

Integrating a Smart Focus System into Surveillance Cameras



Contents

Introduction 3
Smart focus systems 3
Vendor case study: VIVOTEK..... 4

Introduction

For many applications, surveillance cameras must be installed in less accessible locations high above the ground so as to prevent tampering and to ensure they have a broad, unobstructed view of the area to be monitored. It is often difficult and time-consuming to perform installation because the cameras typically used for such applications also require focus to be set manually, a process that introduces the possibility of error that will require physical access to the camera for another round of focus configuration.

Naturally, any maintenance to be performed on such cameras after their installation is equally time- and labor-intensive. This can be a particular problem for outdoor cameras such as those used to counter vandalism or property theft, because of their exposure to large and rapid fluctuations in temperature. These extremes in temperature cause components in the camera constructed of different materials to expand and compress unevenly, leading to a loss of focus, which must be manually re-adjusted in the case of conventional surveillance cameras. In some situations, noticeable deterioration in focus may occur in a mere matter of days.

When a site has a large number of such cameras deployed outdoors, maintaining optimal focus to ensure reliable surveillance can result in significant overhead in terms of the additional time and labor resources needed.

Smart focus systems

To overcome these liabilities, surveillance vendor VIVOTEK has developed a smart focus system. A smart focus system may consist of several elements. Central to such a system is a remote focus utility, which allows users to adjust camera focus remotely. With the help of a stepping motor lens, a user can make adjustments to focus without physical access to the camera.

This basic functionality can be augmented to provide additional features or enhance user convenience. For example, an advanced remote focus capability provides the flexibility to automatically maintain proper focus when zooming in or out, ensuring adequate image quality as focal length is changed or when a specific field of view is required. In addition to reducing the maintenance overhead for surveillance cameras, remote focus offers a convenient way to adjust the view of a monitored location while meeting specific resolution requirements.

The flexibility that a smart focus system enables can make powerful additional functionality possible as well. For example, a feature might be provided to allow users to define a region of

interest in the camera's field of view by setting a focus window in the interface. At the user's prompting, the system can then calculate a focus value based on the dimensions of the focus window, automatically providing the best possible image quality.

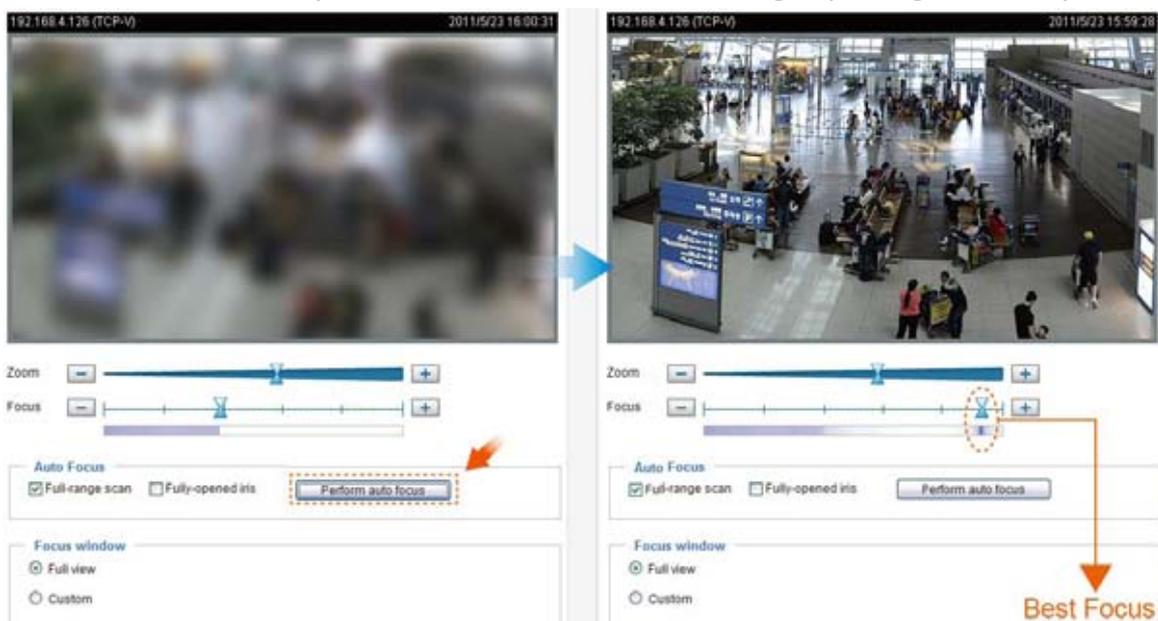
A different type of optimization is possible with focus assist integrated in a smart focus system. A focus assist feature adds a graphical and numerical indicator of the current focus value, making it easier to fine-tune focus. This capability is especially valuable in high-megapixel cameras because their wide field of view and high level of detail make it difficult to distinguish on a small analog monitoring screen whether an object or person of interest is completely in focus or not.

Vendor case study: VIVOTEK

An example of a vendor moving aggressively to adopt smart focus systems in its cameras is VIVOTEK. VIVOTEK's implementation of a smart focus system includes all the elements described above—remote focus, focus windows, and focus assist.

