

WHITE PAPER

Intelligent Video Technology

Panasonic Video surveillance systems

The Panasonic logo is displayed in white text on a blue rectangular background. The text is in a bold, sans-serif font.

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1. Introduction

Intelligent Video (IV) is also referred to as Video Content Analysis (VCA) and Video Analytics (VA). IV automatically analyzes the video stream and extracts useful information from images such as detected intruders. The typical applications are video motion detection, video pattern matching and auto tracking.

Today, security departments deploy more and more surveillance cameras to watch broader areas closely 24 hours a day and 7 days a week. IP technology enables building open, reliable and scalable surveillance systems. While video data is increasing, one person can only watch a limited amount of video data. People quickly lose their ability to concentrate and suspicious movements on the screen are frequently overlooked. Intelligent Video works 24 hours a day without stopping, improving surveillance accuracy and effectiveness.

Another way to use Intelligent Video is to change the video data to a gold mine for business. Customer behavior is recorded on the video and contains valuable information for improving marketing effectiveness, store operations, building layout designs, traffic patterns and more. Reviewing hours of video from dozen of cameras was hard, labor-intensive and time-consuming work. Now, Intelligent Video quickly analyzes a large amount of video data.

Intelligent Video is clearly useful for surveillance and business but was expensive and complicated due to requiring high-performance servers and dedicated software. Panasonic now provides the cost-effective and easy-to-deploy Intelligent Video solution based on its field-proven image processing technology and network cameras equipped with high-performance processors. This paper provides an overview of Panasonic's Intelligent Video Technology.

2. How Intelligent Video works

Video Motion Detection (VMD) is the basic and prevalent technology in the security industry. VMD compares series of images in the video stream, identifying the static background and moving foreground objects. VMD catches all motion, which is the difference between images, but this simultaneously presents a weakness. VND detects wind-whipped flags and reflected light as moving objects, which creates costly false alerts because operators must confirm if they are truly threats. Panasonic Intelligent Video technology has made great progress in extracting information such as position, size, moving direction and staying time from the detected objects and analyzing their behavior. Intelligent Video can now distinguish loitering from normal activities.

Another technology is video pattern matching. While Video Motion Detection focuses on motion and does not care what the motion is, video pattern matching identifies the target by using its shape characteristics. Face matching, which is one video pattern matching application, focuses on characteristics of the human face such as the eyes, nose and mouth. Intelligent Video searches for face-shaped parts on a captured image and identifies the person by comparing the parts with pictures in data-bases.

3. System configuration

There are three system configurations: edge-based systems that Intelligent Video runs on a camera (edge), server-based systems which process on a centralized processing server, and hybrid systems combining edge-based and server-based systems.

3.1 Edge-based systems

Network cameras analyze images and send alarms to operators based on pre-configured alert rules. Edge-based systems do not require high-performance central servers, making the systems more scalable, reliable and cost-effective. Panasonic Intelligent Video Motion Detection (i-VMD), auto tracking and face detection use edge-based system configurations.

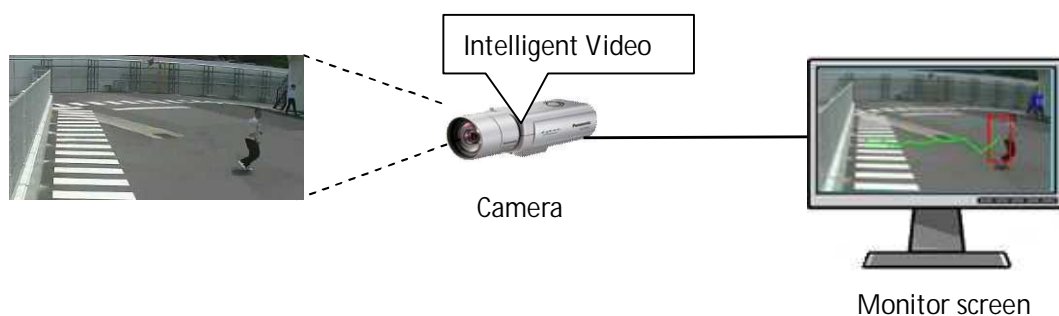


Figure 1. Edge-based system: Intelligent Video feature runs on the edge-camera.

