

# Reliable localization of 3D reflection points in air by an active ultrasound sensor

The ultrasound sensor enables 3D measurement (distance and bearing) of multiple reflection points in air. The compact design delivers object-independent results with high accuracy. Applicability for complex environments is ensured by construction.

## BACKGROUND

Ultrasonic sensors have a broad applicability in industrial applications. Despite the simplicity of simple pulse-echo sensors for ranging, ease of use vanishes quickly in complex environments. Problems encountered are echoes outside of the acoustic axis, multipath reflections, object discontinuities and multiple reflectors in the field of view. The proposed and patented 3D compact sensor is an active ultrasound emitting sensor for 3D localization of multiple reflection points. It provides a wide field of view, short measurement durations, low uncertainty, good object separation capabilities and high robustness in complex environments.

## TECHNOLOGY

The sensor consists of a centered ultrasonic sound emitting device and multiple receivers. Using pulse compression techniques and ultrasound in

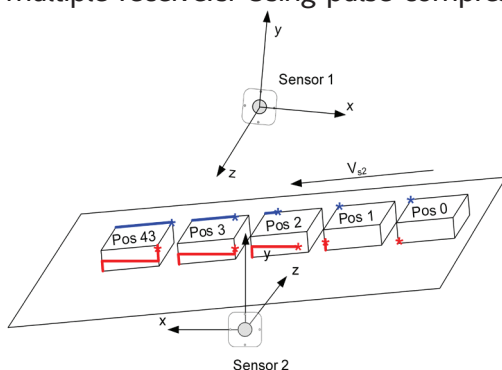


Fig: Parameter measurement of a moving object on a conveyor belt.

the frequency band up to 100 kHz low uncertainty and good noise immunity is achieved. Due to compact construction object dependence of reflectors can be neglected. Efficient methods for 3D localization inherently avoid outliers due to object discontinuities and solving of the channel correspondence problem while still providing fast localization.

## BENEFITS

- Localization of multiple 3D reflection points within a single measurement at a repetition rate of  $\sim 10$  Hz.
- Compact construction (80x80mm) allows 3D measurement independent of object shape.
- Low uncertainty (sub-degree, sub-mm)
- Efficient methods for 3D localization allow detection of outliers due to object discontinuities and solving the echo correspondence problem.
- Object positions and shapes are calculated by sensor movement relative to objects.

## POTENTIAL APPLICATION

- Scene analysis with moving sensor
- Robot guidance with mounted sensor
- Analysis of objects moved by a conveyor
- Setups of cooperating sensors

**REFERENCE:**  
M015/2014

**DEVELOPMENT STATUS:**  
A test-setup based on lab-equipment and MATLAB post-processing was used to successfully verify the applications

## KEYWORDS

Ultrasound sensor, precise 3D measurement, object independence

## IPR:

Patent granted in AT  
PCT filed

## COOPERATION OPTIONS:

License agreement  
R&D cooperation

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