IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advances in Space-based Navigation Systems, Services, and Applications (6)

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DENOISING OF SCINTILLATED GNSS SIGNAL BASED ON CEEMD-MFDFA METHOD

Abstract

The research on signal processing, modeling, imaging and techniques related to ionospheric effects has become a hot topic in recent years. A signal denoising technique that integrates complementary ensemble empirical mode decomposition (CEEMD) with multi-fractal detrended fluctuation analysis (MFDFA), refers to CEEMD-MFDFA is applied in this paper. CEEMD method is introduced in recent time for adaptive signal decomposition, which is much better than the empirical mode decomposition (EMD) having mode mixing problem. First, the amplitude scintillated (noisy) signal is broken down into a given number of K intrinsic mode functions (IMFs) by CEEMD. However, based on criterion of MFDFA designed to select the number K, which aims to prevent over-binning or under-binning on the CEEMD denoising. Besides, MFDFA is also developed to determine with precision the relevant modes to construct the filtered signal. The experimental results from real signal indicate the superior performance of CEEMD-MFDFA filtering over CEEMD based denoising. Key words: complementary ensemble empirical mode decomposition (CEEMD), multi-fractal detrended fluctuation analysis (MFDFA), amplitude scintillation, over-binning or under-binning, denoising.