3.2 Server-based systems

Server-based systems enable more complex analysis. All images captured by cameras are sent to a central server that analyzes them with stronger processing power, more memory, higher-speed data base access and more sophisticated software. Panasonic development partners provide applications.

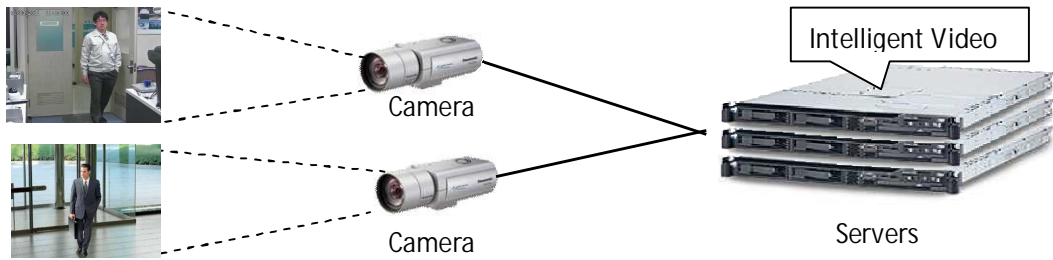


Figure 2. Server-based system: Intelligent Video application runs on the central server.

3.3 Hybrid systems

Hybrid systems combine edge-based systems with server-based systems, substantially reducing server and network overloads. A hybrid system enables a smaller system to run Intelligent Video applications. When a system detects a person from among the people who go by the cameras, the system compares every captured image with photos in a data-base. What the server really needs is the facial part of the captured image. Everything else wastes server and network resources; a hybrid system optimizes this. Cameras clip the facial part on the edge and the server only compares; the Panasonic face matching system uses this hybrid system configuration.

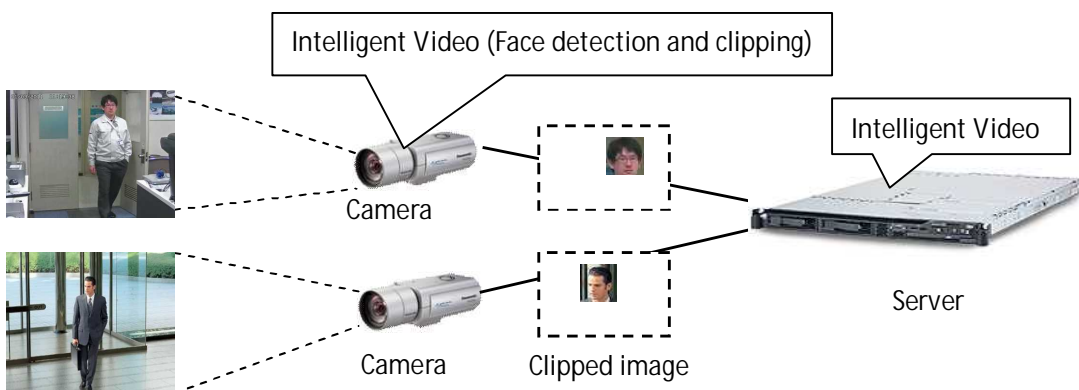


Figure 3. Hybrid system: Intelligent Video features run on both cameras and server.

4. Panasonic's intelligent video technology

Panasonic developed UniPhier, a high-performance chipset, in which Panasonic integrates its audio and video processing technology. UniPhier packs a high-performance AV processor (DSP) and a high-speed CPU onto a single chip and provides high-quality audio and video, low power consumption, real-time processing and secure features. Panasonic network cameras are equipped with the UniPhier platform.

4.1 Intelligent Video Motion Detection (i-VMD)

Intelligent Video Motion Detection (i-VMD) is an optional feature of Panasonic 5 series indoor and outdoor network cameras. Expansion software is required to use i-VMD.

