

Design of a Decade

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Image Sensing Systems (ISS) has just celebrated the 10th anniversary of its operations in Europe. This is how the video detection market has developed over that time

The European traffic market opened its eyes to video detection in earnest in the early 1990s. Together with our European distributors, Bredar in Switzerland and TEC Traffic in The Netherlands, we pioneered early successes proving the viability of video detection for traffic in Europe. While these early systems were designed primarily to replace loop detectors; in time, we introduced advanced capabilities that provided full road coverage for junctions, highways, and tunnels in the presence of challenging weather and lighting conditions.

In the intervening years, the Autoscope® video vehicle detection system has continued to set the standard for accuracy, reliability, and flexibility. Market success and market growth have attracted a handful of companies offering competing video systems. In the larger competition for an aboveground detection solution alternative to inground loops, video detection systems have been a clear winner.

Video detection systems' natural ability to detect over wide areas and to provide a wealth of traffic data is well matched to the detection needs of highways, tunnels, and junctions. These systems are very capable of supporting the increasing global trend towards using the hard shoulder on congested highways as they can provide full detection along the hard shoulder as well as complete coverage.



Figure 1: Autoscope video vehicle detection system

Customers in the driving seat

While the 1990s saw evolutionary growth in the development and deployment of video detection systems with new features and gradually improving performance, the year 2000 marked the beginning of more rapid development and introduction of new vehicle video detection products worldwide.

One of the most significant product innovations was the introduction of the Autoscope Solo® Pro video detection system shown in Figures 1 and 2, with an integrated machine vision processor, a colour camera, and a zoom lens. Good camera performance and high quality video are extremely important to achieve superior video detection performance. By integrating the camera and processor, the ideal video system was created—essentially a video detection system that uses its own eyes! The benefit to you is accurate traffic data and timely notification of incidents and other traffic events. The benefit to us is guaranteed high-quality video, direct camera control for the best picture under all lighting conditions, a quality zoom lens for easy adjustment to the field of view, and the ability to use colour to improve our vehicle detection capabilities.



Figure 2: Integrated camera and video processor board

Continued market successes enable us to responsibly make significant investment in new product development in order to meet new and demanding customer requirements. As a result, today there is an ever-larger array of products and product features to supply vehicle detection requirements for traffic applications as well as other applications in safety or vehicle intrusion security applications

For example, since introducing the Autoscope Solo Pro, we have upgraded the camera and made a series of small but innovative, in-line manufacturing changes to provide a more powerful system—

more memory, a faster processor, an extra COM port, and an optional video compression card. A sister product, the Autoscope Solo® Pro NC, see Figure 3, was introduced to the European and Asian markets in 2002 to provide a single-camera processor in a stand-alone box, without the camera. This product was designed for projects which require a separate processor from the camera. The good news is that it uses the same Solo Pro algorithms to process the video, however, the systems integrator bears the responsibility to ensure the best quality video is supplied to the processor. The benefit to you is flexibility in planning your vehicle detection system architecture, while deriving the benefits of the premiere Solo Pro video processing algorithms in an economic, self-contained package.



Figure 3: Solo Pro NC detection system

Finally, early last year, at TRAFFEX 2003, we introduced a new machine vision



Figure 4: Single-camera RackVision processor

processor called the Autoscope RackVision™. The single-camera RackVision processor, shown in Figure 4, again employed all the functionality of the Solo Pro, with the addition of on-board detector outputs on a standard 3U x 160mm, rack-mounted card. In keeping with our product evolution, the RackVision is able to do presence detection, traffic counting, incident detection and communication, and provides an option for compressed video. This flexibility and full functionality, all on one card, combined with its small size, makes it very attractive in the traffic market.

In only nine months, the RackVision received widespread acceptance in the European market. It has been integrated directly into several brands of junction controllers and has been widely used in many of recent new tunnel projects. In

fact, the RackVision product coupled with our newly developed tunnel incident processing algorithms led to many of the new tunnel projects in Europe this past year.

The RackVision has met with equal success in the American market where it is available in a slightly modified model through our North and Latin American distributor and manufacturing partner, Econolite Control Products, Inc.

