1 *Range imaging sensor.*
Photo: Olaf Poenicke, Fraunhofer IFF
2 *Range image for computing object volumes. Image: Fraunhofer IFF*

RANGE IMAGING SENSOR SYSTEMS FOR MORE TRANSPARENCY IN PRODUCTION AND LOGISTICS SYSTEMS

Fraunhofer Institute for Factory Operation and Automation IFF

Prof. Michael Schenk

Sandtorstrasse 22
39106 Magdeburg
Germany

Contact
Material Handling Engineering and Systems

Prof. Klaus Richter
Phone +49 391 4090-420
klaus.richter@iff.fraunhofer.de

www.iff.fraunhofer.de/en/mft

Range Imaging for More Efficient Processes

Demands for automatic object contour scanning in production and logistics are growing, whether to compute necessary shipping capacities, to optimize packing structures, to scan shipment sizes in order to control sorting systems or to determine the filling level of storage areas or cargo spaces.

A research and development partner, the Fraunhofer IFF has a solution for this: Fraunhofer researchers are transferring new high-tech sensor systems originally from the consumer goods industry to technical applications in production and logistics environments. These range imaging sensors – at a low price common for the consumer good sector – satisfy industry standards for the quality if measurement.

The researchers at the Fraunhofer IFF develop custom integrative solutions that robustly use high-tech range imaging sensor systems in production and logistics.

Advantages at a Glance

– Custom integration of applications from one source
– Analysis of processes, development of algorithms and integration of sensors and data in higher-level systems
– Inexpensive sensor systems, even with integrated processors for integration in networks by Ethernet (http, Profinet)
– Extensive software module kits for the analysis of measured data and modification for customer needs

1

2

Principle of Operation

The range imaging sensor system records images with 3D data of measured objects or evaluated storage areas and cargo spaces. First, the system is calibrated for an empty measurement environment as a reference for the computation of object volumes and dimensions. The range images generated from the objects in the effective range are subsequently always cross-checked against these reference measurements.

With a high quality of measurement, the range imaging sensor system delivers:
– contour data with a resolution of 640x480 depth values,
– measuring accuracy of up to ±1 cm at a maximum measuring frequency of 30 Hz and
– robust measured values, even for moving objects (conveying speeds of up to 5 m/s).

Depending on the application, a measurement system consists of one or more range imaging sensors and a processor that preprocesses measured data and transmits them to higher-level systems. Ethernet links it in networks or cellular radio in mobile applications.

Application: Cargo Space Monitoring

One practical application of the range imaging sensor system is the automatic cargo space monitoring system developed by the Fraunhofer IFF. This systems approach automatically scans the packing of cargo space of commercial vehicles en route, thus generating novel approaches to optimizing transport systems in freight transportation.

The automatic measurement of a cargo space's filling level is transmitted together with the vehicle's current location (GPS) to a logistics control center where the real time data can be used to flexibly route vehicles and assign jobs ad hoc. When suitable free cargo space is available, ad hoc jobs can be assigned to shipments already under way to utilize vehicles more efficiently.

This novel, inexpensive systems solution, installed in the top of the cargo space, generates a precise spatial representation of the cargo space down to a few centimeters based on events (e.g. at every delivery stop). A downstream processor generates an equidistant volume model from the raw data and computes the free cargo space.

Application: Object Measurement

Another potential application in addition to automatic checks of cargo space utilization is the scanning of individual shipments or picked items. This can be done both in static applications that scan pallet contours (e.g. to determine the necessary quantity of securing equipment such as winch straps) or even in the material flow (e.g. to control parcel sorting processes).

The range imaging sensor system can also robustly measure volume flows such as bulk material transported on conveyor systems.

Our Services

Let us help you organize your production and logistics processes more robustly and efficiently by using range imaging sensor system.

Our extensive software libraries and our integration know-how enable us to respond to your measuring needs flexibly and develop suitable applications, from sensor integration through sensor data processing. We can configure hybrid systems, e.g. range imaging sensor systems combined with RFID, to enable you to leverage additional potentials for efficiency.

1 *Range image scanning of free capacity in cargo space. Photo: Fraunhofer IFF*
2 *Using the data in a control center to schedule ad hoc job orders. Photo: Dirk Mahler, Fraunhofer IFF*