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smart IP video solutions

Digital PTZ Cameras - the Latest Trends

The pan, tilt and zoom camera has been a key enabling technology within the surveillance industry for nearly as long as CCTV itself! Initially cameras were given simple pan and tilt functions by attaching a traditional surveillance camera to a motorised mount. Zoom lenses were also motorised allowing remote control of the field of view. Early systems were controlled electrically using a direct cable connection to a joystick. However crude these systems were, they offered huge potential for increasing surveillance coverage and reducing costs.

Because these traditional systems are generally assembled from off-the-shelf parts such as standard C/CS mount analogue cameras, high-performance motorised zoom lenses and waterproof enclosures they tend to be cumbersome requiring large motors to drive the bulky components in an effective manner.

Modern

Although many of these systems are still on the market and very much in use today, modern PTZ system developers have taken the opposite approach, taking highly-integrated components and embedding all of the functionality into the camera unit itself.

The dome camera represents the zenith of this modern technology drive taking all the required components and combining them into a low-profile spherical or hemispherical enclosure. Not only does this make the camera smaller and much more discrete, using darkened plastics the direction of view can also be obscured. High-speed motors allow upwards of 360º per second rotation, rapid zoom and auto-focus all with a high degree of precision and accuracy. Absolute positioning, multiple stored presets, touring, mimics and more all increase the potential uses for PTZ systems. Serial communication channels allow greater scope for remote control.

Internet Protocol

Most modern surveillance systems will be specified to include some level of PTZ equipment so the application of IP technology to PTZ is becoming more and more important. What are the benefits this can bring, and what are the issues?

Video from a modern PTZ camera transmitted over an IP network will provide a level of service equivalent to a static camera but only while the PTZ system is stationary. When the system starts moving, many predictive codecs such as the MPEG family will struggle to cope with the motion in the scene possibly pushing the bandwidth requirements above that of the frame-based MJPEG codec. Constant bit-rate codecs may reduce in quality as the PTZ unit is repositioned making the video much less usable. Next generation codecs such as H.264 and the increase in bandwidth availability will hopefully remedy this in the future.

A second problem is the latency introduced due to the video codec pipeline; predicted codecs such as MPEG4 or MPEG2 can buffer up number of video frames before they start streaming the encoded data. This can lead to latency which is exacerbated when used in a tight control loop such as a PTZ system. The operator driving the PTZ system may notice a significant latency if the encoding parameters are not properly configured.

One of the key benefits of providing an IP interface is the removal of the need to provide direct serial cabling to control the PTZ motors. Control data can be transmitted alongside the video data over the same cable making installation much easier and making the distribution of control possible. This has also driven development beyond simple positional information meaning that it is now much easier for cameras to share metadata regarding their current position, speed, direction, field of view, and alarm state.

The future

Complex analyses of alarm conditions can be performed where high-level controller can coordinate the movement of several cameras to automatically cover alarmed zones. This additional metadata can also be used to provide better, more effective audit trails and even allow statistical analysis of viewing behaviour to improve training and coverage. Because of the streamed nature of the IP control information, recording this metadata along with the video stream is simple allowing live event simulation on playback.

Another advancement IP-enablement brings is the ability to provide onboard video analysis. Having direct control over the PTZ position and performing the analysis locally makes object tracking much more responsive and error resilient and can be performed before the video is compressed for transmission.

One area the technical team at Codestuff are currently working on is the adaptation of video motion detection to a PTZ environment. This will allow the equivalent functionality provided by static motion detection enabled cameras but on a moving PTZ image.

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