RealSense

Vision AI for Advanced People Screening

RealSense Depth Cameras Power Advanced Security Solutions for Airport Screening, Loss Prevention, Customs and Border Control, and Venue Security

Spotlight on Thruvision

Thruvision is the leading developer, manufacturer, and supplier of walk-through security technology. Its solutions are deployed by government and commercial organizations in more than 30 countries, with a concentration in the following markets:

- Retail Distribution – detection and deterrence of staff theft from distribution centers

- Customs and Borders – checking travelers for concealed contraband

- Entrance and Venue Security – reducing queues while enhancing security

- Aviation – checking airport workers to deter and prevent attacks to aircraft and airports

- Mass Transit – protecting travelers from terrorism

THRU**V**ISION

"With RealSense technology, our screening systems deliver better detection performance in airports, distribution centers, and other venues, and they can also be deployed in new locations that might not have been possible before."

– Colin Evans, CEO, Thruvision

Challenge

Security teams at airports, entertainment venues, distribution centers, and many other high-traffic areas need a safe and efficient way to deter theft and ensure that people don't bring prohibited items into public areas.

Solution

Thruvision's people-screening technology can detect items hidden under clothing by measuring the thermal energy emitted by the human body. RealSense Depth Camera D435 captures optical images and depth information about objects in the scene, over which a THz (thermal) image is overlaid.

Results

Thruvision removes the need for physical "pat-downs" and other types of close proximity searches such as walk-through metal detectors and body scanners, allowing security officers to efficiently screen people from a safe distance.

Introduction: The Need for Effective, Discreet, High-throughput Screening

As a leading provider of people-screening technology, Thruvision's advanced detection solutions are commonly deployed at airports, border crossings, retail environments, distribution centers, and many types of public venues. Using patented

RealSense captures optical images and depth information about objects in the scene.

passive terahertz (THz) imaging technology, these systems can detect metallic and non-metallic items hidden under clothing by measuring the thermal energy emitted by the human body. Items concealed in clothing block the body energy from reaching the Thruvision sensors. Dynamic AI detection algorithms highlight these items so operators can instantly spot them on a video screen.

Thruvision uses RealSense Depth Camera D435 to capture optical images and depth information about objects in the scene. Thruvision feeds this information into the processing chain for the terahertz signals and images, a technique known as sensor fusion.

"We must be able to align the optical and terahertz imagery, thus necessitating an optical camera that can provide 3D information with depth as well as 2D image data," explains Nick Graham-Rack, Chief Technology Officer at Thruvision. "RealSense provides the 3D optical imagery we need."

Improving Accuracy, Preserving Privacy

Thruvision's people-screening solutions are both effective and respectful since they do not provide detailed imagery of the subject's body. Operators see a moving image of each person, including the size, shape, and location of any concealed objects. It is impossible to determine the subject's age, gender, or ethnicity from the Thruvision image. Operators can perform "virtual pat-downs" and then challenge the subject to remove concealed items—a process that is quick and safe for both the operator and the subject.

"Our cameras are passive, measuring only the energy given off by the objects in front of them, as opposed to active systems that 'ping' the scene like a radar," Graham-Rack explains. "But that means that the levels of energy we are detecting and processing to make an image are extremely small: less than one-millionth of one-millionth of a watt."

The more Thruvision's cameras know about the world in front of them, the better they can process these tiny signals. Thus the solution captures the scene in the visible band using RealSense depth cameras and then uses open-source tools and techniques to extract information from those images.

This includes detecting and tracking people and distinguishing different parts of a person as they move past the camera.

Selecting RealSense

Thruvision chose RealSense technology due to the accuracy of the depth information it captures at various distances. Highly refined depth measurement capabilities make the cameras ideal for applications that rely on precise 3D information.

"By integrating depth and color cameras into a single unit, RealSense eliminates the need for separate components and complex calibration processes," says Stefan Hale, Chief Operating Officer at Thruvision. "The on-device processing unit lightens the workload on the main system by handling depth data calculations internally."

