

基于压缩感知的低功耗高效率CMOS图像传感器设计

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摘要:

本文提出一种基于压缩感知的低功耗高效率CMOS图像传感器(CIS)设计。在这种压缩感知CIS中, 帧存储、帧差求解和帧压缩等过程分别集成于像素级、列级和芯片级电路中, 实现了图像传感过程和图像压缩过程的融合。这种融合提高了CIS在功耗、传输带宽和输出数据等方面的效率。所提出的CIS设计已采用Global Foundries 0.18 μm 1P6M混合信号工艺进行了投片验证。验证结果显示, 其像素结构可以实现较小的像素面积和较好的填充因子, 相比于其他相关设计更具折衷性。而自适应读出量化方法则可以根据不同的数据类型实现选择化处理, 实现低功耗实时图像压缩。结果表明, 所提出的CIS结构适用于诸如无线视频传感网络等低功耗高效率成像系统。

关键词: CMOS图像传感器; 低功耗; 高效率; 压缩感知

Low Power High Efficiency CMOS Image Sensor Design Based on Compressed Sensing

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Abstract:

A low power high efficiency CMOS image sensor (CIS) based on compressed sensing is proposed. In this compressed sensing CIS, frame storage, frame difference detection and frame compression are respectively integrated in the pixel, column and chip level circuits and achieve the fusion of image compression and image sensing. This fusion can improve the efficiency in power consumption, transmission bandwidth and output data. The whole design has been fabricated using Global Foundry 0.18 μm 1P6M mixed-signal process. The testing result indicate that the proposed pixel structure can not only achieve the smaller pixel size and better fill factor but also keep the better tradeoff compared with other counterparts. The self-adaptive quantization scheme can also make selective processing for different pixel readout and achieve low-power real-time image compression. It proves that the proposed CIS architecture is suitable to the application of low power high efficiency imaging system such as wireless video sensor network (WVSN).

Keywords: CMOS image sensor; low power consumption; High efficiency; Compressed sensing;

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