

Presence Detection and Speed Measurement Using Single-Point LiDAR Sensing

How a vehicle inspection solution manufacturer provides versatile and reliable detection capabilities using LiDAR sensors



Global security has grown to become a major concern in the modern world. Being able to prevent deliberate acts of violence as well as potentially harmful accidents is a priority for most governments, legal bodies and organizations. Doing so efficiently requires a combination of technologies that all share the same high requirements in terms of reliability.

One of the many ways to prevent threats is to make sure that means to cause harm are effectively suppressed from sensitive areas. This is achieved with perimeter security, which essentially requires that everything—people, vehicles or containers of all sorts—is thoroughly inspected prior to gaining access to a given area.

The challenges of perimeter security

[Advanced Detection Technologies LLC](#) is a company that specializes in the design and development of solutions that aim at minimizing risks of vehicle-borne threats. They have developed a global expertise in access control and under vehicle inspection solutions that are used worldwide in sectors such as government and military officials, local and state police forces, security professionals, industrial manufacturing, power generation, public utilities, hospitality, finance and banking industries.

The company's flagship product line is the LowCam[®], an under-vehicle inspection system aimed at providing reliable inspection of any road vehicle's undercarriage in search of foreign objects, such as explosive devices or smuggled goods. The LowCam was also designed to perform automatic front and rear license plate recognition as well as acquire other access-control data such as vehicle counting.

A typical LowCam system works by detecting any vehicle that passes over it. When a vehicle is detected, cameras pointing upwards activate to inspect the vehicle's underbody and provide real-time playback to the operator. At the same time, another camera module takes a photo of the vehicle's front and rear license plate to identify it.

Destined to be used in high-security areas, such as defense complexes or nuclear facilities, the LowCam system must sport military-grade robustness. As such, all of its components—casings, cameras, sensors, electronics—have to be rugged; they must withstand the weight of heavy vehicles as well as operate in difficult environments, such as those often subjected to vibrations, harsh weather or dirt accumulation.



The search for the right sensing technology

When initially designing the LowCam systems, Advanced Detection's development team was faced with the challenge of finding the right sensor to accurately detect passing vehicles. They first tried ultrasonic sensors, but these came short of performance when operating in rain as water accumulation blocked the soundwaves.

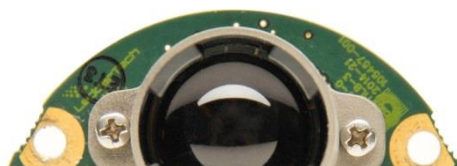
The team also tested the *LiDAR-Lite* optical sensor, which worked in rainy conditions but did not provide good performance in swift-changing light conditions; for example, they did not perform optimally when exposed to bright sunlight and instantaneously subjected to the shadows of an incoming vehicle.

After doing some research online, Advanced Detection engineers came across LeddarTech's single-point sensor LeddarOne, and ordered a few for testing. They rapidly found out that the LeddarOne outperformed both ultrasound and other optical sensors when confronted to harsh conditions, such as rain and extreme light conditions. As software engineer Robert Durish indicated: *"After months of research and testing, we found the LeddarOne to outperform not only LiDAR competitors but also other forms of detection, such as ultrasonic, radar, laser, and video analytics."*

An affordable, all-weather condition sensor for reliable presence detection and speed measurement

The LeddarOne is a very compact (2" diameter) single-beam optical sensor module that is entirely dedicated to a single point measurement. Its three-degree, diffuse beam provides measurement range up to 30 m (100 ft.) with an accuracy of < 5 cm at an acquisition time up to 140 Hz. The use of a diffuse infrared light beam (generated from LED instead of using a narrow, collimated laser beam) proved to be a distinct advantage in resisting changing light conditions. LeddarTech's patented signal processing algorithms provided almost infallible detection capabilities when in rainy or dusty environments.

Two LeddarOne sensors placed at 18" from one another were integrated into the LowCam to provide presence detection and speed measurement capabilities. When a vehicle's bumper crosses the first sensor's field of view, the system triggers the underbody inspection cameras. When the same vehicle's bumper triggers the second sensor, the system can determine the vehicle's speed based on the time interval between the first and second triggers. This speed calculation allows for a very precise snapshot of the vehicle's license plate, framing the photo close enough so to avoid privacy concerns.



LeddarTech: A technology provider of choice

“It was extremely easy to integrate the LeddarOne into our existing Arduino architecture using an Arduino library provided by LeddarTech. LeddarTech’s support was very knowledgeable and even made some speed improvements to the library at our request, which allowed me to focus on the development of the logic needed for our application.”

– Robert Durish, Software Engineer, Advanced Detection Technologies LLC



It is easy to start developing with the LeddarOne, which can easily be purchased online and comes with an SDK. Discount quantities are available to OEMs and integrators for higher volume applications.

LeddarOne sensors can be used in various types of drones for altimetry applications. Other models of Leddar sensors, such as the multi-segment LeddarVu, cater to other drone navigation applications, including collision avoidance.

[LeddarOne product information](#)

[More on LeddarTech solutions for intelligent transportation systems](#)

