WHITE PAPER

How to Get the Best Image Quality from Your IP Camera

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MOXA®

IP cameras are now a mainstay of the fast-changing IP video market, but the fact that the image is digitized and compressed makes it harder to achieve an image quality that rivals that of legacy analog cameras. In fact, since image resolution is moving to the megapixel level—HD (1280 x 720), full HD (1920 x 1080), 3 megapixels, 5 megapixels, etc.—camera configurations are also different compared with legacy SD (standard definition) cameras.

The Trends of IP Cameras

Megapixel images are becoming the default

In recent years, people have become accustomed to HD (1280 x 720) and even full HD (1920 x 1080) resolution videos for digital cameras/recorders and on-line videos, and with TV quickly moving into the HDTV era, IP camera users have come to expect megapixel resolution images from their cameras. Price is also no longer an issue since the difference in cost between megapixel and SD (usually 720 x 480 or 720 x 576) IP cameras is relatively small.

CMOS sensors are becoming more popular than CCD sensors

Since mainstream IP cameras are moving to megapixel resolution images, CMOS sensors are becoming more popular than legacy CCD sensors due to their lower cost, lower power consumption, and the fact that more functions can be integrated onto an SOC. Another advantage of CMOS sensors is that they do not have the same intellectual property limitations that CCD sensors have. In fact, with CMOS development now in high gear, the gap in image quality compared with CCD sensors can be expected to decrease even further in the near future.

The Megapixel and CMOS vs. CCD Myth

Do megapixel images provide higher video quality than SD images?

No! By definition, a megapixel resolution image is derived from image data collected by a sensor that has approximately 1,000,000 pixels. For example, HD images have 1280 x 720 = 921,600 pixels (or 1280 x 800 = 1,024,000 pixels). But these mega-sized numbers do NOT indicate the actual image quality. Although a megapixel image captures a larger image, it does not necessarily have a better image quality.

Is the image quality of a CCD camera better than a CMOS camera?

Not really. Many CCTV engineers and professionals consider the image quality provided by a CCD sensor to be better than the image quality provided by a CMOS sensor, especially in low lux

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Moxa manufactures one of the world's leading brands of device networking solutions. Products include industrial embedded computers, industrial Ethernet switches, serial device servers, multiport serial boards, embedded device servers, and remote I/O solutions. Our products are key components of many networking applications, including industrial automation, manufacturing, POS, and medical treatment facilities.

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(illumination) environments, and this understanding has been transferred to IP cameras. However, thanks to the fast development of CMOS sensor technology, the image quality gap between CMOS and CCD sensors is decreasing. In fact, CMOS sensors provide better quality images in some environments, such as strong light environments, since CMOS sensors eliminate much of the smear and blooming effects inherent with CCD sensors. In the near future, we can expect CMOS sensors used with IP cameras to provide a better image quality than CCD sensors.

Configuring your camera for different environmental conditions

Let's take a look at how to get the best image quality possible from your IP camera. Although good cameras certainly have the potential to produce good quality images, knowing how to configure your camera for various environments can make a big difference in image quality.

Situation 1: When shooting in bright and high illumination environments, such as in direct sunlight.

CMOS sensors provide better light inhibition

A CMOS sensor's light inhibition function will make objects more visible, and eliminate much of the smear and blooming effects inherent with CCD sensors.

CCD camera: with smear

CMOS camera: without smear

BLC and WDR

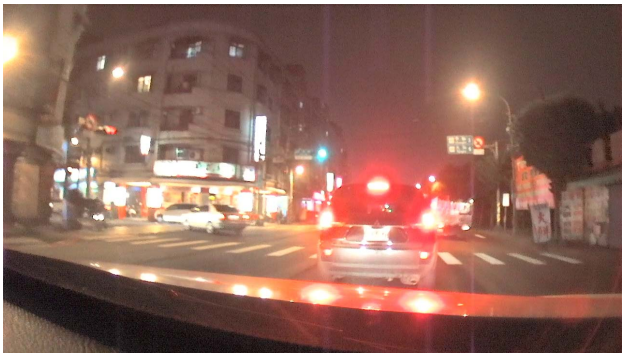
Although most IP cameras have a built-in BLC (back light compensation) function, which can make objects clearer, more recently the WDR (wide dynamic range) function is being used instead.

Situation 2: When shooting in dark, low illumination environments, such as at night.

Day and night functions

Cameras used in dark or low illumination environments should have a day and night capability to make images more visible. The camera will produce color images in high illumination conditions, and switch to black and white with ICR (IR-cut filter) in dark or low illumination conditions.

Color mode at night



B/W mode at night

AGC (auto gain control)
AGC (auto gain control) can optimize the signal level under low illumination conditions. Be sure to configure the AGC to a higher value (such as 64X) to increase the GAIN control value.

Exposure and shutter time
In low illumination conditions, increasing the exposure time and reducing the shutter speed will increase the amount of light being received.

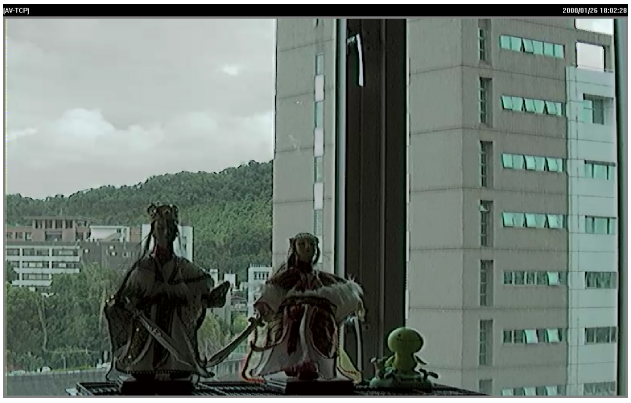
IR illuminator
Under dark conditions, such as close to 0 lux, an IR illuminator can be used to increase the amount of IR light.

