Title: World's first filter-free color splitting image sensor: from concept to silicon to first results
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Company name / Institute: eyeo
Project name:
Funding group:
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Color imaging has relied on the same fundamental principle for more than half a century. The Bayer color filter array, used in virtually all CMOS image sensors today, applies a mosaic of red, green, and blue filters across the pixel array. Each filter transmits only a portion of the light spectrum while absorbing the rest, meaning that up to two thirds of incoming photons never reach the photodetector. This inherent loss sets a fundamental limit on sensor sensitivity and signal-to-noise ratio, impacting image quality across applications, from smartphones to industrial vision systems.

eyeo introduces a fundamentally different approach. Instead of filtering light, its sensors use NCOS® (Nanophotonic Color Splitting), a waveguide-based architecture that separates light by wavelength and directs it to the appropriate pixels. This eliminates the need for color filters and microlenses, ensuring that no photons are discarded and preserving full spectral information.

This presentation introduces the first filter-free color splitting image sensor and shares initial results from a fabricated prototype. Beyond the sensor itself, it focuses on the image processing challenges and opportunities enabled by this new architecture. Color splitting produces a different kind of raw data than a traditional Bayer sensor, with adapted color conversion, demosaicing, and ISP processing developed alongside the sensor. The results highlight a clear path toward significantly improved image quality through enhanced light sensitivity, with strong potential for applications in smartphones, XR devices, and machine vision.

Bio