I-VMD has four Intelligent Video features: Intruder Detection, Loitering Detection, Direction Detection and Scene Change Detection. I-VMD extracts information such as position, size, moving direction and staying time from the moving object detected and analyzes its behavior. Network cameras determine if the moving object is loitering or walking normally and send an alarm to the operators. High-performance UniPhier allows network cameras to simultaneously detect and track up to eight moving objects.

Configuration is also smart. Accurate definition with polygonal detection and the non-detection area, perspective target size and the schedule for operating and non-operating times enables easily setting them through intuitive GUI.

4.2 Intruder Detection (i-VMD)

Intruder Detection is an intelligent Video feature that detects persons or cars intruding in restricted areas. When a network camera detects moving objects in its view, it starts tracking each one of them. Once they step into a pre-configured area, the camera sends an alarm to the operators and highlights them with frames on the screen. This helps operators easily identify what the camera is tracking.

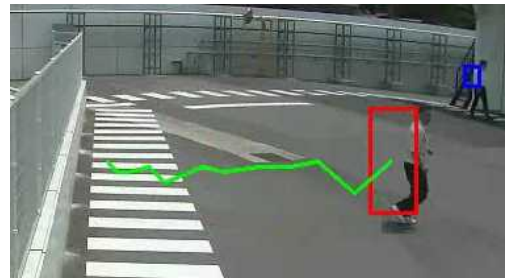


Figure 4. Intruder Detection

I-VMD analyzes the behavior of the moving objects to reduce unwanted failure detection such as a wind-whipped flag. I-VMD decreases false alerts while maintaining the high detection capability of conventional Video Motion Detection (VMD) technology.

4.3 Loitering Detection (i-VMD)

Loitering Detection is an intelligent Video feature that detects people who are loitering in front of a camera. When a network camera detects human-sized moving objects in a pre-configured area, the camera starts tracking each one of them. When they loiter there for a certain period of time, the camera sends an alarm to the operators and



Figure 5. Loitering Detection

highlights them with frames. This helps the operators easily identify whom the camera is tracking.

4.4 Direction Detection (i-VMD)

Direction Detection is an intelligent Video feature that detects persons, cars or moving objects that go the wrong direction such as the wrong way on a one-way street. When a network camera detects a moving object in its view, the camera starts tracking the movement and estimates the direction the object is going. When the object is moving in an unauthorized direction, the camera sends an alarm to the operators and highlights the objects with frames. This helps the operators easily identify what the camera is tracking.



Figure 6. Direction Detection

4.5 Scene Change Detection (i-VMD)

Scene Change Detection is an intelligent Video feature that detects tampering with the camera view. When i-VMD detects interference or tampering such as spraying on a camera dome, changing a camera direction or covering a camera with a cloth, i-VMD sends an alarm to the operators.

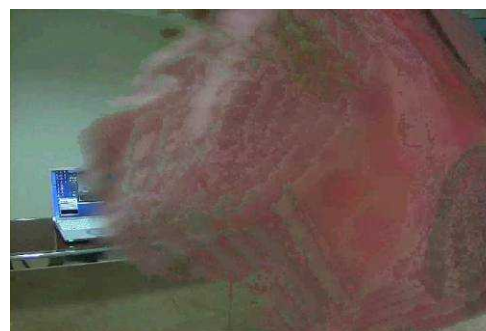


Figure 7. Scene Change Detection

People pay little attention to motionless pictures. If a picture is missed, a long time will be necessary before an operator becomes aware of it. Scene Change Detection finds tampering immediately.

4.6 Advanced Auto Tracking / Auto Tracking

Advanced Auto Tracking and Auto Tracking are optional features of Panasonic 3 and 5 series indoor and outdoor network cameras.

Advanced Auto Tracking and Auto Tracking are Intelligent Video features combined with conventional video motion detection and PTZ control. When a network camera finds a moving object in its view, the camera automatically starts panning, tilting and zooming, and keeps the

moving object displayed in the center of the monitor screen. Non-zoom cameras support Auto Tracking that tracks the targets without zooming in on them.

The network camera tracks the moving object until the target passes from its view. When the target leaves its view, another camera uses Panasonic proprietary inter-camera protocol to resume the tracking.