Furthermore, the RealSense SDK offers ready-to-use APIs for aligning depth and color data. According to Hale, these APIs simplified the software development process by providing the necessary tools and libraries, while RealSense's "field-ready" packaging simplified the mechanical integration into Thruvision's products. "RealSense technology simplified system deployment by eliminating the need for us to design and construct customized screening environments," he adds.

Creating an Intelligent AI Machine Vision Platform

Thruvision uses third-party AI algorithms to detect and eliminate background distractions, bystanders, and other irrelevant details. According to Graham-Rack, the depth information supplied by the RealSense cameras has enabled Thruvision to bridge the gap between the optical and terahertz imaging domains. "We use AI models in the optical domain to extract information that can be shared with and exploited in the terahertz domain," he says. "By removing distractions from the screening image, operators can focus more intently on the task at hand, thereby increasing the likelihood of detection and potentially extending their productivity through longer screening sessions."

To see this technology in action consider the two images above. In the image on the left, a person can be seen in the background.
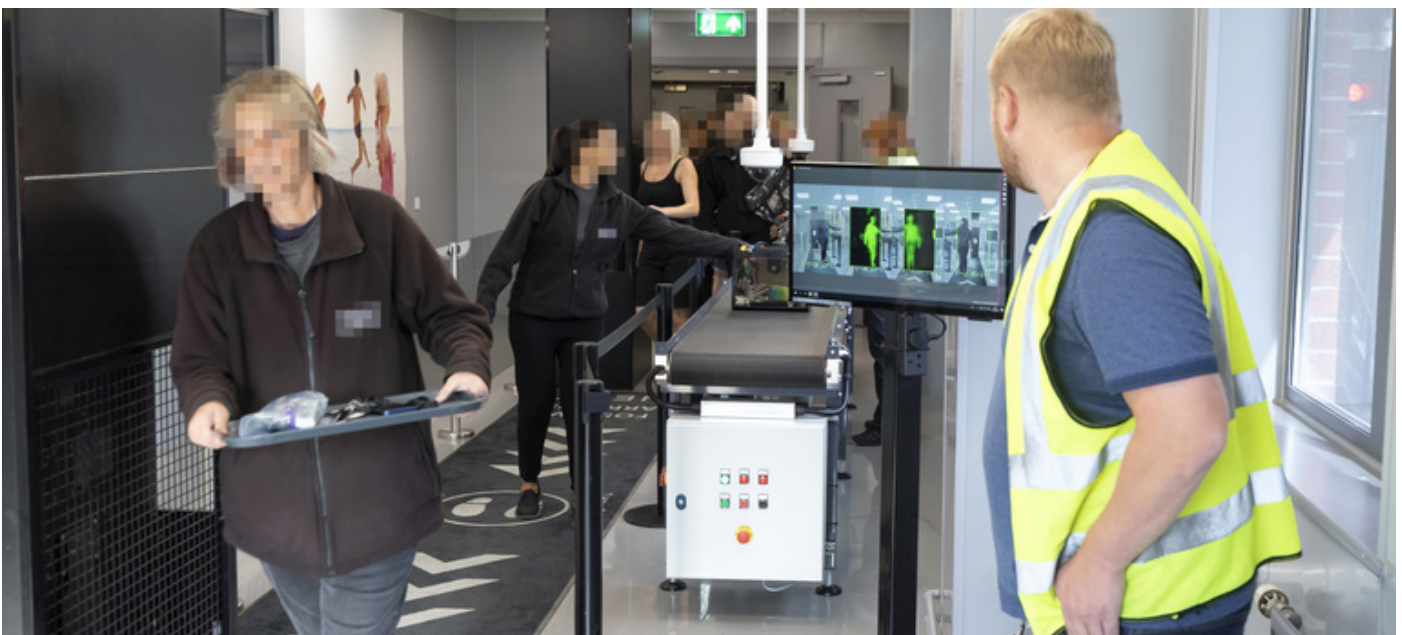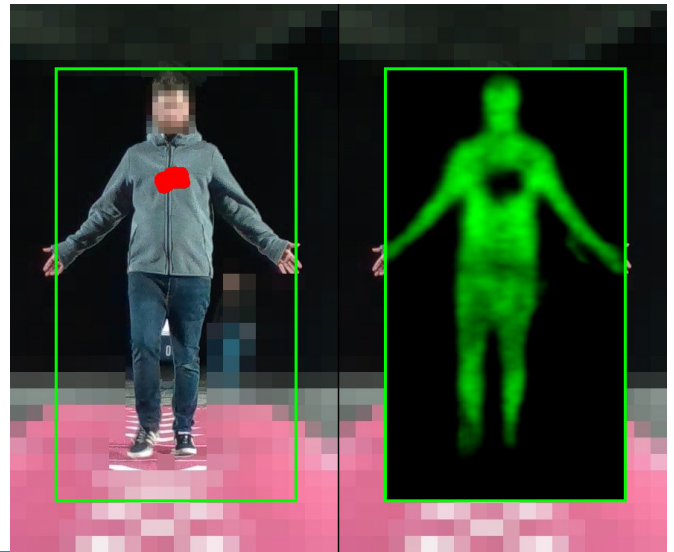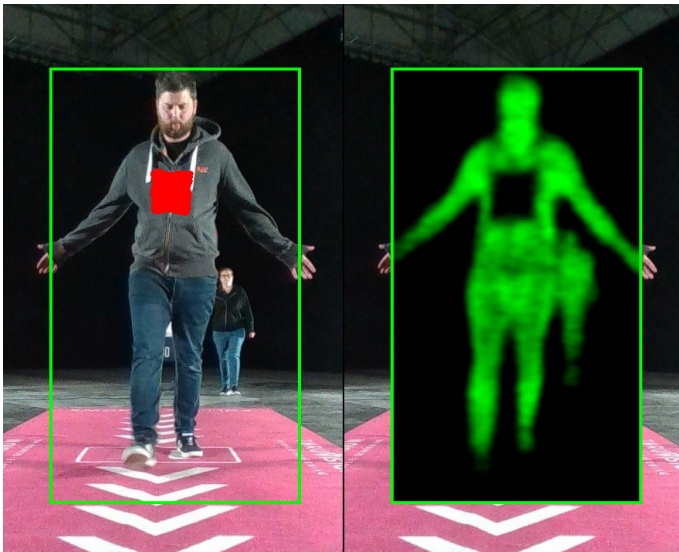
AI algorithms process RealSense data to remove background distractions and preserve privacy.

