

# Optimizing Image Quality for Video Analytics

Video analytics promises to revolutionize the use of security cameras worldwide. Intelligent video solutions are being developed to, for instance, identify a face from millions of possibilities, pick out a suspect in a crowded stadium, detect a group of potential terrorists, or spot suspicious behavior on city streets or in airports.

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Equally intriguing are the non-security applications for video analytics, which can improve business intelligence. For example, video analytics can be used for inventory control, and for both customer traffic pattern analysis and demographic information for marketing intelligence.

But no matter how good video analytics software becomes, its effectiveness depends on image quality. Data sufficient for analysis requires that image sensors deliver wide dynamic range (WDR), high signal-to-noise ratio (SNR), minimal image artifacts and accurate color reproduction.

Expectations for video analytics have exceeded the capabilities of CCD cameras. Generating consistently high-quality images — regardless of lighting conditions, temperature and other environmental changes — while avoiding false alarms is difficult for traditional, analog CCD-based security cameras. For these reasons, latest generation analytics systems are relying on new digital image sensors.

## LIMITATIONS OF CCD CAMERAS

Analog CCD cameras struggle to serve intelligent



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video applications due to their limited dynamic range, resulting in image artifacts such as saturation, blooming and vertical smearing. Saturation occurs when pixels in bright areas are overexposed, causing them to turn completely white. Blooming is the loss of color fidelity when the camera's image sensor captures a confined area with high illumination (the sun or a bright object, for example). Similarly, smearing occurs when large portions of captured images are lost and appear as a vertical white band as excess light energy overwhelms CCD read channels. However, techniques to overcome CCD image deficiencies result in loss of luminance,

color saturation and detail, delivering less accurate data for intelligent video analytics.

Another problem with CCD technology is temporal video noise caused by electron leakage on the sensor chip that appears as cross talk in the video stream. This random video noise diminishes picture quality, contributes to false positives and increases the latency of intelligent video algorithms, which are responsible for performing real-time image processing. The algorithms commonly mistake random sensor noise for scene motion.



CCD-based cameras often experience interlace artifacts that appear as saw-tooth edges around moving objects. This is due to the traditional constraints of the NTSC and PAL television standards, which have no use in video analytics applications.

In short, CCD limitations — image over-saturation, video distortion due to random noise, and various pronounced image artifacts — produce video streams that contain less data, forcing algorithms to estimate or guess, causing false alarms or missed incidents. In addition, extensive filtering techniques required to overcome CCD limitations take up precious bandwidth, data storage and processing time, as well as reduce resolution.

## WDR IMPROVES VIDEO ANALYTICS

A new category of security cameras offer WDR capabilities that improve the accuracy of video images to deliver consistent, high-quality data for video analytics.

WDR refers to a camera's ability to capture images with the highest ratio between highlights and shadows. In other words, WDR cameras can capture details and accurate color in both the lightest and darkest portions of a scene simultaneously, even with high-contrast lighting, strong backlight, glare, reflection and other uncontrolled or variable lighting conditions.

WDR is measured in decibels (dB). As a general rule, effective video analytics requires a camera that provides 100 dB or greater dynamic range, to produce high-quality data with minimum noise (high SNR), accurate color, excellent image quality and precise detail throughout all the lighting ranges of a scene.



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In addition to image quality and color rendition, all-digital WDR cameras provide the best data for real-time network video analytics at the edge; that is analytics embedded in the camera. With all-digital WDR cameras, there is no need to convert



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data from analog to digital; and since video analytics is implemented at the edge, only significant events are transmitted over the network, reducing traffic, false alarms, time and data storage. Even if data is analyzed after it is transmitted to a central server, WDR cameras deliver the best possible digital data for analysis, reducing storage requirements.

## NEW POSSIBILITIES FOR VIDEO ANALYTICS APPLICATIONS

Pixim's Digital Pixel System (DPS) technology's ultra-wide dynamic range, high resolution, accurate color and minimal image artifacts can directly improve security in a variety of important applications, including financial institutions, retail stores, casinos, borders, prisons, campuses, and various transportation-related environments such as airports, seaports, trains and buses.

Beyond these security applications, high-quality images can also reinforce business intelligence. For example, clear and detailed images can help companies track the vehicles and containers used to ship their goods for more accurate inventory control. Retail stores can count the number of people entering a location by time of day and determine which store aisles have the most customer traffic. Train operators can use intelligent video applications to track the number of people entering and exiting a car at every stop, or when passengers stop going in or out of the cars so automatic doors close safely.

In countless ways, video analytics is improved by high-quality images. Pixim will continue to raise the bar on image quality, thereby yielding usable business intelligence as well as providing better data to help prevent incidents and catch perpetrators.

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