

Day/Night Cameras

Camera technology can help end-users deal with low-light environments

Decades of experience in video surveillance design have led to pre-programmed expectations regarding camera placement and how to capture or gather forensic detail (live or recorded). As a result, camera placement and coverage is often designed more like a physical “fan” or triangle of coverage without regard to what it is that really needs to be captured.

While security professionals might consider how to categorize evidence by one of four levels of detail: “monitor,” “detect,” “recognize” or “identify,” the inability of today’s technology to accurately capture evidence often results in having to use archived video as the beginning of the trail of evidence instead of as an indisputable forensics tool. In many cases, additional hours of interviews are necessary to collaborate witnesses to an event or evidence, only to end up using captured video as the final validation stage. Technologies such as megapixel day/night cameras offer an important tool to improve the detail of images collected over a wide range of lighting conditions.

The human eye, trained to differentiate and contrast detail by color, limits the imagination somewhat by our ability to process forensic detail. These assumptions of conventional wisdom are coming under siege as megapixel cameras and their ability to gather detail are providing electronic processing capability beyond human capability. Before this level of detail became available, many applications and individuals preferred to use color as a means of providing evidence. Today, emerging megapixel surveillance cameras and their associated capability beg the question whether a black-and-white image with appropriate light filtering would not provide better definitive detail for confirming evidence when there is not sufficient light available for a clear color image.

In more “mature” surveillance markets such as the U.K., with guidelines provided by organizations such as the Home Office (www.HomeOffice.com), digital surveillance video designs begin by first identifying the required number of “pixels on target.” For example, to capture license plate detail, there is a minimum requirement of 40 pixels per foot. Contrast this to a “blue letters on white background” description that may be the current state-of-the-art approach, or to simply describe a scene by color vs. detail.

Dealing with Low Light Situations

Surveillance cameras are challenged to operate in dramatically contrasting lighting (day/night) conditions. One of the best tools to allow a camera to perform well over a wide variety of lighting conditions is an auto-iris lens, which allows the camera to close the iris during the day to maximize depth of field and then open it at night to maximize the amount of light collected.

If the camera is still unable to collect enough light with the iris fully open, a day/night camera with an automatic IR filter is another option. The color spectrum seen by the human eye is quite limited compared with the spectrum seen by surveillance cameras. The sensors (either CMOS or CCD) within today’s digital surveillance cameras are capable of detecting infrared (invisible to the eye) light to better identify detail within a low-light condition. This infrared light, however, must be filtered during normal lighted conditions or perceptible color distortion will occur. An infrared (IR) “cut” filter within the camera filters this light which is emitted by everyday objects and can even be affected by temperature contrasts.

To leverage the low-light characteristics of the sensors, the camera automatically senses lighting conditions and automates the placement of the filter within or outside the optical path of the camera using advanced algorithms. Since accurate color reproduction is lost with the IR cut filter out of the optical path, the camera typically goes into monochrome mode.

One important consideration is the fact that many lenses will experience a shift in the focus of the scene when the camera enters night mode and is imaging primarily with longer wavelength IR light, which can cause the scene to become blurry. When using a camera with an automated cut filter, selecting an IR-adjusted lens will compensate for this potential shift in focus.

Extreme Low Light

The ability to develop detail in extremely low-light conditions can be aided by two additional approaches. The first approach is to adjust the lens to a lower f/stop to allow more light to excite the sensor of the camera — an approach that could more than double the light available to the sensor. However, there may be a significant difference in lens costs, justified by the critical nature of the scene. Depending on the application, a second approach would be to supplement the natural IR lighting with additional IR illuminators.

Security professionals can take many different approaches to designing an effective video surveillance system. But to capture the highest quality images possible across a wide range of lighting conditions, a day/night camera is an effective tool that can help users deliver the best overall protection possible — around the clock.



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