Norpix Provides a Unique Multi-Camera Capture Solution for a Disney Research Study on Creating Panoramic Video

Lumenera's Lt425C Cameras Were Used in Conjunction with Norpix's SmallPix 2 Portable Computers and StreamPix Software in a Disney Research Study to Create an Algorithm for Correcting Parallax in Video Panoramas

Photo Credit: © www.disneyresearch.com
The above photo is a crop from a 20 megapixel panorama created from an unstructured array consisting of sixteen Lumenera Lt425C USB 3.0 cameras.

BACKGROUND: The Disney Research team approached Norpix to help create a system that could test the algorithm they developed to correct for parallax in video panoramas. To conduct their research, the Disney team required a system that would capture high resolution video with multiple cameras at 60 fps. In order to create a panorama beyond the resolution of a single camera, they needed to stitch together multiple views from the camera array which had overlapping visual fields, but were not precisely positioned.

CHALLENGES: Stitching multiple images together to create a panorama video often results in blurred and distorted images, a loss of image resolution as well as ghosting and other image imperfections. There is also the issue of parallax (the difference in the apparent position of an object caused by different lines of site – in this case sixteen different camera views), and image warping that naturally occurs because of timing difference between cameras.

The system also needed a computer that could handle the high resolution uncompressed images coming from each camera and software that allowed for multiple camera image streaming capture.

SOLUTION: Norpix created a system for multi-camera recording using their hardware and software along with Lumenera cameras, while Disney Research developed the technology for stitching the individual video streams into a single, seamless output panorama. In order to deliver on the challenging system requirements, each camera was tethered to a Norpix SmallPix 2 portable solid state drive computer, with Norpix StreamPix software. All nine computers are controlled via Norpix's StreamPix Remote software installed on a remote computer on a LAN.

(Continued from previous page)

From this remote workstation, the operator was able to observe live sample feeds from each of the eighteen Lumenera cameras and control the capture process. The cameras are precisely triggered using NorPix Pulse Generator & Digital Signal Amplifiers.

At the front end of the solution, sixteen Lumenera Lt425 cameras were chosen for several reasons:
- A frame rate of 60 fps was required for this application. The Lt425 can achieve 90 fps at full resolution
- High speed USB 3.0 interface for the fastest image delivery and simplified connectivity
- 128 MB RAM frame buffer for fast and reliable delivery of images
- Power supplied over USB 3.0 interface – No external power supply
- 1" CMOS sensor with a fully electronic global shutter that captures excellent quality, high-speed images with zero blur
- Hardware and software triggerable

High resolution uncompressed images from each camera were fed to the solid state drive at a transfer rate of over 240 MBps or 1.92 Gbps. The Lt425 cameras, using the CMOSIS CMV4000 sensors, delivered high quality images at fast frame rates. Lumenera's robust and proven USB 3.0 interface, drivers and 128MB frame buffer ensured that all images captured by the cameras were delivered to the host computer hard drive without exception.

The left image shows the camera array Disney Research constructed for capturing the panoramic videos.

The research team noted that the panoramas were captured without particularly accurate placement of cameras in order to demonstrate the flexibility to their approach.

Their technique automatically analyzed the images from the cameras to estimate position and alignment of each camera, which eliminates the need for calibration and allows flexible positioning of the cameras.

Before selecting Lumenera's Lt425 cameras, Norpix tested other competitive solutions without success. Alternate Dual GigE and USB 3.0 solutions were not able to reliably deliver images when attempting to move the large amount of data at high speed and zero latency to the computer drives.

RESOURCES:

Disney Research: For more details on the Disney Research application
http://www.disneyresearch.com/publication/panoramic-video-from-unstructured-camera-arrays/

Norpix: For more details on Norpix's StreamPix Remote software or SmallPix 2 portable computers
https://www.norpix.com/

Lumenera: For more details on Lumenera's high performance USB 3.0 cameras
https://www.lumenera.com/products/high-performance-usb-3.html