Tunnel mission

The market for video detection to help increase tunnel security and safety, originated as a particularly European demand, due to the many hundreds of tunnels throughout Europe. This demand was accelerated greatly by the Mont Blanc and Gothard Tunnel fires. As a result of these disasters, the Inland Transport Committee of the United Nations Economic Commission for Europe developed a set of recommendations for tunnel safety. Video detection systems became, standard accepted practice not only in Europe, but worldwide. Why? Simply because they are effective and provide automated full-road coverage and fast detection of stopped, slow, or wrong-direction vehicles, enabling operators to quickly respond to incidents and hopefully in some cases, to even take action to prevent incidents. The Autoscope system provides timely incident detection, with acceptably low false alarm rates.

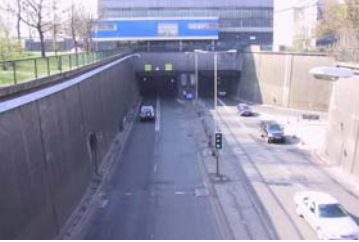


Figure 5: Clyde Tunnel and Control Centre Glasgow, Scotland

Last year was a major breakthrough for projects selecting Autoscope systems for tunnel management. In fact all three products just mentioned above were installed in tunnel management projects this past year.

The Clyde Tunnel in Glasgow, Scotland, shown in Figure 5, was upgraded last year and carries 65,000 vehicles per day through its two tubes.

Techmiracle Limited, our UK distributor, fitted nine Solo Pro cameras in each tube, providing incident detection over the entire roadway as the tunnel courses under the Clyde River. They are mounted high on the sidewall as shown in Figure 6 to provide an unobstructed view down the tunnel. Within a month after commissioning, the incident was detected automatically and notified to operations personnel. Simultaneous automatic digital video recording using third party equipment archives such events. From the control room shown in Figure 7, the operators responded quickly to notify emergency vehicles and to prevent further secondary incidents. Additionally, the recorded video was later reviewed by the authorities to determine who was actually at fault in the accident.

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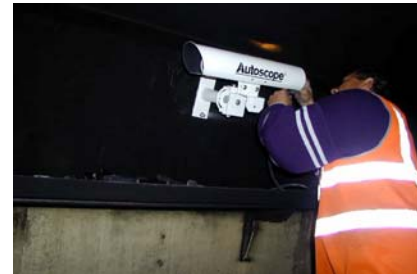


Figure 6: Autoscope Solo Pro mounted high on tunnel wall

Croatia is rapidly building up its national transport infrastructure, which includes modern highways with a number of tunnels just being completed. As part of this buildup, the Autoscope automated incident detection system was selected to supply processing for a total of 91



Figure 7: Clyde Tunnel control centre

CCTV cameras spread throughout six tunnels. The longest of these, and also the first tunnel in Croatia, is the Sveti Rok Tunnel at 5680 m long with 52 CCTV cameras alone, covering two tubes. The tunnel traffic system, designed by Promel Projekt d.o.o. transmits the video from the CCTV cameras via fibre optic cable back to one of three Control Centres. Figure 9 shows twenty-one RackVision processor cards installed this past summer in the Delnice Control Centre from which the Cardak, the Pod Vugles, and the Javorova Kosa Tunnels are monitored.

Tunnels are being built nearly everywhere to move traffic efficiently as this tunnel under the Schipol Airport on the A5 Motorway shows in Figure 10. The Autoscope incident detection system was installed last year by our distributor TEC Traffic to monitor the vehicle traffic under the runway, to ensure safe travel, immediate detection of any stopped vehicles, and quick response to any incidents.

Less delays at Junctions

Junction control applications are extremely challenging for video detections systems due to the accuracy requirement and because of the resultant safety concerns if undetected cars are stranded at a red light. Also the often complex lighting artifacts in the presence of trees, buildings, poles etc. provide additional challenges to overcome to avoid false detections from shadows. Over the years Autoscope has proven to be a superb choice in providing vehicle detection for junctions all over the world from the US standards such as NEMA, 170 and 179 control systems to occupancy controlled junction systems such as SCOOT and SCATS, as well as more advanced European junctions with a vast number of phases, and many tens of virtual loops.



