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A New Variable Length NLMS Adaptive Algorithm

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Abstract: The Fractional Tap-length Normalized Least Mean-Square (FT-NLMS) adaptive algorithm, a member of the variable tap-length LMS algorithms family, has attracted attention recently due to its robustness and low computational complexity compared with existing variable tap-length algorithms. The parameter ?in the FT-NLMS algorithm controls convergence speed and bias from the optimum tap-length, which necessitates a compromise between them due to its fixed value. Therefore, a well adjusted time-varying ?(n)can provide both fast convergence speed and small steady state bias. In this paper, a new robust variable ?(n)FT-NLMS is proposed that ensures a large value of ?(n)when the algorithm is far from the optimum with ?(n)decreasing as the adaptive filter approaches the optimum even in the presence of uncorrelated noise disturbance. Transient and steady state performance analysis of the proposed algorithm will be presented, where expressions for the algorithm steady state excess Mean-Square Error (MSE), steady state tap-length of the adaptive filter, and steady state E{?(?)}are derived. Simulation examples are presented in different experimental conditions , which will demonstrate the advantages of the proposed algorithm over existing variable tap-length NLMS algorithms. Moreover, simulation results will show that the derived theoretical expressions can predict very well the actual behavior of the proposed algorithm.