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An Efficient Waveform Reconstruction Method for Digital Bandwidth Interleaving Sampling System

Digital bandwidth interleaving (DBI) technology is a method that can simultaneously improve the bandwidth and sampling rate of sampling system. However, its waveform reconstruction algorithm is so complicated that it is impossible to realize real-time waveform reconstruction. This paper proposes a frequency-domain waveform reconstruction method for DBI sampling system to improve the waveform reconstruction efficiency. Compared with the traditional time-domain recovery method, the proposed method performs most of the signal processing in the frequency domain. It first converts discrete time-domain signals into discrete frequency-domain signals through Fast Fourier transform(FFT), and then completes digital mixing, filtering, and corrections in the frequency domain. Finally, the reconstructed frequency domain components is converted back into a time domain signal by Inverse Fast Fourier transform (IFFT). The proposed method takes advantage of the computational efficiency advantages of the frequency-domain filtering method compared to the time-domain filtering. And it integrates multiple time-domain filter coefficients in the DBI system into a frequency response coefficient, so that one frequency-domain filtering is equivalent to multiple time-domain filtering operations. To verify the efficiency of the method, a 250MSPS evaluation platform is used to evaluate its performance. Both the classical time domain method and the proposed frequency domain method are implemented on Kintex-7 FPGA. Experimental results show that the proposed method saves 61.43% of the system's DSP resources compared to the time-domain method. Under the condition of limited word length, the reconstructed waveform quality of the proposed method is higher than the classical one.

Minioral

Yes

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No

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