Figure 9: Schipol Airport Tunnel on the A5 motorway



Figure 8: Autoscope RackVision installation at Delnice Control Centre, Croatia

One example of a complex, challenging installation is the Katynskie Roundabout in Krakow, Poland, shown in Figure 11. A total of eight cameras using the Autoscope video detection system are used to provide 31



Figure 10: Katynskie Roundabout in Krakow, Poland

counting stations at this junction, The installation helps to move traffic efficiently, and safely. During rush hour, the total volume count of passing cars is over 5000 vehicles per hour.

Figure 12 shows the view from a Solo Pro camera providing turning movement counts as well as a surveillance view of this junction in Leicester, England. Note that the sunshield is pushed as far forward as possible without obstructing too much of the upper right and left corners of the field of view. Experience has taught that this is important to keep the sunlight

from hitting the faceplate of the camera at any time during the year. Such an occurrence can temporarily “blind” a detection camera, not because of light entering the lens directly, but due to the scattered light if there are even small dirt particles on the faceplate which are not normally seen until illuminated by the sun. (You can observe such an effect by panning a CCTV camera with a dirty faceplate towards the setting sun.) The side benefit of sliding the sunshield forward in this manner is that the faceplate of the camera will typically not need to be cleaned by anything other than natural seasonal rains. This will save maintenance costs without any degradation in detection performance.

In Naples, Italy nearly 60 Autoscope Solo cameras are used to measure traffic volumes and occupancy for controlling and moving traffic efficiently around the city. Installed by our distributor Self Sime, Figures 13 & 14 show three detection cameras and a PTZ CCTV surveillance camera mounted atop a pole and also the complex traffic geometry under detection.

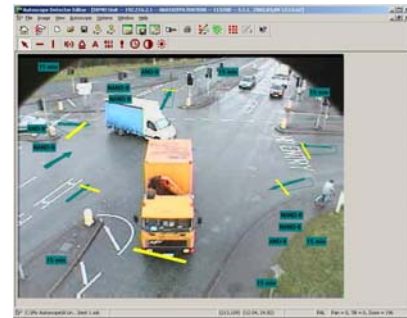


Figure 11: Presence detection for turning moments in Leicester, England



Figure 12: Detection cameras and PTS CCTV surveillance camera in Naples, Italy

Highway Transport

Acceptance of video detection systems for highway applications for traffic management has been growing, with deployments spread evenly throughout Europe, North America, and Asia. In the first large-scale machine vision application in Greece, our distributor ATS Traffic Systems has supplied video detection systems for a new state-of-the-art traffic management currently being built in Athens to accommodate the 2004 Olympic Games. Seventy-five AIS Cameras and 75 Autoscope Solo Pro NC's are now being installed along major highways and junctions throughout the city to provide incident detection and traffic data collection. This is only a part of a multi-year, massive reconstruction of the roadway infrastructure and traffic management system to improve traffic flows at the Olympic Games and for years thereafter.



Figure 13: A typical Naples junction

This project follows on the tradition of the large-scale machine vision deployment of Georgia DOT's Navigator Project, also introduced for the

1996 Olympics in Atlanta. The machine vision component of the Navigator Project has since expanded to well over 1000 detection cameras around the Atlanta metro and outlying regions to monitor traffic flows and compute travel times.

Construction zone safety applications using video are growing as demonstrated in Figure. 15 by this temporary mobile incident detection system operating on this highway in France supplied by our distributor Magsys S.A.. When an incident is detected, the traffic control centre is automatically dialed and the video pictures are transmitted over GSM.

Final Word

After cooperating with local partners in Europe for over a decade, we have overcome many challenges especially those seen in the European market. With an active R&D department looking towards the future, and focused as ever, we have a very long list of customer requests yet to develop! We have our customers to thank for challenges that have resulted in so much innovation. We believe the next ten years will be even more exciting and believe together with our local distributors and customers we can provide solutions to move traffic safer and faster. ■



Figure 14: A temporary mobile incident detection system on a French highway