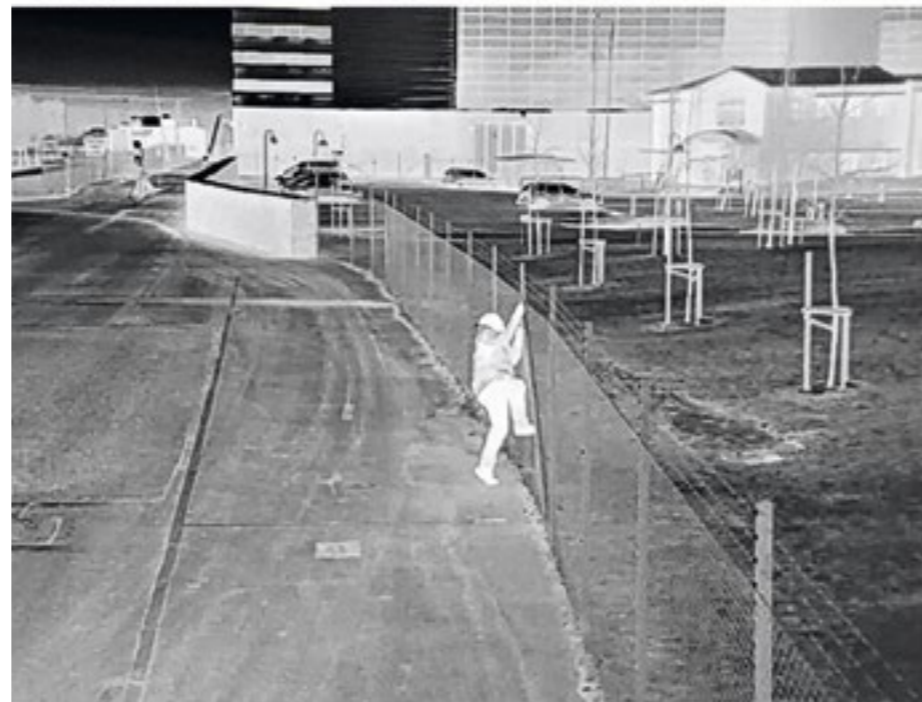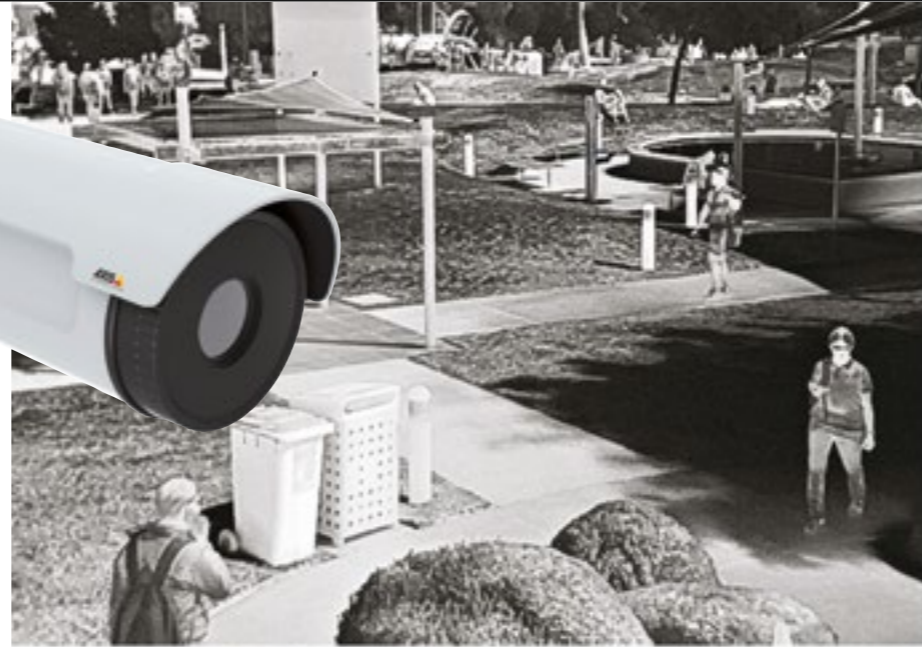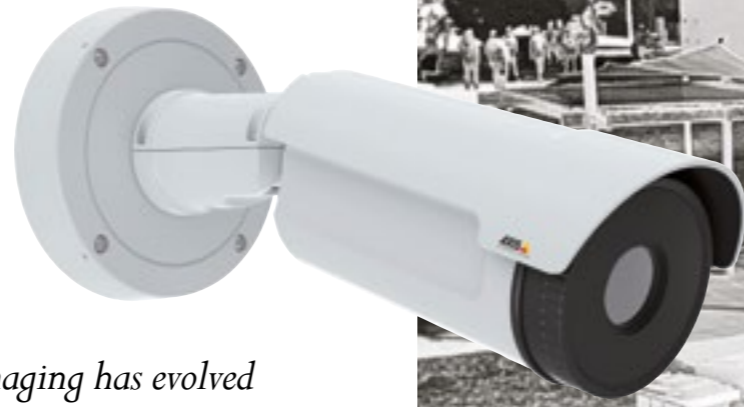# SEEING MORE

