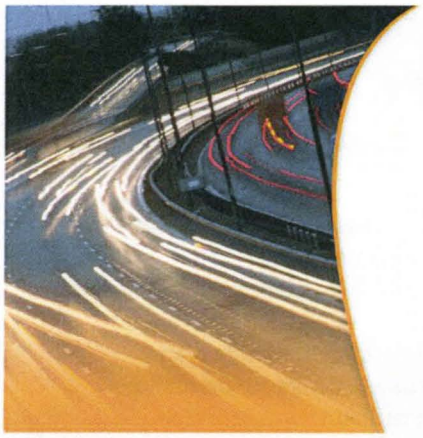

Traffic Speed LiDAR

What is Traffic Speed LiDAR?

By combining well-established laser scanning technologies with geographical positioning systems common to contemporary pavement survey vehicles, Traffic Speed LiDAR provides 3-dimensional measurements of roads and roadside infrastructure collected from a vehicle moving at traffic-speeds.

The technology

The LiDAR measurement unit contains of a set of rotating lasers that spin through 360 degrees at speeds of up to 900 rpm. The lasers measure the distance from the measurement head to any object that lies in the view of the spinning laser beams. Combined, the lasers collect over a million points per second. The unit is integrated into a survey vehicle incorporating a differential GPS and an Inertial Measurement Unit (IMU) that provides information on the location, bearing, pitch and roll of the vehicle as it drives over the network. By combining the inertial and laser measurements, and carrying out a data transformation, the information from the LiDAR can be visualised as a 3D 'survey space' and used to generate a 3D picture of the roadside infrastructure surrounding the vehicle.

TRL has integrated a LiDAR measurement unit into the HARRIS2 traffic-speed survey vehicle, and merged their data acquisition systems. HARRIS2 previously provided high resolution images and laser profile measurements of the pavement surface. The new combined survey vehicle can now not only provide these accurate laser scans of the road surface, but also a 3D image of the roadside infrastructure. Unique things about the HARRIS2 application is that the LiDAR is mounted perpendicular to the road, so the system scans in a circle around the vehicle's longitudinal axis, whereas others tend to mount the LiDAR horizontally. TRL also has other condition measurements on the same system, and whereas others don't.

The HARRIS2 LiDAR is a Velodyne unit employing 64 lasers capable of identifying the positions of objects up to 100m distant at a rated accuracy of ±2cm. However, this does not

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define the overall accuracy, because that depends on the IMU, the integration on the vehicle, and the software used. The accuracy of any point in space is close to 20cm. However, that is absolute, not relative accuracy.

Presently we are carrying out a series of improvements to the HARRIS2 LiDAR system as part of an HA project to further develop its capabilities and demonstrate its uses. Both static and high speed trials are planned in which an assessment of the system's measurement accuracy under different survey conditions will be tested. Our developments are focussing on the needs of the trunk road surveyor, by concentrating on delivering assessment and visualisation tools that can cope with lengthy single pass surveys of major highways.

Applications

With a single survey at traffic speed a vehicle can map the 3-dimensional structure of a road's assets without the need for closures or disruption to traffic. It offers the potential for a large range of applications such as:

- Measurement of bridge/gantry clearances
- Barrier height measurements. It could be used alongside forward video to assess barriers.
- Inspection of earthworks adjacent to the carriageway – e.g. identifying "large" changes.
- Measuring road or rail "envelopes", e.g. to determine size of access (e.g. on local roads) or hard shoulder/edge strip size.
- Recording inventory, when combined with forward video
- Getting rapid 3D information to help plan diversions, closures etc where fundamental accuracy is not essential.
- Investigating incidents (e.g. 3D modelling at accident sites).
- To rapidly provide the framework for 3D models of tunnels, bridges etc.
- To measure deterioration in road and rail tunnels and perhaps bridges (especially masonry – missing bricks etc.)

Further Information

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