Adding to GigE

This Tech Tip is designed to explain some of the additions in the GigE Vision marketplace that have added to the capabilities of GigE Vision cameras.

Gig E Vision

The main features of GigE Vision have been covered previously, but as a quick recap some of the points of note are:

- Long cable lengths – upto 90m between links with the capability to use fibre-optics to go much further between links, all this with standard consumer components.
- Network topologies – one camera to one PC, many cameras to one PC and one camera to many PCs – ethernet-based transmissions has opened possiblities that were not feasible with framegrabber-based systems and gone much further than was possible with USB and Firewire-based systems.
- Self-describing cameras – Genicam means that a device must describe itself to a connecting PC by means of an xml file. This replaces the need for configuration or camera files, for example for describing the format that data streams from a camera.

Power over Ethernet

PoE (Power over Ethernet) is a standard consumer technology that allows upto 15.4W of DC power without sacrificing the cable-length capabilities of GigE. PoE-enabled GigE camera include IDS uEye CP cameras and optionally Stemmer Imaging's CVC GE cameras and the AVT Manta and GT ranges. The advantage is that with a PoE-enabled NIC it is only necessary to run a single cable to the camera.

Figure 1 – Power over Ethernet (PoE) cameras – from left to right: STEMMER IMAGING CVC GE, IDS GigE uEye CP, AVT Manta.

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Since the advent of Gigabit ethernet cameras, the general advice is to use Intel Pro cards as these offer the most performance options. However, Intel-branded cards do not have PoE capabilities, but Intel chipsets are available in third-party cards which do implemeent PoE, such as ADLINK's GIE62+ and GIE64+ cards (two and four channel, respectively).

Figure 2 - ADLINK GIE64+, a four-channel network interface card implementing an Intel Pro chipset with Power over Ethernet functionality.

Processing Images from GigE Sources

The possibilities offered by GigE for large numbers of cameras per PC can quickly make processing power the bottleneck. For colour (Bayer) cameras that are close to the GigE bandwidth limit, such as DALSA's high-speed Genie HC range, even Bayer processing can lead to significant processing overheads. In light of this Silicon Software has a range of GigE Vision framegrabbers to reduce the burden. At the lower end of the scale are the A-series boards, these are delivered with various on-board capabilites such as Bayer conversion, look-up tables to improve contrast, white balancing, digital I/O and filtering – all with minimal CPU interaction. These boards have 4 channels and are available with PoE and can transfer upto 760MB/s (remember that Bayer conversion multiplies the amount of data from a camera).

Figure 3 – Silicon Software VQ4-GPoE – a four-channel PoE card with two on-board FPGAs; one to perform acquision tasks without burdening the PC's CPU, the other to provide user-programmable vision processing.

For higher processing requirements, Silicon Software has it's V-series boards. These have a user-programmable FPGA (supporting Silicon Software's Smart Applets and Visual Applets programming interfaces) as well as twice as much on-board memory as the A-series boards. These are designed to massively offload the CPU from vision processing tasks, for example the creation of 3D data from laser sheet-of-light systems or processing that must be carried out in a deterministic time such as particularly high-speed or high-throughput systems. If the standard board's FPGA is not sufficient it isi also possible to add modules to extend the hardware resources of the board. Once again digital I/O is built into the board, allowing it to work directly with the FPGA design if required.

GigEVision 2.0

At the time of writing, the release of GigE Vision 2.0 is imminent. This brings further feature-support to GigE Vision, including

- Firewall traversal, where a small amount of data is returned to the camera to show that the connection to the camera is a two-way connection, rather than a malicious attack.
- IEEE 1588 Precision Time Protocol, where each device uses a synchronised clock (synchronised in terms of both time and frequency).
- Compressed image streaming support, including JPEG, JPEG2000 and H264 formats.
- Multi-zone images, for example for CMOS sensors that can output data from multiple ROIs.

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