Installation Case Study
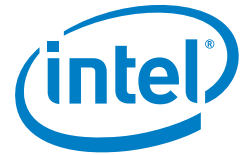**Intel® Celeron® processor N3160**
Wireless-LAN-enabled Omnidirectional Camera with Intel® Celeron® Processor N3160

(intel®)

Next-generation Multifunction Network Cameras Powered by Intel® Processors

With the rise of the Internet of Things (IoT), cameras are becoming increasingly significant for their ability to collect, process, and analyze image data. Sharp* was early to market with its QG-B20C* wireless-LAN-enabled camera with built-in image analytics functions, which provides omnidirectional surveillance with high 4K/3K resolution.
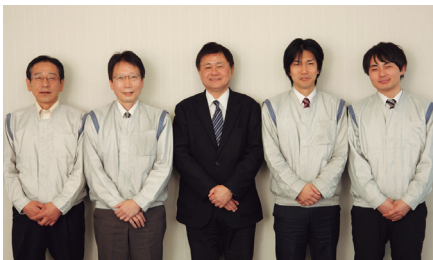
SHARP

Sharp Corporation

2-13-1 Hachihonmatsu-Iida,
Higashi-Hiroshima-shi, Hiroshima

Business activities: Development and manufacture of communication and networking products

http://www.sharp.co.jp/

Shingo Fueta (center)
Manager, Smart Networking Department
Consumer Electronics Company
Sharp Corporation

Toshihiko Tanaka (second from right)
Team Leader, A1291 Project Team
Consumer Electronics Company
Sharp Corporation

Chitoku Kiyonaga (second from left)
Team Leader, A1291 Project Team
Consumer Electronics Company
Sharp Corporation

Yoshihisa Yamamoto (left)
Section Manager, Smart Networking Department
Consumer Electronics Company
Sharp Corporation

Yuya Hirashima (right)
Smart Networking Department
Consumer Electronics Company
Sharp Corporation

Challenge
• **How to overcome performance issues with processing image recognition and image attribute gathering at high speed**

Solution
• **Intel® Celeron® processor N3160**

Installation Benefits
• **High-speed in-camera processing of 4K/3K high-definition images**

An Increasingly Important Sensor Device

The growth of the Internet of Things is leading to the interconnection of a variety of devices in a variety of locations—hastening the arrival of a smart, networked society that will deliver new services and value from information. This in turn is increasing the importance of cameras as a form of sensor that can collect extremely large amounts of data. But searching large volumes of video data for images, including handling high-definition video and performing image analysis in real time, is challenging and costly. The Sharp* QG-B20C* wireless-LAN-enabled omnidirectional network camera with Intel® Celeron® processor offers a solution. It incorporates a variety of image recognition functions and can be used for omnidirectional surveillance with an industry-first 4K/3K (4,064 x 3,048 pixels) resolution.

No Cables Needed

The camera's wireless LAN connectivity eliminates the need for LAN cabling, making it suitable for installation at locations where running cables would be problematic. This opens up a wide variety of uses at sites like construction sites or event venues, including indoor, outdoor, or even temporary use.

Omnidirectional Surveillance

Another key feature is the ability to perform omnidirectional surveillance with 4K/3K high-definition images, made possible by use of the industry-leading 12M Pixel/1-inch CMOS sensor developed by Sharp*. Capability to capture images with high sensitivity means the camera works well in the dark, significantly improving night-time performance. Similarly, the omnidirectional lens improves resolution in the vicinity (5-10m) of the installation site and provides crisp video recording without distortion of peripheral objects. The use of 4K/3K images means that image quality is retained during enlargements, enabling surveillance from a distance and easing the identification of people or vehicle number plates. The camera also has a triple encoding function that can simultaneously process video in three different resolutions: 4K/3K, HD (for recording on SD cards), and VGA (for live transmission). While HD format is normally used, the recording and viewing of 4K/3K data is valuable when a closer look is required or an abnormal situation arises. Likewise, VGA can be used for transmission to a monitor to minimize bandwidth use.

QG-B20C* wireless-LAN-enabled omnidirectional network camera

Intel® Processors Enable New Functionality

Past network cameras have sent video to the cloud in VGA or similar format so that analysis could be performed on a server. This meant that to identify a particular scene or other image from a large amount of video data, someone had to go through it all. The QG-B20C* offers an indexed search function where a search is performed on entered keywords and the relevant video can be downloaded for viewing. The Intel® Celeron® processor N3160, a quad-core processor with a high clock speed of 2.24GHz, plays a crucial role in making this possible. Video in all three formats (4Kx3K, High-definition, and VGA) are encoded on its integrated hardware video codec through the Intel® Media SDK, so that the majority of its computing resources can be dedicated to video analytics.

