Newsletter
July 2013

Project Number: **248623** Project Website: **www.taco-project.eu** Project start: **February 1, 2010** Project duration: **42 months**

PHOTO: IPM

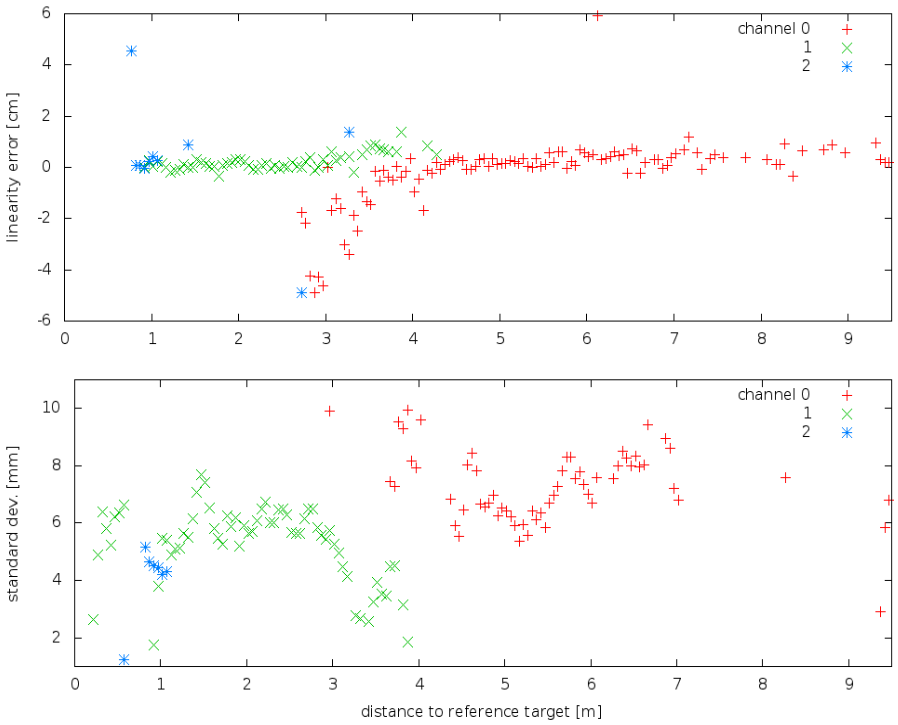

Figure 1: The Linearity error (difference of reported to true distance to a reference target, upper part) of the scanner and standard deviation of repeated measurements to the reference target (lower part of the figure) target are often used for performance characterization of TOF systems. Here, blue color denotes the least, red color the most sensitive TOF channel of TACO. The linearization error is below 1 cm and standard deviation between 3 and 8 mm depending on channel sensitivity and target distance, slightly larger than projected and mostly due to laser speckle of the small measurement spot.

The TACO sensor prototype – robust 3D imaging

TACO implements for the first time an advanced scanning concept, based on an array of steerable micro-mirrors in combination with a pulse laser distance measurement in order to provide 3D imaging.

This approach provides both accurate data at unsurpassed point rate while at the same time offering significant flexibility in the definition of image geometry, resolution and frame rate. TACO's operation principle ensures robust sensing, independent of environmental lighting conditions.

The micro mirrors' flexibility for the image construction comes at the price of a technical challenge for the distance measurement: the small optically active area of the millimeter-sized mirrors must be compensated by the laser power and sensitivity of the measurement circuitry.

TACO's opto-electronical system is divided into parallel channels, each dedicated to a specific range of input signal amplitudes, covering the large signals of well reflecting objects close to the system as well as the dim signals close to the system noise level from distant, little reflecting surfaces.

PHOTO: Technikon

Patricia Rio Branco, editor

Editorial

Dear reader,

This is a busy time for consortium members as the TACO project comes closer to its conclusion at the end of July. After over three fruitful years of joint cooperation, partners prepare to finalise their tasks in a final push to achieve the goals set out at the start of the project. These results will be discussed in the 3rd Review Meeting on 10 September in London.

This third and final edition therefore provides a brief status report of the 3d sensor hardware as well as planned end-user activities.

We hope that the content of this issue is of interest to you. Any feedback is warmly welcome.

About TACO

TACO – Three-dimensional Adaptive Camera with object Detection and Foveation - is a specific targeted research project, co-financed by the European Commission under the EU Seventh Framework Programme. The project is running for 42 months from February 2010 to July 2013.

