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研究论文

TIADC通道误差自适应修正方法

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摘要:

高速TIADC通道间存在的静态增益和时钟偏斜误差严重限制了系统的信噪失真比和无虚假动态范围. 基于泰勒级数逼近原理, 提出了一种自适应补偿结构, 由导数滤波器和额外的参考通道组成. 时钟控制子通道与参考通道在某些时刻同步采样, 通过对比参考通道和子通道导数滤波器组的输出, 可以估计出通道误差参数, 进而完成误差补偿. 整个结构都在数字域实现, 稳定性较好. 特殊的时钟分配器使得各子通道共用一个参考通道, 简化了系统结构. 仿真结果表明, 当AD量化为14位时, 系统的信噪失真比和无虚假动态范围能够提高约50dB, 有效位数能够达到约12位.

关键词: TIADC 自适应补偿 泰勒级数 导数滤波器

Novel adaptive method based on the Taylor series to compensate channel-mismatches of TIADC

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Abstract:

Static-gain and timing-skew mismatches among channels of TIADC significantly limit the Signal-to-Noise plus Distortion Ratio (SNDR) and the Spurious Free Dynamic Range (SFDR) of system. In this paper, an adaptive structure based on the Taylor series theory is proposed to compensate these mismatches. The novel structure is composed of differentiators and external reference channel. Controlled by the clock, sub-channels and reference channel sample simultaneously at some times. Comparing the output of reference channel with those of differentiators of sub-channels, the parameters of mismatches can be estimated, and then compensations can be carried out. The whole structure is implemented in the digital domain, and has the advantage of stability. Due to the special clock divider, all sub-channels share the same reference channel, which simplifies the system. Experimental results demonstrate that the SNDR and the SFDR of the output can be raised around 50dB, and the effective number of bits(ENOB) of the system can reaches about 12bits when the ADCs outputs are quantized to 14bits, which proves the validity of the proposed method.

Keywords: TIADC adaptive compensation Taylor series differentiator

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- 自适应补偿
- 泰勒级数
- 导数滤波器

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- [1] Kurosawa N, Kobayashi H, Maruyama K, et al. Explicit Analysis of Channel Mismatch Effects in Time-interleaved ADC Systems [J] . IEEE Trans on Circuits and Systems-I: Fundamental Theory and Applications, 2001, 48(3): 261-271.
- [2] Huang S, Levy B C. Blind Calibration of Timing Offsets for Four-Channel Time-Interleaved ADCs [J] . IEEE Trans on Circuits and Systems-I: Regular Papers, 2007, 54(4): 863-876.
- [3] Divi V, Wornell G W. Blind Calibration of Timing Skew in Time-Interleaved Analog-to-Digital Converters [J] . IEEE Journal of Selected Topics in Signal Processing, 2009, 3(3): 509-522.
- [4] Zou Y Z, Zhang S L, Lim Y C. Timing Mismatch Compensation in Time-Interleaved ADCs Based on Multichannel Lagrange Polynomial Interpolation [J] . IEEE Trans on Instrumentation and Measurement, 2010, 60(4): 1123-1131.
- [5] McNeill J A, Coln M C W, Brown D R, et al. Digital Background-Calibration Algorithm for ‘Split ADC’ Architecture [J] . IEEE Trans on Circuits and Systems-I: Regular Papers, 2009, 56(2): 294-306.
- [6] McNeill J A, Coln M, Croughwell R. “Split ADC” Calibration for All-Digital Correction of Time-Interleaved ADC Errors [J] . IEEE Trans on Circuits and Systems-II: Express Briefs, 2009, 56(5): 344-348.
- [7] Dyer K C, Fu Daihong, Lewis S H, et al. An Analog Background Calibration Technique