The Pixim D2000 imaging system

Over a year ago, in our issue 22, we wrote about this new breakthourgh imaging technology which is now getting wider acceptance and managing to prove it's quality. We got some real life images and comparing them to ordinary CCTV camera

Pixim's patented Digital Pixel System (DPS) technology marks a fundamental breakthrough in imaging technology. Building upon technology developed at Stanford University in the 1990s, Pixim has created an image capture and processing system that provides high-quality pictures with enhanced dynamic range. Greater dynamic range significantly improves image quality in scenes consisting of both bright and dark areas.

The core invention in DPS is the inclusion of an analog-to-digital converter (ADC) within each pixel of the image sensor. The ADC translates the light signal into a digital value at the immediate point of capture, thus minimizing signal degradation and crosstalk in the array and allowing for greater noise reduction methods. Once the data is captured in a digital format, a variety of digital signal processing techniques are used for optimal image reproduction.
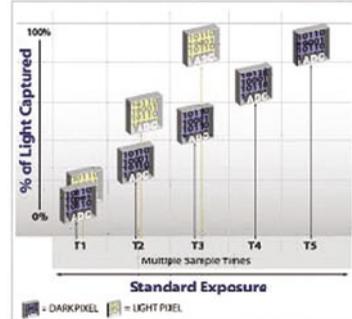
Pixim's DPS technology uses a technique known as "multi-sampling" to gather the information to achieve unmatched image quality and high dynamic range. Each pixel is independently sampled non-destructively multiple times in a single capture frame (which in video is typically 50 or 60 times per second). The imaging system determines the optimal time to sample and store the pixel information before the pixel is saturated and can no longer hold additional charge. In the graphic on the left, the light pixel is saved at time T3, the latest sample time before it saturates at 100 percent. The dark pixel builds up charge more slowly and uses additional time until it is

Pixim Multi-Sample Technology
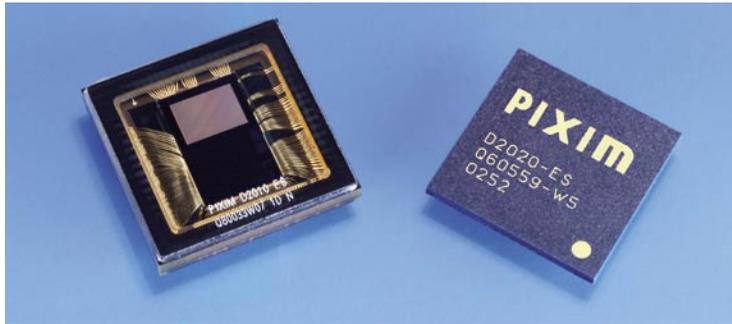
sampled and stored at T5. The stored values of information (intensity, time, noise offset) captured at each pixel are then processed in parallel and converted into high-quality images. In contrast, other technologies typically set one exposure time for the frame and sample each pixel at that time – resulting in images with some pixels that are underexposed (too dark) and some that are overexposed (too bright).

Pixim's first product based on DPS technology, the D2000 Video Imaging System, is comprised of a digital image sensor and a digital image processor. The digital image sensor and digital image processor function much like the eyes and brain in humans, with two-way real-time interactivity to capture the highest quality image possible. Just as the brain of a person walking into a dark room instructs the eyes to open the pupil to allow in more light, the digital image processor loads new code into the sensor to alter not only exposure times but the actual image capture algorithms. The result: the best possible picture given the specific image characteristics and lighting conditions.

Because each pixel has its own analog-to-digital converter and the information generated is captured and processed independently, each pixel in effect acts as its own camera. The exposure time for each pixel is adjusted to handle the unique lighting conditions at that pixel location in the image sensor array. A product built with the Digital Pixel System platform essentially has hundreds of thousands of individual cameras, each of which produces the best image possible.

These images are then combined to create a high quality video frame or picture.

As imaging technology continues to migrate toward totally digital systems, Pixim's Digital Pixel System technology will provide the foundation for image capture and image processing for the highest quality video and still cameras.

The Pixim-based camera provides higher colour fidelity in any lighting condition than competing technologies. Even in typical (tungsten-bulb) lighting conditions, the Pixim camera shows superior image quality. The CCD-based camera is having trouble with white balance and colour accuracy. Notice that the Pixim camera gets all of the details of the colour chart, the details in the sweater and the accurate colour of the wall (egg-shell vs. white).

Bad guys like to blind security cameras by shining bright lights into the lens. The camera with the Pixim video imaging system has minimal blooming artifacts when a 500 watt light-bulb is shined directly into the camera (although there is some lens flare present). A competitor's CCD-based camera blooms to the point that important data is lost in the scene.

Images taken with a standard camera on the left, and the same taken with a Pixim camera on the right

With the Pixim-based camera one can see the details of both the inside scene and the outside environment, including a good image of the bad guy. With the CCD-based camera, all of the outside scene is washed out, including the presence of a person.
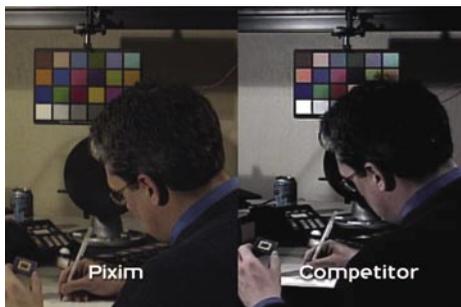
In a high dynamic range scene CCD-based cameras lose important details. With a bright lamp, the table is washed out in a CCD-based camera, but the camera with the D2000 video imaging system gets the details in the table and on the colour chart.

The Pixim-based camera shows much better colour fidelity and clarity in this example using a 2x zoom. Notice the colour of the card table and cards, as well as the differences in sharpness of the words on the table. [•]

For more information visit www.pixim.com

www.cctv-focus.com