

**Zhang, Quan G.; Georghiades, Costas N.**

**An application of the expectation-maximization algorithm to interference rejection for direct-sequence spread-spectrum signals.** (English) [Zbl 1274.93260](#)  
Kybernetika 35, No. 1, 83-91 (1999).

Summary: For a Direct-Sequence Spread-Spectrum (DS-SS) system we pose and solve the problem of Maximum-Likelihood (ML) sequence estimation in the presence of narrowband interference, using the Expectation-Maximization (EM) algorithm. It is seen that the iterative EM algorithm obtains at each iteration an estimate of the interference which is then subtracted from the data before a new sequence estimate is produced. Both uncoded and trellis-coded systems are studied, and the EM-based algorithm is seen to perform well, outperforming a receiver that uses an optimized notch filter to remove the interference, especially for large interference levels.

**MSC:**

[93E10](#) Estimation and detection in stochastic control theory

**Keywords:**

[maximum likelihood \(ML\) estimation](#); [spread-spectrum signal](#); [sequence estimation](#); [narrowband interference](#); [expectation-maximization \(EM\) algorithm](#); [notch filter](#)

**Full Text:** [Link](#)

**References:**

- [1] Ansari A., Viswanathan R.: Application of expectation-maximization algorithm to the detection of a direct-sequence signal in pulsed noise jamming. *IEEE Trans. Comm.* 41 (1993), 1151-1154 · [Zbl 0800.94120](#) · [doi:10.1109/26.231956](#)
- [2] Dempster A. P., Laird N. M., Rubin D. B.: Maximum-likelihood from incomplete data via EM algorithm. *J. Roy. Statist. Soc.* 39 (1977), 1-17 · [Zbl 0364.62022](#)
- [3] Georghiades C. N., Han J. C.: Optimum decoding of TCM in the presence of phase-errors. *Proc. 1990 International Symposium and Its Applications (ISITA'90)*, Hawaii 1990
- [4] Georghiades C. N., Han J. C.: Sequence estimation in the presence of random parameters via the EM algorithm, submitte.
- [5] Georghiades C. N., Snyder D. L.: The expectation-maximization algorithm for symbol unsynchronized sequence detection. *IEEE Trans. Comm.* COM-39 (1991), 54-61 · [doi:10.1109/26.68276](#)
- [6] Han J. C., Georghiades C. N.: Maximum-likelihood sequence estimation for fading channels via the EM algorithm. *Proc. Communication Theory Mini Conference*, Houston 1993
- [7] Kaleb G. K.: Joint decoding and phase estimation via the expectation-maximization algorithm. *Proc. Internat. Symposium on Information Theory*, San Diego 1990
- [8] Milstein L. B., Iltis R. A.: Signal processing for interference rejection in spread spectrum communications. *IEEE ASSP Magazine* (1986), 18-31 · [doi:10.1109/MASSP.1986.1165359](#)
- [9] Modestino J. W.: Reduced-complexity iterative maximum-likelihood sequence estimation on channels with memory. *Proc. Internat. Symposium on Information Theory*, San Antonio 1993
- [10] Wu C. F.: On the convergence properties of the EM algorithm. *Ann. Statist.* 11 (1983), 1, 95-103 · [Zbl 0517.62035](#) · [doi:10.1214/aos/1176346060](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.