VEHICLE THREAT DETECTION SYSTEM (VTDS)

Global Adoption of Autonomous Vehicles depends heavily on safety performance, VTDS rapidly detects threats and delivers 10X safety enhancement

Autonomous vehicle (AV) control systems are challenged to 'see' and respond to the road, especially in unexpected situations, and struggle to mimic human abilities. This challenge is met by AVs having more sensors, algorithms becoming more complex, and threat detection times or computing costs increasing exponentially.

One way of better 'seeing' is by using tags. In fact, we humans rely on tags today – such tags are called retroreflectors, and are used to improve detection mainly at night. We attach tags to objects of importance such as school buses, construction workers, bicycles, road signage, ambulances, trailers, or clothing. Moreover, for AVs, tagging will allow faster more reliable threat avoidance and may be further improved over current products.

Terra Scientia has invented the next level of tagging technology with its **Vehicle Threat Detection System (VTDS),** a forward-looking laser scanner for AVs that detects a unique retroreflector tag designed exclusively for machine vision. It is being developed to supplement AV control systems by detecting threats earlier and with greater reliably than cameras, radar, ultrasonic sensors, or LIDAR. The scanner projects dual wavelengths (940 nm and 1550 nm) to improve specificity – both eye safe – both work day and night. Whenever a threat is detected, the VTDS alerts the AV's control system to take action.

Terra's tags only reflect at a specific infrared wavelength (1550 nm) making its detection signature unique in any environment. Terra's IR-only retroreflector then delivers high-sensitivity and unparalleled specificity. Dedicated to threats, the VTDS works 10X faster, with 5X the detection range, and has superior specificity to current AV systems.

Terra is leveraging both the plummeting cost of scanning laser systems and inexpensive retroreflector manufacturing to deliver an unparalleled cost/benefit safety system. Within the scanner module are dual lasers, photodetectors, optics, mechanics, and a processor and is estimated to cost below $100. The retroreflector material may be made in multiple ways, depending on application, including polymer

casting or sheet extrusion-embossing. An optical IR filter is then coated onto the polymer substrate. In volume, retroreflectors will cost less than $10 per square meter.

Our primary market is the global AV market where VTDS delivers enhanced safety and reduces cost of existing control technology. Initially, Terra will deploy VTDS in closed environments where AVs will be used: construction, mining, theme parks, gated communities, and drone applications. Ultimately, we envision VTDS's broader use in AVs and tagging deployed in school uniforms, construction vests, road signage, school buses, trailers, and any object of vulnerability or threat. When sharing the road with AVs, pedestrians, schoolchildren, and construction workers alike will feel safer knowing they are protected.

The key advantages of VTDS are:

- Highly sensitive –reflects >90% of the selected wavelength
- Highly specific - indisputable tag signature
- Rapid detection – millisecond response for frontal volumetric scan
- Works night and day
- Low cost
- Redundancy - improves safety by 10X