Intel® Media SDK is a free cross-platform API that helps enable fast video playback, encode, processing, and media format conversions, and accelerates RAW video and image processing: Please refer https://software.intel.com/media-sdk for more information

In-camera Image Analysis

The camera also includes versatile image analysis functions that improve detection accuracy by performing high-definition image analysis on the camera. Capable of detecting intrusions, crowd monitoring, and many other computer vision and video analytics functions, the camera can also record parameters like size, color, speed, and trajectory of moving objects in the captured video.

The high-definition video and in-camera image analysis functions of the QG-B20C* make it suitable for use in a wide variety of circumstances. Along with the core functions of intrusion detection and the detection of items being left behind or removed, new functions available on the camera include people counting, queue detection, and free parking space detection.

The people counting function can count the number of people who pass a specified line in a specified direction or the number of people standing in or moving through a particular area. This could be used to visualize the behavior of customers interested in products on display, survey how they respond to a new product, or measure the effectiveness of events.

The queue detection function can determine the level of congestion in a particular area in real time and issue an alert in the event of a predefined level being exceeded. This quantification of congestion can be used as a decision-making criterion for preventing accidents due to overcrowding. The free parking space detection function can monitor whether or not specified parking spaces are occupied, assisting with parking lot operation by combining high-quality video with data on space usage.

Advances in Intel® Architecture Help Meet Market Demands

The QG-B20C* camera has the potential to help meet challenges in a variety of markets. These include monitoring dangerous situations like river flooding, relocating or enlarging areas under surveillance at work sites as work progresses, or enhancing car park security with additional cameras.

Demand from overseas, particularly in developing nations, is even higher than in Japan. Whereas Japan has a well-developed communications infrastructure with optic fiber cable having been installed from Hokkaido to Okinawa, many places outside Japan are not as far advanced.

Such locations in particular place a very high value on the ability to record high-definition video at low cost using wireless LAN connections that are easy to install and versatile enough for anyone to use.

Together with this, when looking to make further improvements to the performance of the QC-B20C*, there were concerns about excessive load being placed on the processor when using it for pattern matching and other forms of image recognition. In response, the intention is to make further enhancements to the image analysis functions by utilizing the graphics processing units (GPUs) ideal for pattern matching that are frequently used with processors supplied by Intel.

Core image analysis functions for intrusion detection and the detection of items being left behind or removed

■**Intrusion detection**

Prohibited area

Generate an alert if new people or objects appear in images of the specified area

⬇

Surveillance of suspicious person being entered into critical area

■**Detection of items being left behind or removed**

Generate an alert if a new object appears in the specified area for longer than a specified time

⬇

Surveillance of suspicious objects being left behind

Generate an alert if a specified time is exceeded after an object is moved

⬇

Detection of art objects and goods being stolen

Main specifications for QG-B20C*

Category	Item	Specification
Camera	Image sensor	1-inch CMOS sensor
	Number of pixels (effective)	12.6 million (approx.)
	Image analysis functions	Intrusion detection, detection of items being left behind or removed, people counting, free car park detection, queue detection
Lens	Focal length	3.16mm (approx.)
	F number	1.9
	Angle of field	Horizontal: 170º, Vertical: 135º (provisional)
Network	LAN port	1 x 10BASE-T/100BASE-TX/1000BASE-T (RJ-45)
	Wireless LAN	IEEE802.11 a/b/g/n/ac
	Image sizes	4,064 x 3,048, 1,280 x 960, 640 x 480
	Maximum frame rate	15fps
	Video compression	JPEG/H.264
	Cropping	H.264 960 x 960 (15fps max.)
External interface	Memory card slot	SD memory card slot 3 x (SDHC/SDXC memory card)
	USB port	USB2.0 Type A receptacle
General specifications	Power supply	DC12V, PoE+ (IEEE802.3at compliant) (AC adaptor for indoor use available as an option, purchased separately)
	Operating temperature	-20ºC – 50ºC
	Operating humidity	10% – 50% (no condensation)
	External Dimensions	220 x 220 x 86mm (camera unit) (provisional)
	Weight	2.5kg approx. (camera unit) (provisional)