

Video Vigilance

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Customer's First

The popularity and acceptance of video vehicle detection systems has brought continual requests for added functionality. The rich data set available from video ensures that these requests will not end any time soon. Three trends have significantly influenced Autoscope® system development and deployment in the past year and one-half. The growing need for roadway surveillance, increased use of Ethernet connectivity to the field cabinet, and widespread digital streaming video made commonplace by the Internet have led to requests to provide such functionality. These requests have recently been incorporated into the Autoscope vehicle detection system and will be explained further in this brief article.

The Autoscope Solo Pro II and Autoscope Solo NC were introduced in January of this year, following on the heels of the successful Solo Pro product introduced in 2001. In addition to continued high-performance color video detection, these new products fulfill a number of customer requests for new functionality. The Autoscope Solo Pro II sports a more capable, enhanced CPU board with faster processor and more random access memory (RAM). More significantly, a mini-PCI bus was added to accommodate an optional daughter card for video compression and a third serial communications port was added to support direct control of a pan-tilt unit. Finally, the color camera was upgraded to one with increased optical zoom (16X vs. 12X) and other features required for advanced capabilities. The Autoscope Solo NC product was developed for our European and Asian customers by request. It enables them to take advantage of the high-performance detection Solo technology in applications where cameras are already available. The Solo NC uses the same enhanced CPU board as the Solo Pro II, however the integrated color camera has been removed. Instead, the Solo NC processes video from an external black & white or color camera. The video is input via a BNC connector. The CPU board and power supply have been repackaged with convenient RJ-45 connectors for networking multiple units together.

Vehicle Detection AND Surveillance

For years, we have been asked the question whether CCTV surveillance cameras with pan-tilt-zoom (PTZ) control can be used for vehicle detection. They can be, but typical P-T unit presets are not sufficiently accurate so that when the preset positions are restored, detection suffers. More typically, the operator does not return the camera to the preset position, rendering detection meaningless! For this reason, *we still recommend the use of separate detection and surveillance cameras when possible.*

In a new twist to the previous question, we have been frequently asked over the past several years, whether our detection cameras can be used for surveillance purposes. The answer has of course been "yes," to some degree, limited only by the fixed mount and ability to zoom out for wider angle of view. However, now with the

enhancements discussed in the previous paragraph, the Autoscope vehicle detection system can provide fully integrated PTZ control for surveillance and automatically return to detection mode at a preset position.

To accomplish this, we have selected a pan-tilt (P-T) unit that specifies a +/- 0.2 degree repeatability, which will be sufficient for most detection applications. Additionally, the P-T controls have been integrated into the Solo Pro II and Solo Software Suite, so that an operator can remotely control the P-T as well as zoom lens for surveillance purposes. It is not necessary to add a separate communications channel from the TMC. A short cable from the back of the Solo Pro II can be easily connected directly to the P-T unit.

The Autoscope Solo Pro II will switch quickly from detection mode to surveillance mode when a human operator takes manual control of the camera PTZ via mouse, joystick, or other pointing device. During this interval, any detector outputs, such as for intersection control, will place a constant call for safety, during the time the system is in surveillance mode. Once the operator is finished, he or she will simply command the unit to return to detect mode. The lens zoom setting and the P-T control position for detection, which are stored in the Solo Pro, are then transmitted directly to the P-T unit. Should the operator neglect to command the Solo Pro to detect mode, after 5 minutes of inactivity, the Solo Pro will automatically return to detect mode.

Ethernet to the Field

A growing number of traffic management communication systems are extending their local area networks (LANs) to their field cabinets. Since the vast majority of equipment relies on serial communications standards using RS-232, RS-422 or RS-485, a growing number of Ethernet-to-serial adapters have been introduced to the market. For example, Comtrol, Digi International, and Lantronix, to name a few, have responded with products to fill this niche. Single-channel products provide low-cost connectivity while multi-channel products provide cost-effective connectivity when multiple serial ports may be required in the cabinet. It is typically sufficient to use a single-channel adapter to service multiple Autoscope detection cameras as they can share a multi-drop serial communications channel. For example, Comtrol's DeviceMaster Primo and Digi's DigiOne products provide serial RS-232, RS-422, and RS-485 output up to 230K baud. If more than one channel is required, as perhaps when different devices are installed in the cabinet, all three companies have a variety of product offerings that supply from 2 to 64 serial ports at one IP address.

These companies each provide software drivers that make their remote Ethernet-serial ports look like local serial ports connected to the local computer running the applications software. However, these drivers typically slow the communications. It is faster for the applications software to use a TCP/IP channel to talk directly to the adapter.

To provide this faster, direct connection, the Autoscope applications software suite now offers a TCP/IP Socket channel to connect to these adapters and other devices, over any communications medium that uses TCP/IP such as Ethernet LAN's or even the Internet. We have measured a factor of 3 increase in throughput compared to use of one serial port driver. System configuration is also simpler since the drivers do not need to be installed.

Devices such as Cellular Digital Packet Data (CDPD) modems can now be used directly as they connect through the Internet using the wireless cellular phone system. These provide flexibility and convenience as they can be quickly deployed anywhere.

Digital Streaming Video

Now for the first time, the Autoscope Solo Pro II provides digital streaming video direct via the normal data communications channel. An optional Video Compression daughter card provides video frame rates up to 15 frames per second. Variables such as available communications channel bandwidth, scene complexity, and requested video quality will determine the frame rate.

We are all becoming used to streaming video from the Internet. These applications use well-equipped computers to provide high-quality video to many distributed customers using standard MPEG3, MPEG4, or proprietary CODECs.

By contrast, the challenge is great for a distributed video vehicle detection system to provide acceptable video from many distributed cameras to one central location. Embedded solutions within a camera require low-cost, low-powered processors to provide the streaming video. To meet the challenge, the Solo Pro II Video Compression card uses off-the-shelf video chips using wavelet technology to deliver quality streaming video.

To further serve the needs of our customers, we have also added detector output status to the digital video stream to assist with remote system detector configuration and verification of detector performance. The cost savings provided by this capability are significant. Eliminated are the high-cost alternatives of full bandwidth analog video transmission to the TMC or driving to the field to observe performance first hand.

For those customers who do not need high frame-rate video, the Autoscope Solo Pro II and all other Solo Pro models can still provide streaming JPEG video snapshots. The frame rates are again dependent upon communication channel bandwidth, scene complexity, and requested video quality. The complexity of the video detection task may have an affect also, since the JPEG compression is performed using available background CPU cycles.

To view the streaming video, the Autoscope Video Player has been enhanced to also record and play back either wavelet or JPEG streaming video from one or many Autoscope products. A "Video Wall" feature maximizes the video display for easy viewing at the click of a single key. The speed of play back can be varied from single frame to faster than real-time to facilitate the analysis of video clips for evaluation purposes.

Summary

Video based detection systems are here to stay. New developments now available allow the operator to switch from video detection mode to surveillance mode using a precision pan-tilt unit and native zoom lens. Internet and Ethernet-to-the-field communication channels can now be used using TCP/IP Socket channels with the use of third-party Ethernet-serial adapters. Finally, enhanced digital video streaming provides remote viewing convenience and reduces installation costs. Expect innovation and performance improvements in video detection systems to continue for some time to come. While detection accuracy and system reliability are the most important considerations when selecting a vehicle detection system, you may also wish to consider the vendor's commitment to the support and R&D necessary to provide continued solutions to your traffic management needs.