

Measuring distances in microseconds

November 5 2009



In a measurement channel the laser radar (on the right) determines the distance of an object up to 80 meters away every two microseconds or faster. (© Fraunhofer IPM)

(PhysOrg.com) -- Standard laser devices are fast enough for measuring the size of a room, but they need to be faster for outdoor mobile applications. Researchers have brought these scanners up to speed -- they can measure ten times faster than usual scanners.

Will the massive truck be able to pass under the bridge or should it take another route? Do the houses lining the street leave enough room for the oversized vehicle to pass through? Such questions are answered by sending out a car fitted with distance measuring equipment to check the route the heavy load will take. A [laser](#) mounted on the car scans bridges, buildings, signs and trees along the way.

Working on the time-of-flight principle, the scanner sends out short laser pulses which are reflected by the obstacles they encounter. The time the light needs to travel to the obstacle and back to the integrated sensor provides the distance measurement. The results are coupled with the car's GPS position.

Unfortunately, the car has to travel very slowly to pick up enough points on the objects for accurate measurements. Using scanners of this type in airplanes or helicopters to determine terrain elevations and objects on the ground is also problematic, as high plane speed means the resolution is low and the resulting image incomplete.

Researchers at the Fraunhofer Institute for Physical Measurement Techniques IPM in Freiburg have now substantially increased the speed of distance measurement, which is the key to more efficient laser scanning. “We can either measure ten times faster or retain the scanner speed but analyze ten times as many points of an object - for instance from an airplane,” explains Dr. Ilia Bourovoy, project manager at the IPM. The laser measures the distance several million times per second. Dr. Bourovoy reveals how the researchers achieve this speed: “We have developed new electronic circuits and special software to process the data. In addition we have optimized the laser pulse rate.”

While conventional scanners need several pulses for one measurement, the new pulse laser radar can determine the [distance](#) on the basis of each individual transmitted pulse. Apart from higher measurement speed, this offers the further advantage that the measured values do not depend on the speed at which the scanner is moving - for instance when mounted on a car or airplane. Scanners requiring several [laser pulses](#) per point produce blurred images as the scanner has already moved when the next pulses are transmitted.

The new pulse laser radar device has already been built on a laboratory

scale. In future, cars equipped with it will be able to travel at regular traffic speed as they record 3D data along roads. From aircraft too the pulse laser radar will deliver a high measurement point density.

Provided by Fraunhofer-Gesellschaft ([news](#) : [web](#))

Citation: Measuring distances in microseconds (2009, November 5) retrieved 24 April 2024 from <https://phys.org/news/2009-11-distances-microseconds.html>

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