LIDAR SYSTEM FOR APPLICATIONS IN THE AUTOMOBILE INDUSTRY

Task

Driver assistance systems are increasingly being used to partially or fully autonomously drive vehicles. Such systems must be able to detect objects and obstacles in the environment both quickly and reliably. In addition to radar sensors, LIDAR systems are increasingly being used for such purposes. These systems determine the distances to surrounding objects by time-of-flight measurements of reflected laser radiation. Conventional LIDAR systems incorporate a mechanical beam deflector (scanner), whose function and reliability may be affected by the vibrations that occur in the vehicle. In addition, the sampling rate is limited by inertia. For these reasons, a LIDAR system without moving parts is desirable, one that operates reliably, maintenance-free, at a high sampling rate, in a large ambient temperature range and under mechanical loads caused by shocks and vibrations.

For this purpose, a LIDAR demonstrator with a linear beam profile without moving parts was developed at Fraunhofer ILT in close cooperation with Fraunhofer IMS in Duisburg.

Method

In the LIDAR demonstrator, the radiation of a pulsed diode laser is horizontally expanded to approximately 40 degrees by a micro-optical system. The reflected laser radiation on objects is mapped to a line sensor with 80 pixels. The sensor was developed at Fraunhofer IMS and is based on SPAD technology, which enables high optical sensitivity at a sampling rate in the kHz range.

Results

The LIDAR demonstrator was able to detect objects at a distance of up to 30 meters at a field of view of 40 degrees. The sampling rate is currently 10 kHz.

Applications

The LIDAR system serves as a sensor-based component for driver assistance systems and can, for example, be used in the field of autonomous driving. Objects in the roadway area, such as obstacles or vehicles in front, can be reliably detected even under harsh environmental conditions.

Contact

Dr. Thomas Westphalen
Telephone +49 241 8906-374
thomas.westphalen@ilt.fraunhofer.de

Dipl.-Ing. Dipl.-Wirt.Ing. Martin Traub
Telephone +49 241 8906-342
martin.traub@ilt.fraunhofer.de

1 LIDAR demonstrator.

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
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