Situation 3: When shooting scenes that have bright and dark conditions in the same image.

WDR (wide dynamic range)
Some environments exhibit both strong light conditions as well as dark areas. In this case, configure the WDR (wide dynamic range) level to improve the image quality.

without WDR

with WDR

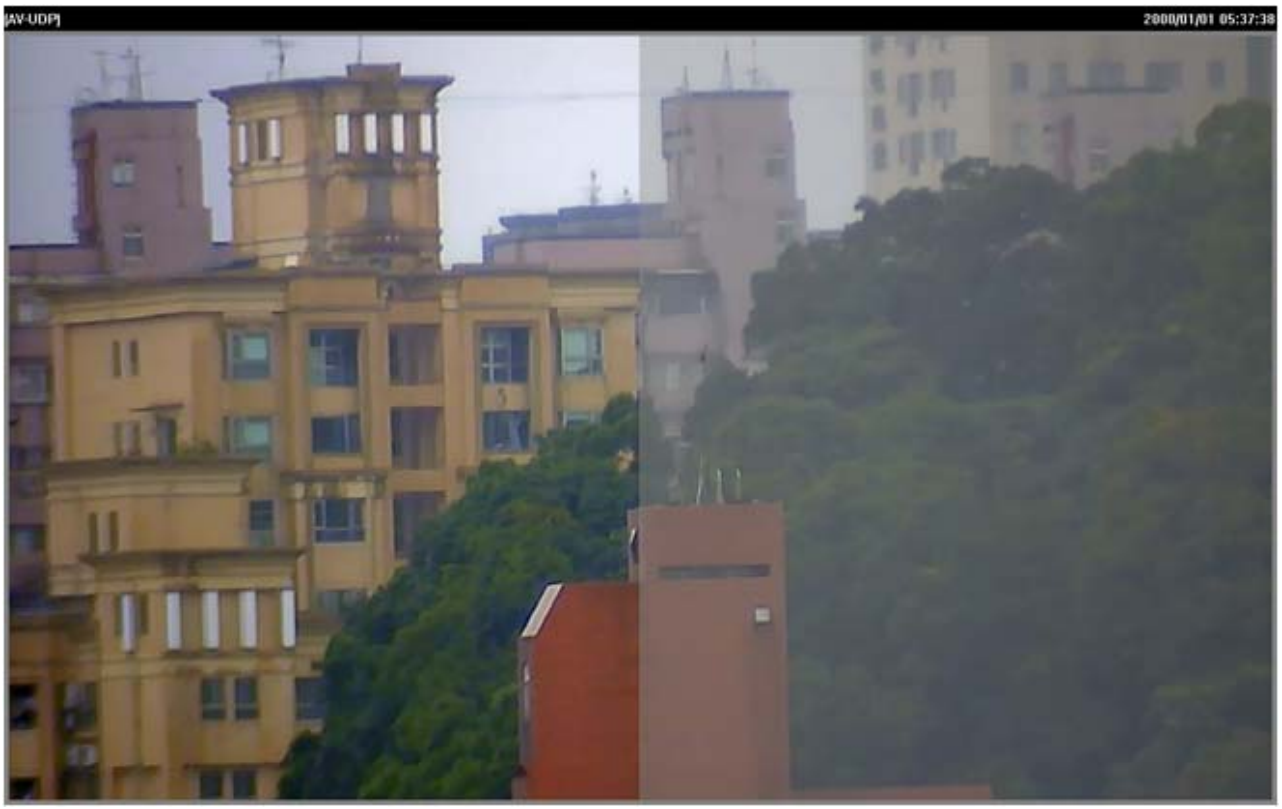


Situation 4: When shooting in foggy, rainy, or dusty conditions

De-mist function
Eliminating the blurred images caused by foggy, rainy, and dusty conditions can be achieved with a de-mist camera function, which uses an intelligent video analysis algorithm to enhance the image definition.

The Trends of IP Cameras

De-mist on **De-mist off**



Situation 5: When shooting color-rich objects

AWB function

Color-rich objects can cause images to have a color cast (i.e., a tint of a particular color). In this case, the AWB (auto white balance) function can be used to correct the color.

Situation 6: When shooting under high noise conditions

DNR function

A camera with a built-in 2D or 3D DNR (digital noise reduction) function can reduce the effects of excessive image noise, which can degrade the video signal. The DNR function reduces the amount of image noise, resulting in a clearer image.

Situation 7: When shooting in conditions affected by AC power frequency

Flickerless function

An AC lamp can cause a flicker effect, which is a consequence of the AC power frequency (50 or 60 Hz). To eliminate flicker, configure your camera to PAL (60 Hz) or NTSC (50 Hz) modes.

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Moxa's Solutions

Moxa's series of rugged HD (1280 x 720) IP cameras feature a cutting-edge HD CMOS sensor and powerful codec chip. The cameras provide good light inhibition, 2D/3D_DNR (digital noise reduction), WDR (wide dynamic range), de-mist, and good performance in low light conditions. Moxa's cameras compare favorably with other major IP cameras on the market, and provide the best image quality available. A box-type IP camera is currently available, with fixed-dome-type and PTZ speed dome IP cameras under development. For more information, visit Moxa's website at http://www.moxa.com/IP_camera or your distributor:
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