Martin Jensen explains how thermal imaging has evolved to become a highly versatile tool for the security world

I n this article, I will be exploring some of the many ways thermal imaging is being used today, alongside some exciting new applications of the technology that will be adopted more widely in the future. Before getting started, however, it would be worth giving a basic overview of how thermal imaging technology works.

Thermal cameras are not really cameras in that they don't pick up visible light. To oversimplify, sensors pick up infrared light being emitted by objects in their 'field of vision', with a central processing unit taking these inputs and creating an image. Generally speaking, these infrared sensors are very sensitive and can pick up minute differences between objects – giving a very accurate, high definition and easy to interpret image.

Designed in 1947 for military purposes, thermal cameras now have a wide array of different applications: from improving elderly care to assisting maritime search and rescue. As the cost of thermal cameras has decreased, so have their appeal to sectors with

> **THERMAL TECH IS NO LONGER LIMITED TO AN EXCLUSIVE MARKET OF MILITARY ORGANISATIONS**

traditionally tighter budgets such as healthcare and education. The versatility of the thermal camera, combined with the ever-decreasing price tag, sees the technology used far more widely than it once was with the market set to grow to US$10.27 billion by 2021.

PERIMETER PROTECTION

Thermal cameras can enhance a security system in many ways, but one of the most common uses is for perimeter protection. Using contemporary cameras with limited visibility can be harder to spot something out of the ordinary than when using thermal imaging. For example, at an installation surrounded by forest and dense vegetation, it is easier to spot a person's heat signature than it is to spot them using visible light. This is the case both when a video feed is being monitored by people and by video analytics software.

Using video analytics software with thermal cameras is a very effective perimeter protection solution. The software can be programmed to include a predefined 'safe zone', enabling the camera to ignore activity

outside a certain perimeter. If movement is detected within this zone, the camera will automatically alert security personnel. By having this layer of software monitoring the video feed, the number of camera operators can be reduced – saving money on wages. Having an automatic input from the cameras can also see the technology integrated into existing systems; for example, intrusion into the 'safe zone' could trigger a light or audio announcement.

While visible light cameras do work well with video analytics, when looking at perimeter protection thermal cameras are often the way to go. They have a superior range, can operate effectively in fog and heavy rain and aren't affected by light conditions or small insects such as spiders (which account for a surprising number of false positives). All of these benefits lead to a reduction in false alarms versus using regular cameras only, saving time and money.

LOW-LIGHT PURSUIT

Helicopters equipped with thermal cameras form a staple of cop shows on daytime television. In nearly all examples where a criminal is on the run, there will be a helicopter on hand to spot and track the suspect, guiding police officers in an efficient manner and minimising the chances of escape. Thermal cameras prove a game changer for aerial surveillance, as they enable accurate pursuit in low light and can spot heat signatures far more effectively over distance than visible light cameras and their human operators.

And it's not only aerial support units that can benefit from thermal imaging. In recent years, border security forces in many countries have been under growing pressure to stem the flow of illegal migrants. While canine units have been used to great effect, dogs are expensive to train and keep, and are only effective in comparatively short shifts and are at risk of being distracted. Thermal cameras offer some similar functions to dogs without these negatives, particularly in detecting people concealed in vehicles, and have been adopted by border forces around the world.

In addition to security applications, thermal imaging can save lives. One of the core aspects of the technology is that it can differentiate the heat signatures of almost anything from great distances. Take the case out at sea. The sea is a vast expanse of cold water where, in the dark, with only the guidance of the moon or a searchlight, it can be a difficult place to navigate let alone find anything as minute as a person. Thermal cameras help to stop this problem.

