Real Speed Measurement Using Multi-Segment Flash LiDAR Sensing

How a speed enforcement solution manufacturer enables precise, undetectable and affordable speed measurement system using a single multi-segment LiDAR sensor

Automated road law enforcement is one of today's most sought-after traffic management applications. Indeed, being able to automatically detect vehicles, calculate their speed and enforce infractions—while having a calming effect on driving behaviors—is of great convenience for city administrations and legislative bodies, which can now dispatch human resources where it matters the most.

However, reliable speed calculation still is a challenge, as many outside factors can potentially jeopardize the exercise's validity. The technology used must provide very precise and consistent measurements to be enforceable in the eyes of the law. Such systems must also be energy-efficient and rugged, for they have to operate 24/7, rain or shine.

The challenges of automated law enforcement

TrafficLogix is a company that specializes in the design and development of various traffic calming solutions that are capable of providing precise speed calculations of passing vehicles. When designing the Enforcer Cam, the latest installment in their SafePace® product line, TrafficLogix wanted to take things to the next level and capitalize on the collected data to enable additional features, such as Wi-Fi connectivity and real-time reporting to nearby enforcement officers. For this reason, the core sensing technology selected had to provide rich and very accurate data.

The Enforcer Cam had to be able to detect incoming traffic at a distance of 35 m for vehicles (including motorcycles) going from 0 to 180 km/h, and determine their real speeds with a less than 3% error margin. Engineers at TrafficLogix also wanted the solution to be able to tell vehicles apart from each other, when clustered in dense traffic, for optimal enforceability. The Enforcer Cam had to withstand outdoor operation for extended periods of time, from several hours to days continuously, requiring the selected technology to be robust and remain unaf-

fected by temperature changes, ambient light variations, vibrations caused by wind or passing vehicles, and falling rain or snow.

In addition, TrafficLogix wanted a technology that was undetectable, in an attempt to counter the proliferation of radar detectors, which are getting more and more common among drivers. As such, radar technology was ruled out from the start.

About searching for the right technology for the project, here's what software engineer and project manager Ahuva Basch had to say: "*Finding an accurate, undetectable technology that could be used to measure speed and pinpoint which vehicle is the violator, thereby ensuring enforceability was a game changer.*"

A cost-effective and undetectable solution to address speed limit violations

After a thorough business analysis and comparison of similar technologies found online, TrafficLogix selected LeddarTech's M16 multi-segment LiDAR sensor module as the best solution to meet the application's requirements.

The Leddar M16 Sensor Module is an advanced sensing solution that combines 16 independent active elements into a single sensor and without any moving parts, resulting in rapid, continuous and accurate detection and ranging—including lateral discrimination—in the entire wide beam.

Contrary to radio waves used by radar-based traffic enforcement systems, the infrared light beam emitted by the M16 is virtually undetectable by common means. The M16 also benefits from a greater freedom of placement than radar when it comes to angular positioning in operational context.

The Enforcer Cam was positioned diagonally at the rear of outgoing traffic: approximately 3 to 5 m on the roadside, and at a height of 2 m. This positioning allowed the M16 sensor to monitor a 24° (hor.) by 4.5° (ver.) zone, effectively detecting multiple vehicles simultaneously in each segment at ranges up to 35 m.

The M16's rapid data acquisition rate and optimized signal processing algorithms provide precise speed calculations of all vehicles in the sensor's field of view, grouping and tracking several detection points as they move from one segment to another (e.g. side view mirror, license plate, body, etc.) for increased data reliability. The unparalleled richness of the data acquired in this manner allows the Enforcer Cam to identify vehicles that exceed a given speed threshold, providing nearby enforcement officers with the exact location, real-time photos and videos of the scene where a speed violation is detected.

LeddarTech: A technology provider of choice

Many factors influenced TrafficLogix's decision to use the Leddar M16. In addition to the undetectability of Leddar, the M16's compact size and superior power and range were key elements that justified its choice. The service received from the supplier was also an element that was praised by TrafficLogix, mentioning LeddarTech as "*very supportive on all fronts, with high levels of assistance and responsiveness during development and integration.*" according to Ms. Basch.

It is simple to start developing with the M16, which can easily be purchased online and comes with an SDK. Discount quantities are available for higher volume applications. Other models of Leddar sensors, such as the multi-segment LeddarVu, caters to other intelligent transportation solutions such as automated tolling, parking spot occupancy sensing or vehicle profiling.

Leddar M16 product information

More on LeddarTech solutions for Intelligent Transportation Systems