Docket #: S13-419

Low-Power CMOS Image Sensor for Object Detection

Stanford researchers are developing a low-power, CMOS image sensor with embedded feature-extraction for mobile vision applications. Leveraging the fact that vision features are often edge-based, the sensor's readout circuitry digitizes ratios of neighboring pixels (representing edges) rather than absolute pixel values. As a result, scenes with wide variations in lighting can be represented with fewer bits per pixel, and 100X-1000X less power compared to commercial mobile sensors. The approach is ideal for power-constrained applications – wireless sensor nodes, phone cameras, wearable devices and unmanned aerial vehicles. The approach is also cost-effective, as it uses a standard linear pixel array. This technology could enable an "always on" camera that continuously captures features for object-detection, which in turn could extend the capability of both contextual awareness and augmented reality on mobile platforms.

Stage of Research
Researchers are completing chip architecture designs and performance estimations. Chip layout, manufacture and test are the next steps.

Applications

- Cameras in:
  - Mobile phones
  - Wearable devices
  - Mobile computing
  - Unmanned Aerial Vehicle Systems
- Wireless sensor nodes

Advantages

- Low power consumption (250uW for entire chip vs. typical mobile cameras at >100mW)

Publications

- Omid-Zohoor, Alex B. "Imaging providing ratio pixel intensity." Patent Application No. PCT/US2015/018002, published September 2015.
- Omid-Zohoor, Alex, Christopher Young, David Ta, and Boris Murmann. Towards Always-On Mobile Object Detection: Energy vs. Performance Tradeoffs for Embedded HOG Feature Extraction. *IEEE Transactions on Circuits and Systems for Video Technology*.(2017):1.Web.

Patents

- Published Application: WO2015131045
- Published Application: 20170064211
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