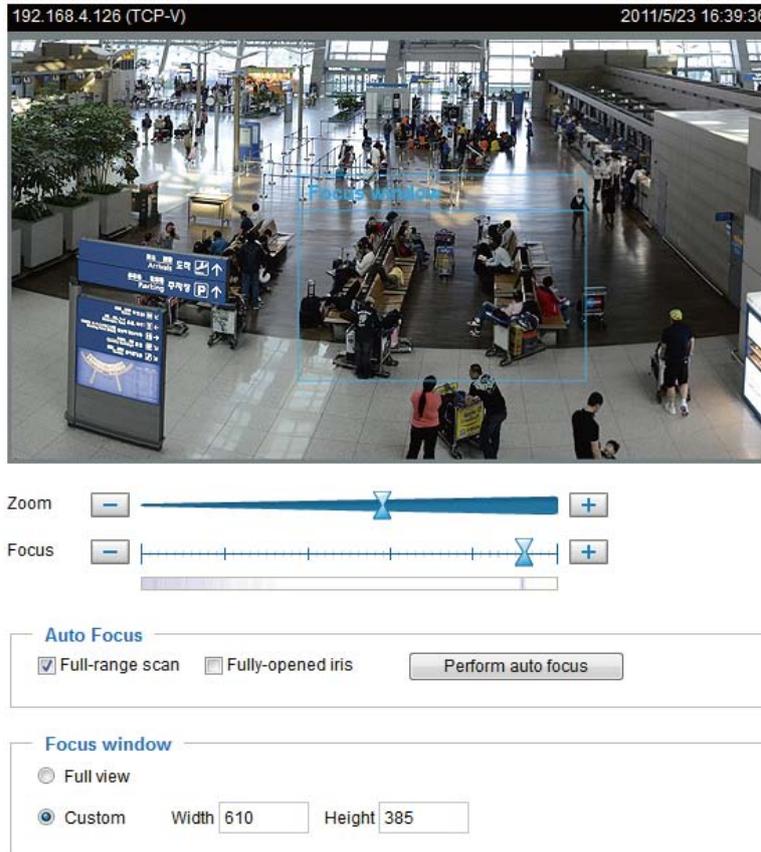
Remote Focus – Lens with Stepping Motor Iris

VIVOTEK's remote focus capability is available through a web browser interface. Users can manipulate a slider to adjust focus, with auto-focus options also accessible in the same window. The ability to change zoom settings is controlled with another slider positioned just above the focus slider for extra convenience, since adjustments in the two are typically made consecutively. It is recommended that the zoom multiple first be adjusted to the desired value, which will determine the focal length. Then click the "Perform auto focus" button, and the optimal focus value will be set automatically, with the focus slider bar reflecting any changes made dynamically.



Remote Focus – Define a Region of Interest by Focus Window

Users can set a focus value by scanning the entire field of view, or by defining a region of interest. If the latter option is chosen, the region can be set by either dragging out a rectangle or by entering the number of pixels for its width and height in fields provided in the web browser interface. The former provides an intuitive and quick way to define the region of interest, while the latter is particularly useful when a specific resolution is desired.



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Zoom

Focus

Auto Focus

Full-range scan Fully-opened iris

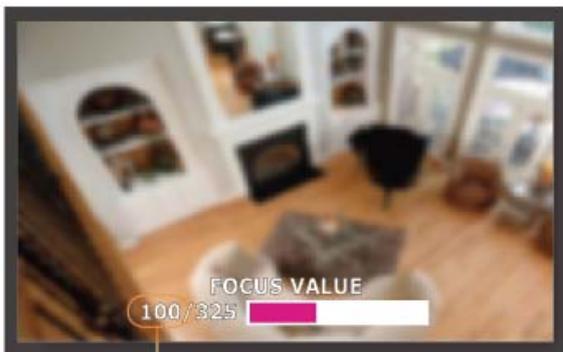
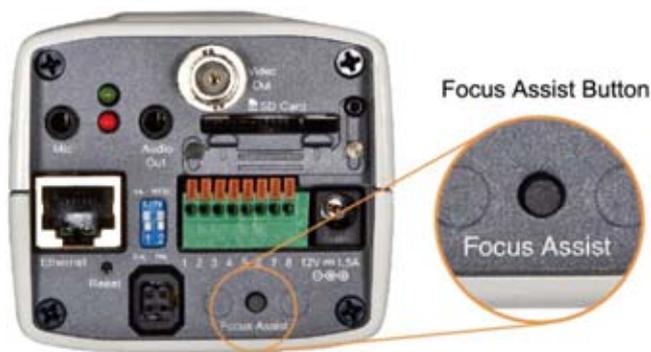
Focus window

Full view

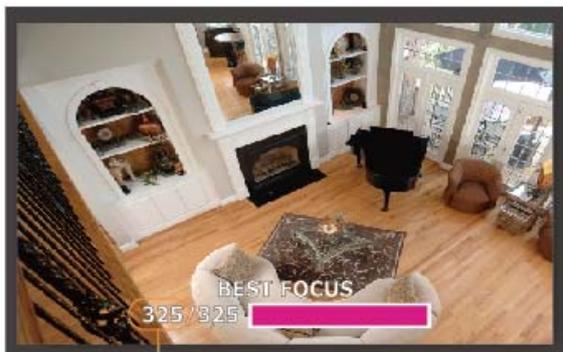
Custom Width Height

Focus Assist – Hardware & User Interface

The focus assist functionality is enabled with a hardware button on VIVOTEK's cameras. Once enabled, a focus value indicator appears on-screen in the web browser interface. In addition to a graphical representation of the current focus value, the indicator provides both the actual focus value number and a number corresponding to the optimal focus value. The indicator thus provides a simple and precise way to adjust focus to achieve the best possible picture quality.



● Current focus value



● The best focus value



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