

[54] ECHO CANCELLER USING PARAMETRIC METHODS

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[56] References Cited

U.S. PATENT DOCUMENTS

- 4,057,696 11/1977 Gitlin et al. 179/170.2
- 4,479,036 10/1984 Yamamoto et al. 179/170.2
- 4,531,220 7/1985 Brie et al. 375/14

FOREIGN PATENT DOCUMENTS

- 58-90832 5/1983 Japan .
- 58-138132 8/1983 Japan .

OTHER PUBLICATIONS

"A High Speed Digital Adaptive Echo Canceller", N. Demytko et al., Australian Telecommunications Research, vol. No. 1, 1973, pp. 20-8.

"Echo Cancellation on Time-Variant Circuits", N.

Demytko et al., Proceedings of the IEEE, vol. 65, No. 3, Mar. 1977, pp. 444-53.

Lannart Ljung et al., Fast Calculation of Gain Matrices for Recursive Estimation Schemes, Int. J. Control, 1978, vol. 27, No. 1, 1-19.

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[57] ABSTRACT

A parametric echo canceller comprising two transversal filters is employed to recursively model the echo path. The first transversal filter receives the input signal, the fed-back echo residual signal and a first set of Kalman gain coefficients to produce a first intermediate result. The second transversal filter receives the echo signal, the fed-back echo residual signal and a second set of Kalman gain coefficients to produce a second intermediate result. The second intermediate result is subtracted from the first to yield an estimated echo replica. The estimated echo replica is then subtracted from the echo to yield an echo residual. The taps of the first and second transversal filters are weighted in accordance with first and second sets of weighting coefficients, which are generated in accordance with the Fast Kalman Algorithm.

17 Claims, 7 Drawing Figures

