

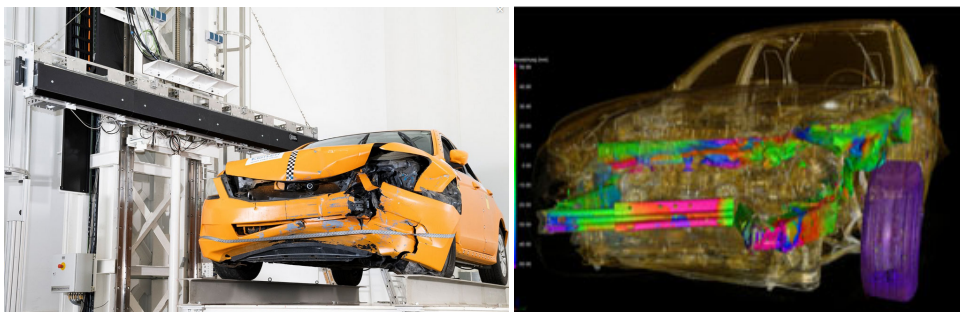
European Machine Vision Forum

Visit of the labs of the Development Center for X-ray Technology of the Fraunhofer IIS

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XXL Computertomography

The XXL CT hall in Fürth is one of the largest x-ray systems in the world. Thanks to the use of high X-ray energies it is possible to examine very large objects such as, for example, assembled vehicles (or crash cars), sea-freight containers or aircraft parts, in 2d as well as in 3d. As a result, the customer receives 2d or 3d images of the examined object which can be used for further analysis and evaluation.



DeepDive/Giant Eye

The latest development is a second XXL CT hall which is still under construction and will be opened to the public in the end of 2025.

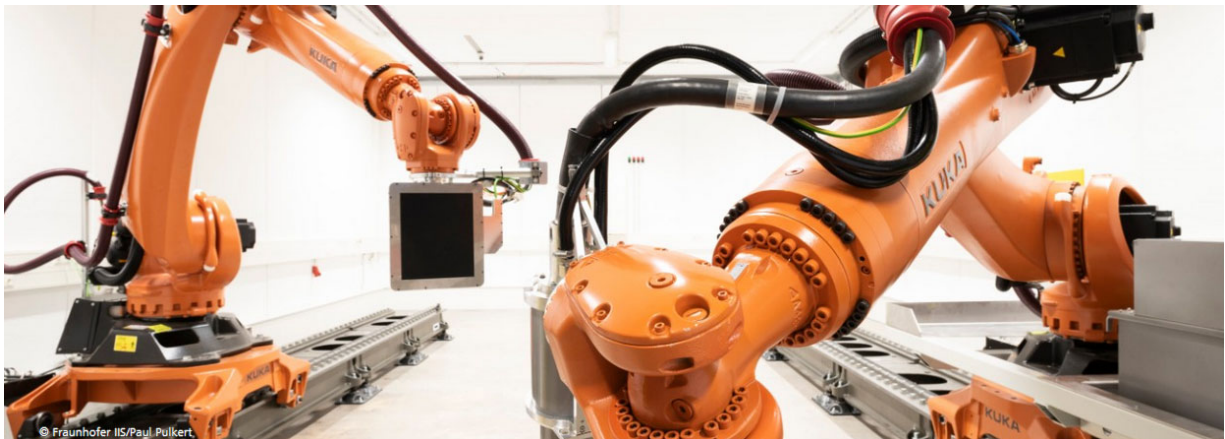
In this system, the object (i.e. electronic vehicles) can remain in the horizontal position for being examined, which is a necessity for i.e. electronic vehicles other than in the previous hall, where the objects have to be brought in a horizontal position. This system will be presented to the participants during the evening session on Thursday and will also be addressed in the keynote by M. Salamon.



Robot-Based Micro-Computed Tomography for Large Components (RoboCT)

For bulky components in automotive manufacturing, such as side frames or attachments like doors and tailgates, as well as fuselage components from the aerospace sector, there have not been any series-capable or production-integrated X-ray systems available in the past, especially not for a complete 3D CT examination. Such examinations could only be conducted under laboratory conditions with immense effort at a few suitably equipped locations.

With RoboCT, however, large or complexly shaped components, which would otherwise hardly fit into a CT system, can be examined and inspected using X-ray and micro-computed tomography. Two or more large robots move the X-ray tube and detector around the object and examine it without the need to disassemble it.



Phenotyping with X-Ray

Underground root structures and ripening processes of fruiting heads

At the Development Center for X-Ray Technology a climate chamber that can precisely simulate the temperature and humidity of any region, has been established. Plants of different genotypes are automatically transported to the X-ray source on a conveyor system. The facility is capable of producing 3D CT images.

Climate change has a significant impact on global flora, especially on crops. Many plant species are not able to adapt quickly enough to the new conditions. Plant varieties that can be cultivated profitably even under adverse conditions will become increasingly important to society. Until now, anyone who wanted to study roots and tubers had to dig them up. As a consequence of this irreversible type of analysis, the evaluation of time-resolved information could be realized only via statistical methods.

The “RootForce” algorithm, developed specifically for this purpose, can reliably separate the root structure from the rest of the image, allowing the root structures to be precisely evaluated. These images can be viewed over time to determine which genotype is the most promising candidate for specific climatic conditions.



X-ray radiation stable detectors XEye

In industrial use, flat-panel detectors and conventional line scan cameras have to be replaced often because after short periods of operation they suffer irreversible damage due to the high radiation exposure. Because the scintillator does not completely absorb the X-rays, the semiconductor located directly behind it, is damaged by the radiation. This becomes noticeable, for example, in pixel or column defects, or in the superimposition of various images, the so-called image lag.

Therefore, the Development Center for X-ray Technology has developed the XEye digital X-ray detector series which offers consistently high image quality and long service life. It ensures reliable results in industrial X-ray inspection over many years of use. Due to the detector's robust image quality, image processing parameters no longer need to be updated for automatic fault detection. There is a wide range of technical models, among which also a high speed sensor, with which occurrences in movements (like in motors) can be made visible.



Reliable yield forecasting using X-ray technology DeBiFiX:

With the help of the autonomous field robot DeBiFiX (Determination of Biomass on the Field with X-ray), it is possible to make detailed biomass determinations of growing plants in the field. Using X-ray technology, visually inaccessible fruits such as chickpea pods, rapeseed pods, or wheat ears are completely recorded and digitally evaluated. Thanks to the non-destructive process, this can be performed repeatedly, providing a dynamic picture of yield development during the growing season. The technology can be flexibly expanded by additional cognitive sensor systems such as RGB, hyperspectral, and laser light sectioning. Breeding issues such as the early selection of high-yielding and stress-resistant varieties can therefore be addressed much more quickly, precisely, and efficiently than before.