4.7 Face detection

Face detection is an optional feature on Panasonic 3 and 5 series indoor and outdoor network cameras. Expansion software is required to use it.



Figure 8. Face detection

Face detection is an Intelligent Video feature that searches captured images for face-shaped parts in real time and highlights them with frames. This is useful to watch those who come and go and is also used with a face matching system.

4.8 Face matching system

The Panasonic face matching system is a cost-effective and flexible hybrid Intelligent Video system. The system is available with Panasonic 3 series indoor and outdoor cameras and the WV-ASF900 face matching server or WJ-V200 network disk recorder. The WV-ASF900 works with everything from small to large installations; the NJ-NV200 is for small systems.



Figure 9. Face search of WV-ASF900 shows detected targets.

The WV-ASF900 face matching system receives clipped face images from a number of network cameras, extracts face characteristics and compares them with the target facial photos in the data-base. When the system finds a person similar to the target, it sends an alarm to the operators. A WV-ASF900 face search enables operators to quickly discover where people have passed by and what they did. The operators can trace the people with a glance at the history table that shows when and where they were captured by cameras. History works with the Panasonic video recorder and provides easy playback.

This system is also useful to measure and improve marketing. The WV-ASF900 face matching system estimates the age and gender of visitors from the captured face images. Combining this with sales data on Point-of-Sales (POS) selling systems enables better understanding the correlative relationships between customer behavior and marketing.

The WJ-NV200 network disk recorder is an all-in-one solution for small systems. The recorder supports up to 24 camera units, enabling one out of 24 cameras to perform face matching analysis. Expansion software is required to use it.

5. Partner's Intelligent Video applications

A large number of industry-leading video management system companies belong to the Panasonic System Developer Network (PSDN) partner program. These seasoned partners provide excellent Intelligent Video applications that work with Panasonic Network Cameras.

6. Considerations for deploying i-VMD

Server-less edge-based i-VMD enables introducing Intelligent Video systems easily at an affordable cost. Installing the cameras so that you obtain better detection and a lower failure rate is important. This section describes the steps to properly deploy and run Panasonic i-VMD.

(1) Clear requirements

Purposes, targets, zones, operating times and environmental restrictions should be clarified at the planning stage. Based on these requirements, design the system with proper cameras and options.

(2) On-site survey

The detection rate is affected by factors such as the captured target size, shooting angle, light, weather and background. Panasonic recommends implementing an on-site survey to confirm if the cameras detect targets as planned. If necessary, the design and/or settings should be revised.

(3) Installation

Good detection performance needs clear input. Cameras should be securely installed. Poor mounting and other installation issues negatively affect image quality through vibration and/or swinging from poles, walls or the ground. Once Panasonic PTZ cameras are securely set, adjustment can be performed from the central office without dispatching workers.

(4) Maintenance

Improper maintenance sometimes increases failure detection. Environment changing with the seasons may affect detection performance. Proper maintenance keeps i-VMD efficient.

7. Conclusion

As described in this paper, Panasonic and its development partners provide Intelligent Video solutions. With IP and high-quality HD video technology progress, Intelligent Video will make your surveillance system smarter and more cost-effective. Intelligent Video also provides an innovative way to utilize the video information for business intelligence (BI) for better marketing.

For more information, visit the Panasonic Security Camera site at <http://security.panasonic.com>.

About Panasonic System Networks Co., Ltd

Panasonic System Networks Co., Ltd. is a subsidiary of Panasonic Corporation. The company was newly launched in 2013 by merging three companies: Panasonic System Networks Co., Ltd. and Panasonic System Solutions Infrastructure Co., Ltd., which were engaged in product development and manufacturing, and Panasonic System Solutions Japan Co., Ltd., which marketed system solutions.

The new company offers everything from development and manufacturing to sales, implementation and maintenance. Leveraging the full capabilities of this comprehensive enterprise to resolve customer problems and provide countermeasures enables reinforcing customer competitiveness while developing and expanding customer potential.

Our system proposals are based on our wealth of image processing and communication technologies, backed by manufacturing knowhow, a versatile product range and IP expertise.