



1 Point cloud embedded
in open source environment

2 Measurement vehicle
REDAR

3 Visualization of data in
RODOS®

3D ENVIRONMENT ACQUISITION WITH REDAR

REDAR – Road and Environmental Data Acquisition Rover

Acquiring high quality 3D road surface and environmental data is getting more and more important, e.g. in the area of vehicle virtual product development and simulation. REDAR has been developed as an efficient solution to those needs.

A kinematic measurement system can help to digitize both: road surfaces and buildings/vegetation. The advantage compared to conventional static measurements is a significant saving of time without having to accept a loss of quality necessarily.

At the Fraunhofer ITWM, on basis of a multi-purpose vehicle, a measurement unit was designed and built which is capable to record three-dimensional data with millimeter accuracy. REDAR is able to acquire data by driving in typical traffic situations, while at reduced speed – such as on automotive test tracks – the data density can be increased

up to a 5 by 5 mm grid for special and high-end simulation purposes.

Because the entire sensor system is located outside of the carrier vehicle, the modular structure can be adapted depending on the situation and tasks. It is possible to use additional sensors or any other carrier vehicle (e.g. air or water vehicles).

Depending on customer requirements, the high-precision data can be treated in a variety of post-processings and can be established according to the purposes for usage in the fields of fatigue strength or status detection. The captured circumstantial environments (including buildings and vegetation) can for example be used for ambient illustration in the driving simulator RODOS®. This offers both: a very realistic visual simulation environment and on the other hand, a highly accurate description of the road

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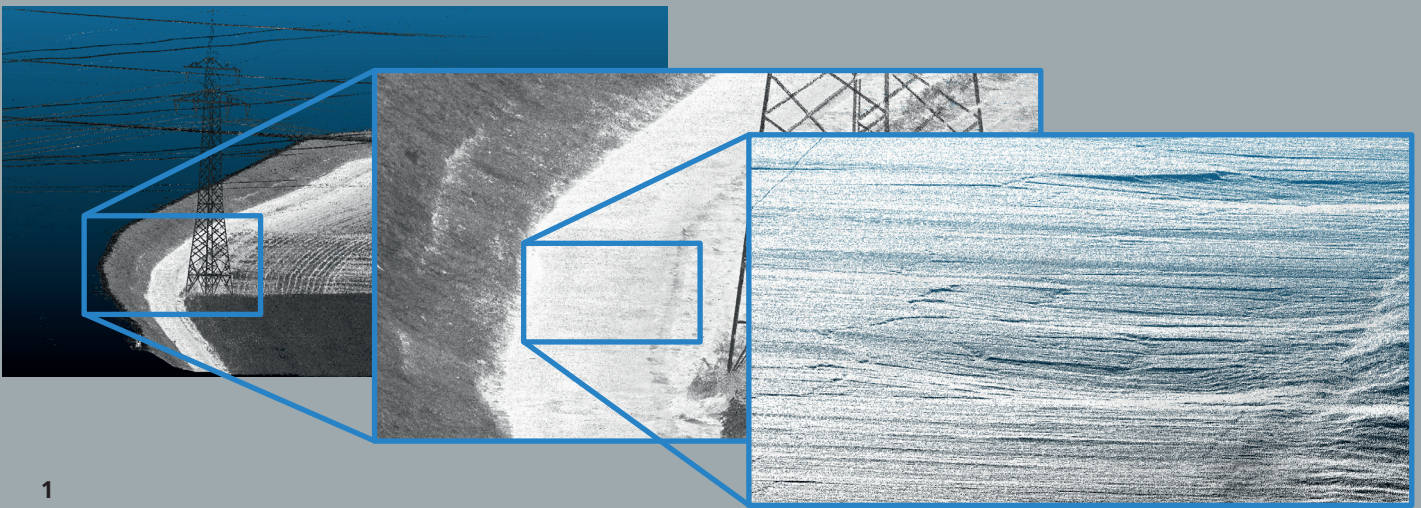
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surface as basis for calculating the vehicle movement in vehicle or tire simulation (for example with **CDTire**). Additionally, REDAR can enlarge road databases (as for example in **VMC**) with every driven kilometer and expand comprehensive datasets with variables (such as road roughness value, IRI, etc.), which are derived from the measured data.

Applications with REDAR

- Condition assessment of roads and buildings (tunnels, bridges, etc.)
- Road surface model for (multi-body) simulation; keyword "digital road"
- Assessment of road irregularities by standardized parameters (IRI, C, etc.)
- Connection to the ITWM own driving simulator RODOS®, VMC® and CDTire
- Pictographic documentation of road space

Benefits of REDAR

- Millimeter-precise digitization of real roads and environments
- Measurements during ongoing traffic possible – no complicated/expensive closures or night driving
- Point density depending on vehicle speed
- Surface models in homogeneous grid (for example 5 mm × 5 mm)
- Simultaneous acquisition of vehicle-dependent variables such as wheel hub or body accelerations
- Modular measurement setup – different sensor configuration or carrier vehicles
- Output formats (extract): .crg, .las, .pts, Wavefront OBJ

Standard equipment

- Two high-performance laser scanners, each with more than 1 million pixels per second
- A high-precision IMU (Inertial Measurement Unit)
- GPS
- Distance sensor
- Four industrial color cameras with 5 megapixels each
- Onboard data acquisition computer
- Generator and uninterruptible power supply