The Future of Machine Vision
Tackling the Demands of High-Speed Digital Imaging with CoaXPress® 2.0 Technology

Summary
There is an ever-increasing need for faster and higher manufacturing throughput in factories. The vision inspection system has previously been the limitation on factory output. In order to achieve higher throughput, vision systems must capture high-resolution images much faster while processing at a much greater speed.

In addition, image processing systems must be able to process a moving or still image and make a go/no-go decision within milliseconds of image capture. CoaXPress 2.0 delivers the throughput and low latency required for these applications.

Advancements in Complementary Metal-Oxide Semiconductor (CMOS) image sensors are occurring rapidly and these devices are now capable of much higher speed sensitivity, dynamic range and resolution. Image sensors which support 4K resolution are becoming common. In fact, at least one manufacturer is producing sensors with a resolution up to 250 megapixels.

These requirements aren’t limited to only traditional machine vision applications, such as manufacturing and production. For example, traffic and license plate monitoring and autonomous vehicles will require cameras that can produce extraordinary detail and color accuracy. Additional uses are medical imaging and telesurgery systems, which demand precise imaging with virtually no latency. Other challenging applications include video surveillance, aircraft infotainment and high-speed board-to-board communications, as well as defense and aerospace systems.

All of these applications will push the boundaries further than ever before. To meet their requirements, a higher throughout signal path, up to 1200 Mbyte/second, will initially be needed with gradually increasing data rates in the future. Systems that require longer cable runs must also be able handle these higher speeds with the least expensive cable and connector solutions.

The number of camera and frame-grabber manufacturers adopting CoaXPress continues to grow, as it offers them the easiest way to transition to high-speed digital imaging while minimizing deployment costs with speeds eight times faster (CXP-12) and ranges 10 times longer than competing solutions.

To be truly effective, a communications bus must combine simplicity (ideally plug-and-play), the capability for customization, the lowest possible cost-per-bit, as well as the ability to scale in performance with little or no additional hardware.

CoaXPress 2.0
CoaXPress 2.0 is the next speed grade to the CoaXPress 1.1 standard, which addresses the highest performance in demand today. The formulation of the CoaXPress 2.0 standard is nearly completed and the final draft is ready to be released. CoaXPress 2.0 will extend the maximum downlink data transfer rate from 6.25 Gbps with CoaXPress 1.1 up to 12.5 Gbps with CoaXPress 2.0. CoaXPress 2.0 is backward compatible to CoaXPress 1.1. Therefore, all existing products in the market today developed based CoaXPress 1.1 will work with the newer version of the specification. These higher speeds allow for higher frame rates or larger camera resolutions. It also enables the use of fewer cables to achieve the desired throughput.
Microchip has supported CoaXPress technology from its inception. Today we announce our CoaXPress 2.0 EQCO125X40 chipset. This chipset supports all speedgrades from CXP-1 to CXP-12 in one device. Its equalizer and CDR circuitry adapt automatically to any speed, which simplifies development of products supporting all speed grades. The CDR further reduces high speed design challenges to a minimum. This device is now available for sampling.

CoaXPress is the only standard that allows video, camera control for triggering, and up to 13W of power to be delivered via a single, off-the-shelf 75Ω coaxial cable up to 100m with standard BNC, Micro BNC or DIN1.0/2.3 connectors. It is an asymmetric, high-speed, point-to-point open, royal free, serial communication standard. This standard also supports GenICam, with a roadmap that extends to 1200 MByte/second over a single cable.

Even though coax cable is inexpensive, its shielding makes it more resistant to EMI than other types of cable and enables automatic cable-loss equalization to increase achievable distance. In addition, BNC, Micro BNC and DIN1.0/2.3 connectors are easily field-installable. The maximum data rate over a single cable is 1200 MByte/second (CXP-12), and scalability is essentially infinite, limited only by the number of cables that can be accommodated. For example, the maximum range can still be maintained with a data rate to 4800 MByte/second when four cables are used. When simultaneously using additional cables for up to six lanes a downlink speed of up to 7200 MByte/second is attainable over a distance of 40m with RG6 coaxial cable.

CoaXPress is designed to meet future imaging challenges, its scalability works for both high speed and low speed applications, making it usable in a vast number of applications other than those considered to be “high end”. When the highest performance is not required, CoaXPress systems can be built using less expensive components. This is just one of the reasons why the standard is gaining popularity in a broad spectrum of applications and markets.

Microchip has built a demo showing how to aggregate image data of 2 sensors via MIPI CSI-2 interface and use CoaXPress for transport. This demo showcases front-view cameras in support for autonomous driving. This solution can be used with CoaXPress in support of MIPI/CSI-2 for embedded applications as well as applications for high-speed vision in automotive applications.