When it comes to perimeter protection thermal cameras have the advantage

In 2001, the UK coastguard deemed the technology to be too expensive, yet recently they have installed thermal cameras onto a number of their helicopters as they believe that the tech will be invaluable to search and rescue operations.

After finding out that 25 percent of drownings happened in harbours, Danish dockmasters installed thermal cameras as a way of improving safety. After the installation, they found that the cameras detected 100 percent of falls with only 0.08 false positive hourly rate. The fall identification programme provides another example of how the cameras can be easily integrated with video analytics programmes to perform certain tasks. The cameras' effectiveness, efficiency and reliability make them an extremely useful tool as they are not only capable of fulfilling security requirements, but have a proven record of saving lives.

Another case where thermal camera technology has been used to incredible results was during the 2011 earthquake and following tsunami. The cameras were

positioned on poles, their diminutive size meaning that rescue services were able to squeeze them through small nooks and crannies to find any sign of heat signatures emanating from survivors. Additionally, unlike other more basic cameras, the poor weather and light does not affect the mission as much as it would have if the cameras had not been thermal. It meant that survivors were saved in the shortest time possible.

One of the sectors to have adopted this technology most recently is the retail industry. Research has found that US$35 million of goods are stolen from shops and supermarkets every day. With this much at stake, the market was looking at new technologies to help reduce shrinkage. Thermal cameras, by their nature, take advantage of temperature differences to detect hidden goods. Fortunately, this perfectly fits the bill when combatting one of the biggest targets in supermarkets – fresh food. By picking up subtle temperature differences, thermal cameras can identify 'cool' areas that may indicate a shoplifter is

concealing chilled goods under their clothes. This is a far more effective technique than using the naked eye. Targeting shoppers with bulges under their clothes can lead to some very embarrassing mistakes!

Thermal cameras can monitor each customer as they leave the store, allowing the security team to pick up anything suspicious and challenge potential shoplifters as appropriate. This technology can not only reduce a company's inventory loss but, as stores account for shrinkage in the pricing of their products, eventually decrease the price paid by the customer.

With this technology becoming more mainstream it is now becoming more accessible to schools who, generally speaking, do not have large budgets to work

INFRARED SENSORS GIVE A VERY ACCURATE, HIGH DEFINITION AND EASY TO INTERPRET IMAGE

with. When the technology was first developed it was possible to spend thousands and thousands on cameras, whereas now you can buy thermal cameras for less than US$1,000.

One of the key reasons for choosing thermal cameras over visible light cameras in schools is for the sake of child protection and privacy. As thermal cameras themselves aren't actually cameras but thermal sensors, they cannot gather or store visible images of students. They can, however, monitor for unusual or unauthorised activity as normal, for example detecting a presence in off-limit areas or identifying students skipping class. As explored with previous examples, they can form a part of a

connected security system for maximum effectiveness and a reduction in spending on security staff and work particularly well with video analytics.

In boarding schools, the thermal cameras are able to spot students sneaking out and send someone to go and deal with it instead of having professors and teachers or extra staff patrolling the grounds at night time. Alternatively, when connected to an audio system, the technology allows security staff to play a pre-recorded or live message, which will deter the student and save a little more time and money.

RAPID RESPONSE

Being able to quickly respond to incidents is an absolute necessity in care homes where elderly residents are at risk of falling and hurting themselves. Carrying out physical patrols is very time consuming and can detract from clinical care. Using cameras to detect falls and alert staff can be an efficient way of reducing the time spent physically checking on residents.

It is also important to take into consideration the wishes of those in care — namely that they won't like to feel as though they are under surveillance. Thermal cameras can strike a happy balance, given that they cannot gather visible video footage and as such can only be used to detect falls rather than as a surveillance tool.

One problem often associated with thermal camera technology was the high price point. However, now that this tech has matured and hit the mainstream its use is no longer limited to an exclusive market of high budget, often military, organisations. With the decreasing price, solutions including thermal imaging are now available to a much wider customer base. It is good to see education and healthcare institutions make use of the equipment to ensure the privacy and safety of their wards — a step-change from the technology's early uses ●

Martin Jensen – Axis' Global Product Manager – has over 20 years' experience in the communication electronics products industry, with specific areas of expertise extending to mobile phones, audio products and IP cameras.

A thermal camera monitor shows the body temperature of passers by

Picture credit: Getty