The Ava Cloud Video Security difference — audio analytics

Summary

Most physical security systems rely only on vision to detect or record events of interest. Ava cloud video security includes audio detection in the vicinity of each Ava Camera to help identify when an event of interest occurs inside or close to your buildings.

The Ava cloud video security difference

Until recently, to create a system that combines both audio and video analytics in a single physical security solution required equipment from different hardware and software vendors. This was expensive, and often was difficult to integrate and maintain the components needed to include audio and video detections in the video management system. By using a multi-vendor model, the possibility existed of potential security and privacy risks being included in the combined system.

All Ava Cameras can identify unusual sound events, for example, breaking glass, loud noises, a gunshot, somebody screaming, fire, smoke, or car alarms, or other anomalous sounds. Ava Cameras also detect ultrasonic frequencies, enabling them to be used to detect the location of a panic alarm.

With audio analytics on-board each Ava Camera, operators gain a full overview of the environments they are monitoring.

By using both video and audio analytics together, you have better coverage of the areas you need to monitor, as the sounds do not necessarily need to originate from within the fields of view of your cameras, and are still detectable even when they come from behind pillars or other objects.

With the Ava 360 and Ava Dome cameras, you have directional audio analytics highly integrated into your on-premise Ava Aware™ and Ava Aware Cloud™ video management systems. With they Ava Compact Dome cameras, you have the same audio analytics, but without the ability to determine direction. You do not need to buy additional equipment, or use software plug-ins to enable the audio analytics. The Ava video security solution is an end-to-end system, created by a team of engineers with 20+years of experience in advanced high-end audio and video system design and engineering:

- **Hardware** — we designed the audio system specifically to meet physical security requirements, taking it all the way from concept to mass production. By using best-in-class digital Micro Electro-Mechanical System (MEMS) microphones, and a new and robust acoustic design with a compact form factor that protects the microphones from dust and liquid while maintaining excellent pickup sensitivity and consistency, we created devices suitable for all environmental needs. By incorporating microphones into each Ava Camera, you save on the expense of having to purchase, install, and maintain separate microphone and video detection systems, without needing to configure the communications between disparate audio and video solutions. Each camera is tested on a state-of-the-art audio production test system at the production line to validate and assure performance and resilience.

- **Software** — using a highly-optimized deep neural network and the power of modern data science and classical array processing technologies, the audio pre-processing module suppresses ambient noise, enhances the interesting signals, and extracts the best features for audio event classification. These output results are used to raise alerts if

unusual sounds are detected. For multi-microphone arrays, the processing module estimates the time difference of the arrival of the sound source at each microphone, and calculates the directions-of-arrival in azimuth and elevation angles. The classification and direction information is passed securely from the Ava Camera to the Aware Cloud video management system, where alarms are raised to notify the operator. The Aware Cloud video management system shows these alarms as alerts in the Alarms tool, and also on the Video view and Map view tools, enabling your operators to watch the relevant video recordings, isolate the cause, and take actions based on the information provided by both the directional audio and the video analytics.

- **Data collection, labeling, and deep learning** — to create the class-leading audio classifications, while minimizing false positives, Ava Security uses the high-quality built-in microphones in our own Ava Cameras to record thousands of hours of sound in real-world installation scenarios and in relevant environments. This data is accurately labeled and structured by our audio experts to create our highly-optimized, accurate, and flexible neural networks for audio analytics. These neural networks, running inside each Ava Camera then detect unusual or loud sounds, classifying them into relevant categories to allow the Ava cloud video security solution to raise events, or for you to create suitable rules that trigger on certain sound types.

- **Privacy** — to protect the privacy of people located near to your Ava Cameras, you have control over how sounds are processed and analyzed inside each Ava Camera. You can configure each Ava Camera so that only the metadata about each detection is sent to your Aware Cloud video management system, or

can send short sound clips and the metadata about each detection. For situations where it is necessary to record audio, you can configure each Ava Camera to store the audio that corresponds to each alert.

- **Integration with Aware Cloud** — the audio analytics from each Ava Camera are seamlessly integrated into the user interface of the Aware Cloud video management system. Where appropriate, you can configure the microphone array orientation, and select sound profiles for every Ava Camera in only a few mouse clicks. You can also create audio alarm rules, so that, on an audio event occurring, Aware highlights the event in the user interface, and can send email or other communications platform notifications to enable you to instantly react to the situation, rather than having to wait for a witness call. Using Map view, your operators are also shown the location of the camera that detected the audio event.

What are directional audio analytics?

For Ava Cameras with built-in 4-microphone arrays, the camera can capture directional information from the sound field. So, not only can your Ava Cameras detect and identify unusual sound events but, depending on the camera model, they also alert your operators to the location from which the sound originated, in near real time.

Ultrasonic detection

As well as being able to detect noises in the audible spectrum, Ava Cameras are also designed to detect ultrasonic frequencies. Ultrasound can be used to accurately pinpoint the location of a device that emits suitable sound frequencies, and has several advantages over other technologies that can be used to

pinpoint a device, for example GPS, Wifi, bluetooth, and RF systems. These advantages include:

- Ultrasound can be used indoors.
- Ultrasonic waves do not pass through walls or ceilings, so your detections are confined to the areas in which the device is located, preventing Ava Cameras in other rooms or floors from erroneously alerting on the alarm.
- You do not need additional equipment to implement a system to detect ultrasound signals.

