor (ANCP) has been proposed recently in the literature to nonlinearly compress the noise power to a certain desired range instead of shifting it linearly. The algorithm uses a variable gain factor to control the dynamic range of the residual noise power. However, the controllability provided by that gain factor is inadequate. In this paper, we propose a new way to represent the gain factor. The new method takes into account the desire to accurately maintain the noise power when it is tolerable and suppress it while exceeding the unbearable level. Simulation and implementation results show that the new method outperforms ANCP in controllability and additionally in computational efficiency [J. W. Feng and W. S. Gan, IEEE Signal Process. Lett. **5**, 11–14 (1998)].

MONDAY AFTERNOON, 4 DECEMBER 2000 PACIFIC SALON C, 1:25 TO 4:45 P.M.

Session 1pUW

Underwater Acoustics: Scattering

Dalcio K. Dacol, Chair
Naval Research Laboratory, Washington, DC 20375-5320

Chair's Introduction—1:25

Contributed Papers

1:30

1pUW1. Standard-target calibration of broadband sonars. Kenneth G. Foote (Woods Hole Oceanogr. Inst., Woods Hole, MA 02543)

The object of a standard-target calibration is specification of the overall frequency response function of the system. In terms of the transmit and receive signal spectra S_T and S_R, standard-target far-field form function F, and two-way acoustic path loss P for an on-axis far-field calibration; the frequency response function is $H=S_R/(S_T F P)$, where each of the displayed functions is frequency-dependent. In practice, a broadband calibration may be hindered by (1) a vanishing denominator value, causing a divergence in H, or (2) a small numerator value or large denominator value, effectively amplifying the influence of noise. The general solution to these problems is to use multiple dissimilar targets to be able to avoid extrema in F, change the transmit signal waveform to avoid nulls in S_T, and ensure that the signal-to-noise ratio is high over the frequency band of interest. The near-field case can be addressed by adjusting the target range. Given these measures, the standard-target technique demonstrated by Dragonette *et al.* [J. Acoust. Soc. Am. **69**, 1186–1189 (1981)] for scattering measurements may be rendered into general practice for active broadband sonars.

1:45

1pUW2. Bistatic target detection, interferometry, and imaging with an autonomous underwater vehicle platform. Joseph R. Edwards, Henrik Schmidt (Dept. of Ocean Eng., Rm. 5-204, MIT, 77 Massachusetts Ave., Cambridge, MA 02139, jre@mit.edu), and Kevin D. LePage (SACLANT Undersea Res. Ctr., 19138 San Bartolomeo (SP), Italy)

The acoustic detection and classification of completely and partially buried objects in the multipath environment of the coastal ocean presents a major challenge to the underwater acoustics community. However, the rapidly emerging autonomous underwater vehicle (AUV) technology provides the opportunity of exploring entirely new sonar concepts based on mono-, bi-, or multistatic configurations. For example, the medium frequency regime (1–10 kHz) with its bottom penetration advantage may be explored using large synthetic apertures, where acoustic information is accumulated over a series of sonar pings. The performance of such approaches is highly dependent on accurate platform navigation and timing, which poses a significant challenge to AUV developers, particularly because the navigation procedures are themselves dependent on the complicated multipath acoustic environment. Using experimental data from the GOATS'98 SACLANTCEN/MIT experiment, this paper describes an investigation into the feasibility of combining seabed scattering data from