TACO aims at developing a 3D sensing system with real 3D foveation properties endowing service robots with a higher level of motion and affordance perception and interaction capabilities with respect to everyday objects and environments. The interdisciplinary project consortium consists of 7 European partners from industry and academia.

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Figures 1 and 2 show the performance figures of the TACO prototype and a sample 3D image taken during the system test phase with the TACO time-of-flight (TOF) system and a 10 mm aperture galvanometric scanner (slightly larger than the current TACO optics).

Article source: Stefan Schwarzer, IPM

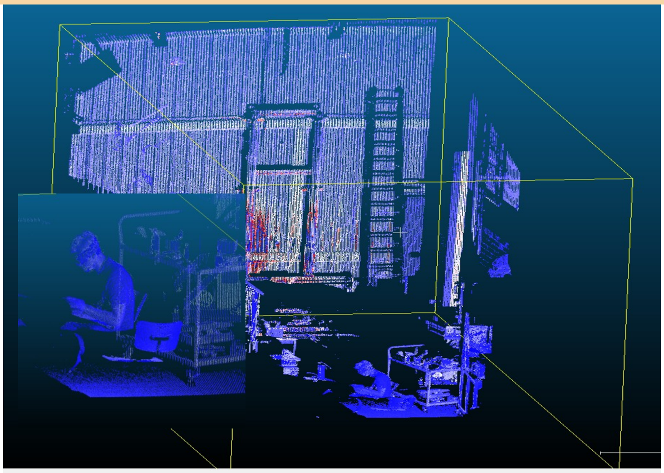

PHOTO: IPM

Figure 2: 3D image of the scanner laboratory. The inset in the lower left corner is a zoom into the lower right part of the full image that demonstrates the possible resolution of the system. The visible line structure demonstrates the choice of mirror trajectories.

Final investigations into the performance and benefits of the TACO sensor are under way

TACO finished sensor is currently being tested at Shadow Robot Company is expected to be finalised by the end of July.

It is an exciting time for the project as the finished sensor has now been delivered to the testing partners and evaluation against the selected use cases can now commence.

At the time of writing, the TACO sensor is with Shadow Robot Company in London where it is being used to provide data that facilitates the automated grasping of objects passed to the Shadow Dextrous Hand. Shadow prepared for the arrival of the TACO sensor by using a Microsoft Kinect sensor to emulate TACO sensor data and are hoping for some interesting results from the absolute distance measurement afforded by the TACO sensor.

Later in the testing program the benefits of the TACO sensor in areas including 3D inspection tasks, robot operator situational awareness, self-localisation in domestic environments and object recognition and localisation will be investigated. For 3D inspection, the goal will be to demonstrate that the dynamic resolution of the TACO sensor permits faster scanning of larger areas, whilst maintaining a high level of detail in regions of interest by utilising the foveation capabilities of the sensor. The higher spatial resolution available from the sensor is also of interest to object recognition, where higher resolution at increased range is expected to yield a more accurate representation of the object's surface.

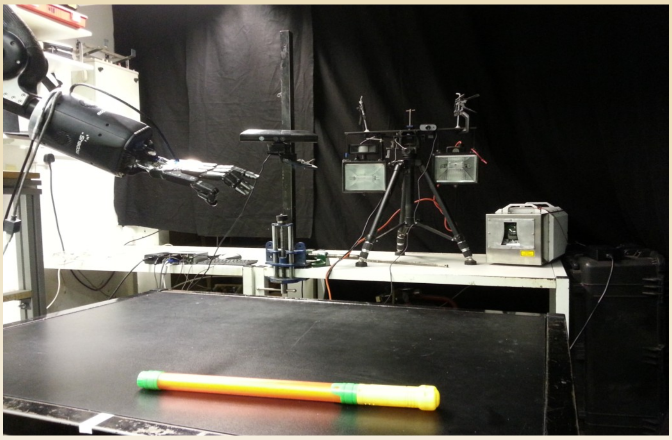

PHOTO: SHADOW

Figure 3: SHADOW test set-up

All testing activities are expected to conclude by the end of July and the TACO consortium are looking forward to sharing the results of three years of development efforts with the community.

Article source: Ryan King, OTL

Consortium:

1 **Technikon Forschungs- und Planungsgesellschaft mbH (Austria)**

2 **CTR AG, F&E Zentrum für Sensorik (Austria)**

3 **Stiftelsen SINTEF (Norway)**

4 **TU Wien (Austria)**

5 **Oxford Technologies (UK)**

6 **Shadow Robot Company (UK)**

7 **Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (Germany)**

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