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Sparse adaptive channel estimation based on mixed controlled l_2 and l_p-norm error criterion. (English) Zbl 1373.93333

J. Franklin Inst. 354, No. 15, 7215-7239 (2017).

Summary: In this paper, we propose sparse adaptive channel estimation algorithms based on a mixed controlled l_2 and l_p-norm error criterion and zero attracting theory. In the proposed algorithms, a controlling parameter within the range of $[0, 1]$ is adopted to control the mixture of the l_2 and l_p norms which are exerted on the estimation error. The sparsity-aware characteristic is implemented by an l_1-norm penalty, a correntropy-induced metric penalty and a log-sum function constraint which are to exploit the in-nature sparseness of the channels. The proposed sparsity-aware algorithms give desired zero attractors in their iterations to speed up the convergence. The derivation of the proposed algorithms is presented in detail. We can find that the previously proposed sparsity-aware algorithms can be regarded as a special case of the proposed sparse adaptive algorithms. Also, the behaviors of the proposed algorithms are well verified over a multi-path wireless communication channel. As a result, our proposed algorithms are superior to the previously reported sparse mixed adaptive filters with respect to both the convergence and steady-state error for handling sparse signals.

MSC:

93E10 Estimation and detection in stochastic control theory
93C40 Adaptive control/observation systems
93E03 Stochastic systems in control theory (general)

Keywords:

sparse adaptive channel estimation; mixed controlled l_2 and l_p-norm error criterion; zero attracting theory; l_1-norm penalty; correntropy-induced metric penalty; log-sum function constraint

Full Text: DOI

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