Image Capture for Digital Surveillance

Intelligent video surveillance analytics requires sharp images to run properly. Todd Rockoff, Vice President of Asia Sales at Pixim, discussed capturing clear images at the Global Digital Surveillance Forum, part of SecuTech Expo 2007, in Taipei, Taiwan.

SUBMITTED BY PIXIM

New digital technologies greatly enhance the value of video surveillance. Even though video surveillance historically has been an analog medium, today's analog transmission systems rely heavily on digital components to process and record video evidence. Surveillance practitioners increasingly take advantage of the Internet to allow flexible, remote monitoring of video surveillance. Moreover, system designers are adopting analytics capabilities, whereby computers monitor digital video to derive important statistics from scenes or to identify situations potentially requiring human intervention.

The technical requirements of digital video differ from those of analog video requiring system designers to adopt new ways of measuring the performance of image capture subsystems. The various candidate image capture technologies include CCDs, CMOS Active Pixel Sensors (APS) and Pixim's Digital Pixel System (DPS) technology.

THE DIGITAL SURVEILLANCE CHALLENGE

Internet video promises unprecedented flexibility and remote-control capabilities for surveillance systems. However, the promise of Internet surveillance is constrained by the precious network resources of storage and bandwidth.

Machine analysis of surveillance video could be the solution to unlocking the full value of digital surveillance and promises great economic advantages for security systems. If false negatives and false positives can be eliminated, analytics can remove human error and greatly leverage human resources available to secure a given facility.

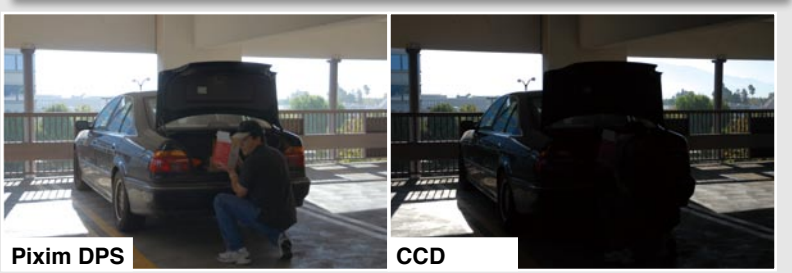
Together, Internet video and analytics can extend the reach of a surveillance operation and greatly leverage the human resources available.

In order to unlock the full value of Internet video and analytics, digital

Todd Rockoff, Vice President of Asia Sales at Pixim

In order to unlock the full value of Internet video and analytics, digital surveillance requires high-quality video capture under diverse conditions.

Benefits: Zero Blooming and Smear



The images show side-by-side frames captured from a typical car park scene. The Pixim DPS image on the left provides a clear image of both foreground and background. The perpetrator is clearly shown in the Pixim DPS image on the left, along with foreground and background details. By comparison, the CCD image on the right does not deliver a high-quality image of the perpetrator because it loses all of the detail in the darker foreground. The CCD image on the right loses key evidence in the presence of strong backlight. Detail is lost in the shadows, so that the license plate becomes unreadable. The CCD image also shows lack of detail and inaccurate color in the building and outdoor highlights resulting from the CCD image sensor blooming and smearing.

surveillance requires high-quality video capture under diverse conditions. Some of the key performance characteristics are as follows:

- Excellent low-light sensitivity
- Accurate color reproduction
- Operation across a broad temperature range
- High resolution
- Accuracy under bright lighting
- Minimum analog conversion artifacts

DPS TECHNOLOGY

The core invention of DPS is the digital pixel. A derivative of technology licensed from Stanford University, the digital pixel is a sensor design wherein every pixel includes a dedicated Analog-to-Digital Converter (ADC).

When combined with high-speed memory on the sensor, the digital pixel enables wide dynamic range (17 bits = 128,000:1) and excellent low-light performance.

Wide Dynamic Range (WDR) is achieved through Pixim's patented Multi-Sampling technology. In Multi-Sampling, each pixel is measured 144 times per 1/60 second field exposure. Such a high sampling rate is a direct benefit of the digital pixel, which allows the full pixel array to be read in the same way as a high-speed memory. In each field exposure, the system retains the value at each pixel that gives the best Signal-to-Noise Ratio (SNR). Pixim's proprietary rendering algorithms then combine the samples taken at various times during the field time to yield a best-looking result on a video display.

In effect, Multi-Sampling enables every pixel to determine its own shutter speed during each video field capture as a function of the light impacting that pixel in that frame.

DPS: ENABLING DIGITAL SURVEILLANCE

Higher-quality video provided as input to a video compression chip gives better compression results, which in turn means less storage and less bandwidth needed to convey video at a given quality level. Higher-quality video also gives more accurate analytics results. Pixim's solution provides several advantages for digital video, including the following:

- Native ITU656 output
  No board-level analog conversion
  Signals are all digital from pixel to packet
- Native progressive scan
  Global electronic shuttering
  No motion tearing
  Higher compression rates than CCDs
  Higher analytics accuracy
- Less readout noise than CCDs
  Higher compression rates than CCDs
  Higher analytics accuracy
- Higher vertical resolution than CCDs
  Higher analytics accuracy
- More natural colors than CCDs
  Higher analytics accuracy

Digital surveillance demands high-quality video capture under diverse conditions. AS

Benefits: Superior Resolution & Detail

The images show side-by-side frames captured from a typical building lobby application. The subject and both indoor and outdoor detail are all clearly visible in the Pixim DPS image on the left. By comparison, the outside details are not clear in the CCD image on the right because they are overexposed.

DPS Benefits: 1024x More Dynamic Range

The photos show side-by-side frames captured from a typical warehouse scene. The detail indoors and outdoors is clear in the Pixim DPS image on the left. By comparison, the CCD image on the right loses all of the detail in the truck parked outside.

These images show side-by-side frames captured from a typical ATM application. The faces are clearly shown, as is the color of the money and the background information, in the Pixim DPS image on the left. By comparison, the CCD image on the right loses all of the detail in the foreground.