Robust frequency estimation for sampled sinusoidal signals without iteration

A DEEKSHA¹ and G. RAJENDER²

¹²Electronics and Communication Engineering, TRR College of Engineering, Patancheru, India
¹ deekshaadula@gmail.com and ²raju3653@gmail.com

ABSTRACT

This paper presents a signal frequency estimation method for sampled sinusoidal signals, which requires no iteration for the frequency search. This paper robustifies the algorithm of Zhang et al. to maintain the same signal-to-noise ratio as with the traditional four parameter estimation method that requires iterations for the signal frequency search. Numerical simulation results show that the frequency estimation error when Gaussian noise is added to the input data is little higher than the square root of the Cramer–Rao bound. Further, it was shown that the effect of harmonic components on the frequency estimation error can be minimized when the phase interval is close to \((2/3)\pi\). Furthermore, Simulation results show that the frequency estimation with the proposed method is more accurate than that with the IEEE-1057 method when the harmonic components are added to the input signal.

Keywords: Cramer–Rao bound (CRB), frequency estimation, IEEE Standard 1057, least-square method.