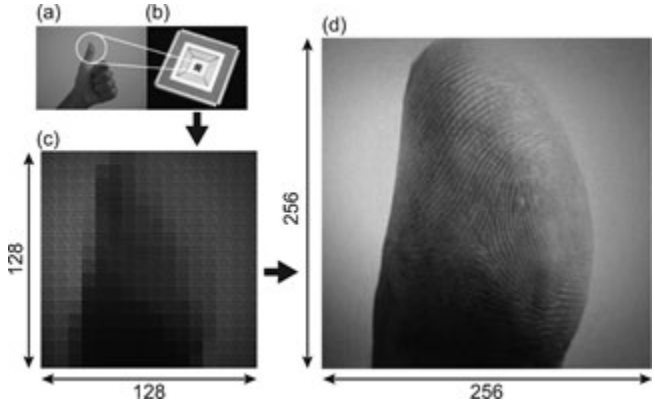
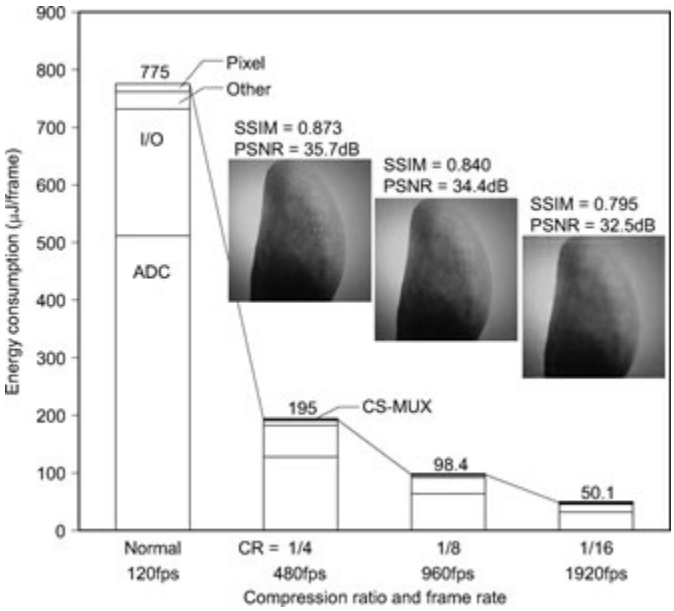
Docket #: S11-113

CMOS image sensor with single-shot compressed sensing

Stanford researchers have patented an image sensor that overcomes frame rate and power consumption limits for high-speed mega-pixel imaging, and therefore can extend battery life for mobile phone cameras. The image sensor uses compressed sensing (CS) to reduce the number of captured measurements, hence the number of Analog to Digital conversions performed, without adversely affecting signal. The prototype, a 256x256 0.15 µm CIS process image sensor, demonstrated no loss in Signal to Noise Ratio or sensitivity relative to normal capture, and close to linear reduction in energy consumption per frame with CS compression ratio. The sensor benefits cameras with high-frame-rate imaging and limited power sources.



Captured and reconstructed images: (a) target object, (b) packaged prototype chip, (c) sensor output at CR=1/4, (d) reconstructed image.



Energy consumption per frame, Structural Similarity Index (SSIM), and Peak Signal to Noise Ration (PSNR) versus compression ratio CR.

Applications

- **Cellphone** and **mobile device cameras**
- **Biomedical imaging** (e.g. blood flow or neuron activities) with limited data bandwidth and power supply

Advantages

- Low power, longer battery life, and high frame rate
- High scalability in pixel resolution
- Capability of capturing moving objects
- Simple optical design

Publications

- Y. Oike and A. El Gamal, "CMOS Image Sensor With Per-Column ?? ADC and Programmable Compressed Sensing," IEEE Journal of Solid-State Circuits, Vol. 48, NO. 1, pp. 318-328, January 2013.
- Yusuke Oike, Abbas El Gamal, A 256×256 CMOS Image Sensor with ??-Based Single-Shot Compressed Sensing, presented at IEEE International Solid-State

Circuits (ISSCC) Conference, Feb 19-23, San Francisco, CA, published in Digest of Technical Papers, published online: 3 April 2012, DOI: 10.1109/ISSCC.2012.6177057

Patents

- Published Application: 20140231620
- Issued: 9,191,026 (USA)

Innovators

- Yusuke Oike
- Abbas El-Gamal

Licensing Contact

Mona Wan

Senior Licensing Manager for Special Projects

Email