This feature can be used, for example, to create a panic alarm that plays ultrasonic frequencies between 18 - 20 kHz, that when triggered in the vicinity of Ava Cameras, can be used to "silently" alert your security staff to a situation on your premises, and be used to pin-point the location of the alarm being triggered.

Expected performance

The accuracy and performance of the audio analytics from Ava Cameras very much depends on the environment in which the cameras are installed.

By either wall or ceiling mounting your Ava Cameras, and ensuring the installation locations are at least 1 meter away from noise sources such as air-conditioning units, ventilation ducts, and fans, the following ranges for different audio detections are possible:

Table 1 – Audio detection range

Detection	Range (Ideal)	Range (Noisy)
Glass break	Up to 15 meters	Up to 8 meters
Gun shot	Up to 100 meters	Up to 50 meters
Screaming	Up to 15 meters	Up to 8 meters
Smoke alarm	Up to 15 meters	Up to 8 meters
Car alarm	Up to 30 meters	Up to 20 meters

Detection	Range (Ideal)	Range (Noisy)
Ultrasonic panic alarm	*Up to 40 meters	*Up to 15 meters

* For Ultrasonic panic alarms, the detection range is influenced by the quality and power of the device used to create the panic alarm. In testing, panic alarms created using mobile telephones can usually be detected when within 15 meters of an Ava Camera.

For loud noise detections, the audio detection range is dependent on the type and source of the noise. For example, a gunshot is detected at much greater range than a hand clap or slamming door. This makes it difficult to predict the detection range without knowing the type and source of the noise.

In some conditions (loud background noise, strong room reverberation, etc.), the detection performance and working range degrades.

Use cases

Being able to detect audio events, and, depending on the model of camera, to be able to triangulate the source of that noise, has many applications in different sectors. Here are some relevant examples:

Retail sector

Statistics show that retailers are concerned about violence and verbal abuse against staff — with 48% having experienced it, loss prevention, and anti-social behavior. The audio analytics from Ava Cameras identify sounds and offers situational awareness of store premises. By adding directional information from the relevant Ava Cameras, this situational awareness is further enhanced.

Retailers can detect and act on aggressive behavior, vandalism, and robberies to safeguard customers and staff, and to reduce shrinkage. Issuing employees with suitable ultrasonic panic alarms provides an additional level of protection.

Education sector

To monitor schools and campuses, operators have to balance proactive measures with effective incident response. Conventional security solutions lack insights to make operators truly efficient. Ava Security's integrated audio analytics capability is a real asset in several cases.

Reports show that 19% of students in grades 9–12 having been bullied on school property. Globally, about 150 million students aged 13-15 report facing peer violence at their schools. Acts of verbal aggression and fighting can occur anywhere on campus: classrooms, hallways, gyms, cafeterias, bathrooms, or playgrounds. Our cameras' microphones can identify screaming and loud noises, as well as the direction of the commotion even when the camera is pointing in a different location. By providing your staff with ultrasonic panic alarms, they can also quickly call assistance in situations when backup is required.

Gun violence is a reality many schools face. By installing cameras with embedded directional audio analytics, campus administrators are better equipped to identify and assess attackers and their location before they endanger more lives.

Real estate (offices)

Securing commercial buildings goes beyond safeguarding people and property. Today's security professionals respond to the needs of the business, staff, contractors, and visitors and deal with the realities of property damage, theft, and disgruntled employees.

Ava Security's integrated audio analytics helps security staff react to breaking glass, loud noises, screaming, gunshots, smoke alarms, or panic alarms. Going to the source of the disturbance as fast as possible can make the difference before threats escalate.

Healthcare sector

Administrators of healthcare facilities are constantly challenged to keep patients, staff, visitors, and property protected. With Ava Cameras, security operators can detect and contain verbal aggression incidents against staff or patients before they escalate.

It is also easier for staff to monitor high-risk patients, as well as identify and assist patients who slip and fall. The cameras' microphones pick up loud noises, screaming, and glass breaking and send alerts in real-time. Providing your staff with ultrasonic alarms means that they can quickly call assistance when needed.

Conclusion

By integrating microphones in each Ava Camera and developing and training the audio analytics, the Ava cloud video security solution adds features that provide real value to your organization.

By being able to pin-point the location of loud noises and other audible and inaudible sounds and overlaying this information onto the Aware Cloud user interface, your operators gain much more awareness of your environment than they would get from a traditional video-only system. With Aware Cloud able to issue suitable alerts and events to your operators even when they are away from the monitoring stations, Ava's audio and video analytics provide an enhanced oversight of your protected areas.

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Security

Ava Security is a global technology company with offices in the UK, Norway, and the USA. It was founded in 2016 to create a better, smarter way to deliver security. Ava protects people, property, and data anywhere.

Innovative companies worldwide use Ava Reveal™ for human-centric data loss protection and Ava Aware Cloud™ for video security and analytics.

To learn more about Ava's smart solutions and how you can enjoy proactive security, visit our website or schedule a demo with a member of our sales team at sales@avasecurity.com.

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