Advances in lens standards help solve ITS woes

When an application involves imaging objects at differing distances to the camera, a specific lens aperture is required to maintain a usable depth of focus. The smaller the aperture, the larger the depth of focus – but also, the less light available for properly exposed images. Increasing the exposure time creates blurred images at speed. The speed needs to be slowed to compensate. An increase in camera gain increases noise in the image, resulting in sub-optimum images. The field-of-view of a fixed focal length lens may be too large when capturing objects further from the camera and too small when capturing objects closer. In some traffic applications the object of interest is moving in relation to the camera, and in others the camera is moving in relation to a stationary object of interest. Yet there is also the scenario where both object and camera are in motion.

How do we deal with these types of negative domino effects where one fixed parameter causes a progression of compromises to image quality?

The answer is easy. By using available technologies in lens standards and camera design to provide the flexibility needed to adapt to ever-changing ambient imaging conditions.

The ability to easily re-focus, re-zoom and set the aperture to match the conditions, all from the comfort of an operations terminal, is the key to coping with these effects. Today's advances in combining lens control standards derived from high-end consumer digital photography with the technology of modern, industrial-grade high-resolution cameras makes this possible. And not only for roadside and tunnel inspection tasks, but also for mobile and stationary traffic surveillance, access control and, of course, incident management and speed enforcement – to name just a few uses.

The technology

The Micro Four Thirds (MFT) lens standard was developed by Olympus, which formed a consortium for the advancement of this optical standard. The objectives were to create a lens interface that allows camera bodies and lenses to be interchangeable, to provide a flexible and compact platform for future developments in optics and cameras, and to facilitate the addition of movie capability. Since its inception, many well-known companies have joined the consortium to design, promote and market products adhering to the standard. Companies such as Carl Zeiss, Joseph Schneider Optical Works, Leica Camera, Panasonic and SVS-Vistek are designing and producing products that take advantage of the superior qualities of this future-oriented optics standard.

An MFT lens with remote-controllable focus, aperture and zoom, coupled to an industrial camera that has auto/manual-gain, auto/manual-exposure control and PWM outputs that can drive a pan/tilt mount, gives the user the fullest flexibility imaginable in adapting to ambient spatial and radiometric parameters. Since the MFT standard addresses the optical requirements of modern large-format CCD/CMOS sensors, image quality is superior to many available lenses currently being used for high-resolution cameras. The ability to finally implement optical zoom tracking in ITS applications using a high-quality industrial camera can be considered a mild breakthrough.

(Main) **The Evo Tracer camera and** (right) **how the camera looks with its MFT lens**

(Above) **Close-up of the lens mount** (Left) **Connectors at the back of the camera unit**

Need to know?

The move towards lens standards is helping to create new solutions to old ITS problems

- ITS applications that use cameras have been plagued with issues that compromise image quality, but a recently introduced standard looks set to eliminate the need to compromise
- The MFT standard is being adopted by vision industy pioneers to create a new breed of lenses
- SVS-Vistek's Evo Tracer product fully incorporates this standard

The solution

A member of the growing MFT standards organization, SVS-Vistek has combined the best of both worlds to create the Evo Tracer. This product fully incorporates the MFT lens standard into the company's popular Evo series industrial GigE Vision cameras, utilizing 1MP to 8MP quad-tap sensors to achieve high frame rates and excellent image quality. The lens' parameters as well as those of the camera and those of the PWM outputs can all be controlled through a single Gigabit Ethernet interface using simple commands. A second Gigabit Ethernet port is available for maximum data throughput and increased frame rates.

The Evo Tracer opens up new avenues of approach for ITS integrators and end users alike. The simple ability to adapt to an uncontrollable environment by easily controlling all possible parameters that affect image quality and usability can help put an end to the negative domino effect. ○

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Vacations may be a good time to reflect on our lives but they are not often a good opportunity to think about Intelligent Transportation Systems, especially when the vacation is in a tropical paradise. My wife and I just spent a week on Kuai, one of the smaller and less populated Hawaiian Islands. We were last there about 10 years ago and as I drove around this trip, I was struck by how much transportation intelligence I was flooded with and how starkly different it was the last time. The travel experience was very different and the implications for public transportation departments profound.

For a moment I thought back to vacations 20 years ago, when contact with the office was pretty attenuated. By 10 years ago, I had my Blackberry so was up to date with all the work-based information that I could have lived without, but travel around the island was still low tech. We used paper maps, read paper brochures, depended on local recommendations for where to go and where to eat, and took friends' recommendations with us from home. All the electronic assistance we had was in the car, mostly the radio for weather. In the hotel there might have been a wired internet connection but websites were more like newspapers. Even if there was a mobile device, such as my Blackberry, the sites were not prepared to serve mobile customers.

Now it's 2013 and my travel buddy was my iPhone or my wife's Android device. Want lunch when we landed? Check out the noodle joint by the airport that we heard about, get directions and turn-by-turn guidance. Need a dinner recommendation? Check Yelp or TripAdvisor for where to eat, read menus, make a reservation on Open Table and again get turn-by-turn directions.

Since Kuai is a small island with essentially one outer roadway, traffic information was largely irrelevant, but on a larger land mass, traffic and congestion information is instantly available. Several years ago this would have only come from a public 511 system but today private services collect and disseminate traffic from probes, sensors and crowdsourcing. Hour by hour weather is a touch away. Where is the best surf? I'm sure we could have gotten that information.

State DOTs have the responsibility for safety and emergency response – and these can't be delegated – but there is a vast array of companies distributing information. What should the government do in this new world? Lead, follow or get out of the way.

One option is for local government to stay competitive with new apps for iPhones and Android devices. Another is to provide their information to private companies. A third is to incorporate private data in public systems. A final option is to abandon public dissemination of traffic data and leave the field to the private sector completely. They are difficult choices, each presenting hard issues, but the wealth of free private intelligence makes these questions important and the answers will shape government ITS programs for years to come.

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