Why CMOS Camera Technology?

Although CCD sensors are still very common in Industrial Image Processing, it is well established that the CMOS technology has much more developing potential than CCD's.

With the recent advancements CMOS image sensors are nowadays a mature technology, bringing a great number of advantages in many machine vision applications. Due to carefully selected CMOS processes and proper signal handling techniques temporal noise of CMOS image sensors nowadays outperform CCD's. Even the fixed pattern noise is no more an abstacle that prevents the usage of CMOS imagers in high-end metrology applications.

State-of-the-art CMOS imagers with active pixels (APS) are nowadays unsurpassed in terms of their extraordinary high dynamic properties, their antiblooming resistance as well as in terms of readout speeds (up to 60 MHz per output channel). For example, with the MV-D1024 CMOS imager from Photonfocus readout speeds of 150 full frames per second can be achieved.

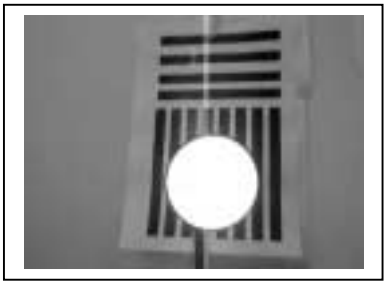
Using logarithmic compression at pixel level further prevents saturation of the image and permits in scene contrasts of more than 120dB. With the LINLOG™ technology, developed by Photonfocus, it is possible to combine linear with logarithmic response in any way, thus enabling adjustment to very different illumination levels. Besides the LINLOG™ technology prevents reduced contrast and slow response with consequent image lags as it is known from logarithmic sensors.

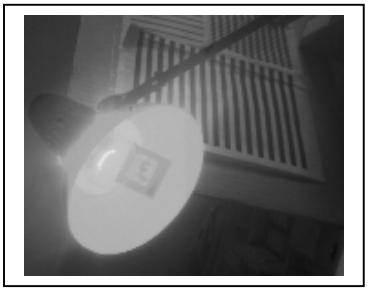
Further key advantages of CMOS imagers are the capability of accessing only parts of an image (ROI) and of integrating functionality on the chip (camera-on-the-chip). With more functional integration the component part count decreases and the system design is simpler with lower power dissipation. Furthermore CMOS technology is based on standardized fabrication and enables short camera design cycles.

Conclusion: The combination of several of these advantages can drastically reduce the overall implementation cost of a vision system.

What is Blooming?

When exposed to high light intensities CCD sensors suffer from an artifact created by charges flowing to neighboring pixels and changing the information of a whole column of the image.





Global Electronic Shutter for High Speed Imaging

Early CMOS image sensors worked with a rolling, or line shutter, where an aperture of integrating pixels was sweeped over the sensor. This technique leads to distortions when used in imaging of fast moving objects. With a global and simultaneous exposure, combined with pixel synchronous readout capability, and external trigger possibility Photonfocus has realized CMOS imagers for high end motion analysis. The pictures below show the effect of a rolling shutter and a global shutter on the image acquisition of a fast moving fan (100rpm).

Rolling Shutter

Global Shutter

Photonfocus proprietary Technology Combining High Dynamic and High Speed at excellent Contrast.

		
The picture of a light bulb shows the performance of the proprietary LINLOG™ mode of operation. Both, the filament of the light bulb, and the test chart in the background can be seen clearly. A dynamic range of over 120dB has already been measured with this principle.	Conventional Imagers with linear response and the same exposure parameters would result in a completely saturated image inside the lamp.	If with a conventional imager the exposure time, or the aperture is reduced, the background information disappears completely.