In the image on the right, the AI algorithms have removed the person in the background, as well as blurred the face of the main subject. The clean background presents fewer distractions so operators can focus on their primary task of monitoring the people walking through the screening lane, while the blurred face preserves privacy.

"Our SmartFocus technology uses the depth information from RealSense, along with person-detection and pose-detection algorithms to determine the outline of the person being screened," Graham-Rack notes. "Once this is done, we can treat everything else in the scene as background, and choose to remove it."

Working with the Experts in Machine Vision

Thruvision's adoption of RealSense technology has led to the creation of an intelligent platform that improves detection performance and reduces the possibility of prohibited items being missed during screening. "With RealSense, our systems deliver better detection performance in existing locations, and they can also be deployed in new locations that might not have been possible before," says Colin Evans, CEO at Thruvision. "In addition to operating in more challenging environments, we can offer our customers features that enhance their business operations in other ways as well, such as automatically counting and logging the number of people that pass through each screening system."

Evans says the RealSense team has been immensely supportive and helpful throughout the development of these screening solutions. "We look forward to working with RealSense to understand how we can leverage the RealSense product roadmap as we continue to extend the capabilities of our systems," he concludes. "Intel is a world-renowned brand that

is associated with quality and reliability. We are proud to include RealSense products within our offerings."

> *"Intel is a world-renowned brand that is associated with quality and reliability. We are proud to include RealSense products within our offerings."*
>
> – Colin Evans, CEO, Thruvision

Technical components of the solution

- RealSense Depth Camera D435
- Thruvision people-screening technology
- Third-party AI algorithms for person-detection and pose-detection

Learn More

• Thruvision

https://thruvision.com/

• RealSense Technology

https://www.realsenseai.com