Efficient Automated Average Speed Control with Leddar d-tec Traffic Detection Sensors

The Challenge

The client, a global leader in digital security and identity solutions, needed to develop a system capable of efficiently determining the average speed of vehicles passing on roads and highways, as part of the local law enforcement strategy.

By measuring the average speed of vehicles, the client aimed at improving road safety, but also wanted to meet objectives such as driver behavior modification, traffic flow improvement and lower greenhouse gas emission.

The system consisted of two detection units that detected the vehicles at entry and exit of a given distance (to calculate the average speed) and a camera-based acquisition module that was triggered at entry point (to take a photo of each passing vehicle's license plate). The collected data was then transmitted to the local authorities for law enforcement purposes, if applicable.

The system had to accurately detect and identify 95% of passing vehicles with a 50 cm maximal error margin at both ends of the detection zone, for vehicles of any color or shape going from 20 to 250 km/h. The system also had to monitor two traffic lanes simultaneously, and work in adverse weather (rain, snow, fog, wind) and/or difficult lighting conditions (direct sunlight, at night, in obscured areas such as tunnels, etc.).

During the development phase, the client first tried various laser configurations, which turned out to be unsatisfactory: the laser technology had a hard time detecting dark colors, and required two units at both entry and exit points to effectively cover the detection area. Laser technology thus only allowed around 80% detection rate, as well as being very expensive.

The Solution

A representative of LeddarTech met the client during a tradeshow and suggested the Leddar d-tec traffic sensor as a potential solution.

Originally designed to be used facing the traffic flow, the Leddar d-tec was turned sideways to maximize its full 16 detection channels. By pointing the sensor slightly down towards the road, the d-tec could be used perpendicularly to the traffic flow, allowing detection over several lanes simultaneously as an effective optical barrier.

In addition to its modified spatial orientation, the Leddar d-tec was customized to further meet the client's needs. On the hardware side, the motorized pan and tilt feature was removed because the sensor had to be static to ensure precise data. On the software side, the algorithms were

optimized to filter out water trails left by vehicles in rainy conditions, and the sensor's refresh rate was increased from 12 Hz to 200 Hz to ensure maximal performance and responsiveness.

The resulting Leddar solution is able to fully meet the clients' requirements, effectively detecting passing vehicles with a near 100% success rate over two traffic lanes. The sensor works reliably in rain, fog, or snow, thanks to the use of diffused LED light sources combined with proprietary signal processing which filters out unwanted noise. The sensor's robust waterproof enclosure was used without modification by the client, thus resulting in even more economy.

Conceptualization of the Mesta 5000 automated average speed control system at entry point.
Source: Safran (Morpho). Image modified by LeddarTech.

The typical d-tec installation is fast and simple. The sensors can be mounted on new or existing infrastructure at entry and exit points of the speed calculation zone. Power over Ethernet (PoE) supply and data communication to the d-tec is done by a single Cat5 cable, and link with the acquisition module is done almost instantaneously thanks to analogic trigger signals.

The Outcome

The customized Leddar d-tec solution was selected and deployed in over 150 sites in France.

The d-tec performed almost flawlessly, as observed by the local authorities, who highlighted the sensors' reliable detection capabilities and positive impact on road safety and driver behavior.

The client praised the unmatched performance of the Leddar d-tec compared to other technologies: Leddar achieved a near 20% better detection rate than laser-based solutions, as well as being more affordable and easier to integrate, making it the all-around most cost-effective sensing technology for this application.

Product Reference
- Leddar d-tec traffic sensor