

Multifocal sensor systems for port security

Roland Meier, head of Panomera multifocal sensor systems, Dallmeier, Regensburg, Germany

The technological advances that have been made in the field of network-based surveillance in the last few years are astounding. High definition (HD) and megapixel (MP) cameras were introduced onto the market and the question arose: Which are more suitable for professional video surveillance of ports, HD or megapixel cameras? But since then, even that discussion is already outdated. A new technology, known as multifocal sensor technology, has taken the market by storm and is paving the way for a whole range of previously inconceivable surveillance and analysis capabilities.

When the first HD and megapixel cameras were launched onto the market a few years ago, they were clearly superior to the predecessor standard definition cameras, with much higher resolutions. HD cameras are impressive because of a technology that is derived from the field of video – that is to say relating to moving images. On the other hand, the

roots of megapixel technology are in the field of static photography, even though they can reach higher pixel values than are possible with HD cameras. But before any discussions begin as to whether HD or megapixel cameras are more suitable for modern surveillance tasks, one point must be considered: resolution on its own is not everything. In order to be able to use the images from surveillance cameras efficiently and analyse them successfully, other dimensions besides resolution are important, such as effective image breakdown, recording of the overall image or analysis in the past. Whereas both HD and megapixel cameras very soon reach the limits of their capabilities in these areas, a new technology, multifocal sensor technology, performs flawlessly.

Unlike HD and megapixel cameras, which are equipped with a single lens, the multifocal sensor systems work with several lenses, each of which has a different focal length. Thanks to this new sensor

concept, the camera can be adapted optimally to the area for surveillance, so details are still clearly visible, not only close up but also at very long distances, and individuals can be recognised. However, that is not the only way it stands apart from conventional cameras.

Efficient image breakdown

One of the main arguments advanced by the defenders of high definition cameras is that HD uses the widescreen format with an aspect ratio of 16:9 compared with the 4:3 format of the megapixel cameras. This corresponds more closely to the human field of vision, and makes it possible to record yet more information laterally as well.

But real scenes seldom correspond to either of these two formats. However, in order to cover all areas of interest, it is often accepted that unimportant expanses, such as the sky, will be captured as well. In this case, pixels and the recording and storage capacity they take up are all



Panomera® is a patented multifocal sensor system, opening up completely new possibilities for the video surveillance of ports.



With multifocal sensor systems all PTZ functions like panning and zooming are even available subsequently in the recording.

wasted needlessly. But there is a more elegant solution: instead of forcing a scene for surveillance into a given format, with multifocal sensor systems there are no rigid, pre-set aspect ratios. They adapt the pixel ratio to the situation at hand. The image is split efficiently without being locked into specific aspect ratios such as 16:9 or 4:3. Thus for example aspect ratios like 5:1, 10:1 or 3:4 can be used without any difficulty.

Constant resolution over the entire object space

It is true that HD and megapixel cameras use progressive resolution options, but they quickly reach their limits precisely when it is important to be able to recognise details even at long distances. "Movies or television programmes like CSI often suggest to viewers that even blurry pictures can be transformed into high quality police wanted posters with just a few clicks", explains Roland Meier, team leader, Panomera® Multifocal Sensor Systems at Dallmeier. "But pixels are still just pixels: if there is no additional image information present, for example because an HD or MP camera only represents a person at a distance of 50 metres with a collection of coarse blocks, this information cannot be conjured out of thin air afterwards. So you are aware that something is happening here, but it is completely impossible to even recognise, much less identify a person. And that is precisely the objective of a professional video system."

So in order to obtain the desired information in the past, multiple cameras had to be installed at different locations. But this in turn involves higher costs. The appropriate cabling for power supply and data transmission is needed at every individual installation site, so the infrastructure costs and subsequent maintenance costs for multiple camera sites are enormous.

This is where the new multifocal sensor technology can help, since the resolution it offers is currently equivalent to about 32 times greater than a conventional HD camera. It can be used from just a single installation point to provide surveillance of a huge area. Roland Meier says: "With conventional cameras, the resolution drops off as distance increases. Or to put it another way, the further a person or object is away from the camera location, the poorer the resolution there is, so you are able to make out fewer details. In contrast, a multifocal sensor system uses different lenses, so constant resolution can be guaranteed over the entire area under surveillance. So the resolution at 100 metres is exactly as good as it is at 20 metres. This makes it possible to recognise people for example even from 160 metres".

Permanent recording of the total picture in highest resolution

Those who have no desire to install multiple conventional cameras over the area in question, as described previously, can use 'PTZ' cameras. As their name suggests, these cameras can 'pan, tilt and

zoom'. So in theory it would be possible to use these cameras to watch over a relatively large area and to pan or zoom to a location of interest if the need arises. But PTZ cameras do have one critical disadvantage, they only ever record what the operator is currently seeing live. So if the user zooms in on a certain scene, it is only this scene that will be recorded. Any additional incidents in the viewing range of the PTZ camera are lost and cannot be analysed or proven subsequently. Accordingly, the surveillance system is only as good as the user who is operating it.

In contrast, a multifocal sensor system always delivers total performance, since the whole picture is constantly recorded in its highest resolution. "Those are three important points straight away: the whole picture is recorded so no areas are lost, even if the operator is currently concentrating on a smaller inset. This total picture is recorded all the time, so there are no gaps in time. And finally, the recording takes place in the highest resolution, so no details are lost in the recording." says Roland Meier .

He continues: "Moreover, unlike PTZ cameras, multifocal sensor systems do not have any mechanical parts so there is no wear which extends the equipment's operating life significantly. And there is another advantage, whereas with PTZ cameras only one operator can have control over the camera at a time, with the multifocal sensor system any number of users can connect to the camera and select their entirely individual views."

Analysis in the past

Seeing live images from the surveillance cameras is one thing but with professional video security systems, most analyses take place in the past. This means that the video system runs, and if an incident should occur at a given time, the recordings are searched later in order to reconstruct the course of events and identify the individuals responsible.

Consequently, it is an essential requirement of modern surveillance systems that they are also able to zoom or pan even in the recordings. With conventional HD or MP equipment, this is not possible. "Even with PTZ cameras, these functions are only possible in live mode, not subsequently, in the recording. And if the operator is concentrating live on another area in the surveillance scene at the precise time, the entire incident will not be seen on the video images." states Roland Meier.

Here too, the solution is available with multifocal sensor systems, because all PTZ functions are fully available even in the past, even as the system continues recording images live. Roland Meier explains: "Since the overall image was recorded at the highest possible resolution, it is also possible to move within the image and to zoom in on pertinent details. This opens up a wide range of analysis options, which were simply not possible with the prior technology."

About the author



After his studies of micro electrical, mechanical and optical systems (MEMOS), Roland Meier has been working as the project leader at an international engineering company. He has been working with Dallmeier for over six years and was, amongst others, responsible for realising the world's largest IP video surveillance solution at the City of Dreams casino in Macau. As head of Panomera multifocal sensor systems he is now responsible for the project handling and sales of the Panomera technology.

About the company

Dallmeier is one of the world leading providers of products for network-based video surveillance and has more than 25 years of experience in the development and manufacture of high quality components and complete solutions for the CCTV/IP sector. Whether its cameras, recorders, intelligent video analysis, software or video management: Dallmeier offers complete systems with perfectly integrated components from a single source. All products are developed and manufactured on Dallmeier's own production sites in Germany, and meet the highest requirements concerning quality and reliability, which is confirmed again and again by independent international test centres, through numerous certifications and awards.

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