Dear partners and friends of Fraunhofer IGD,

The Hannover Messe is a great opportunity for our scientists to present their research findings to the international community. In the last issue, we gave you a preview on our exhibition appearance at Hannover Messe; in this issue you will find a retrospective covering even more fascinating topics from the event.

- Interactive flow simulation in real time
- Production at a glance with Plant@Hand3D
- Improving compressors via the cloud
- Fraunhofer 3D scanning technology facilitates fully automated digitization

I hope you will enjoy reading all about it!

Dieter W. Fellner, Professor

INTERACTIVE FLOW SIMULATION IN REAL TIME

Be it in urban planning or in the automotive industry, virtual wind tunnels help save costs and fast-track developments. It takes patience, however, to compute flow simulations. At this year’s Hannover Messe, Fraunhofer researchers have shown that it can be interactive as well.

When it comes to buildings, aircraft, and cars, it is important to know their air resistance or how airflow will behave when it hits them. In the draft process, the 3D model is therefore subjected to a pertinent simulation. However, it is often very processing-intensive and it takes several hours, or even days, before the engineers have the results for analysis. This interrupts the design process, thus prolonging the development time.

For several years, Fraunhofer IGD has been working on accelerating flow simulations by means of state-of-the-art graphic card processors in such a way that engineers or designers will be able to instantly review their drafts. “Our demonstrator will show what becomes possible if individual simulation steps can..."
be processed within fractions of seconds,” explains Professor André Stork of Fraunhofer IGD. “The user can look right at the simulation as it is being processed and interact with the system at the same time.” In the “Tangible Simulation” demonstrator, the wind flow for several real objects is processed in the form of speed and pressure fields. In the process, a camera captures the real objects in order to determine their position and speed.

These parameters serve as input for the simulation, in which a user can interactively analyze the impact of the objects’ position changes on the flow field. “The computed flow is thereby not quite as physically precise as in lengthy processes,” explains Stork. “However, it can be more than sufficient to provide better results in the design process, thus significantly accelerating the development.”

For more information: https://www.igd.fraunhofer.de/IET

PRODUCTION AT A GLANCE WITH PLANT@HAND3D

The fourth industrial revolution is changing production processes and environments. At Hannover Messe 2016, the researchers of Fraunhofer IGD have shown how to clearly locate the generated data and information to accelerate decision-making processes.

Digital technologies are changing production processes and environments. Manufacturing environments are becoming more complex, and many processes are semi-automated. Frequently, information is updated at one-second intervals, while it must always be possible to record and analyze it. For any business to be competitive, it is not only important that employees have access to the right information at the right time, but also that they understand this information in order to respond to it quickly and appropriately.

Previously, each production planning and management system required its own analysis. “Our solution, Plant@Hand3D combines all key production information in one application,” explains Professor Bodo Urban of Fraunhofer IGD. “In the process, intuitive access to production data is of particular importance to us.” A realistic 3D model of the production environment serves as a starting point here. All data are managed on an interactive multi-touch table. With simple finger gestures, individual machines can be zoomed in on from an overview of the entire hall. Snapshots of production records are presented on each machine with overlays.

Compliance with the real environment facilitates intuitive locating and understanding of information. “We can see right away where production processes are held up or material is lacking,” says Urban. The overview is immensely important for the production manager – he is able to better plan orders and assign tasks to employees in a more coordinated way. This supports fast decision-making and response. The individual employees also have all required information at a glance on displays in the production hall or on tablet PCs at their workplace. Smartwatches can also be integrated in the information chain.

For more information: http://igd-r.de/plant-at-hand-3d
IMPROVING COMPRESSORS VIA THE CLOUD

Small and medium-sized companies have a demand for engineering software and high computing power. An EU project coordinated by Fraunhofer IGD provides both. Cloud technology facilitates the development of compressors. The partners have presented their experiment at this year’s Hannover Messe.

46 partner institutions from 13 European countries are working together in the EU project, CloudFlow. The idea is to provide small and medium-sized companies with the opportunity, by means of cloud computing, to use simulation software via the internet on the CloudFlow platform. In doing so, the available servers provide very high computing power to solve complex tasks (High Performance Computing, or HPC).

“In practice, mainly small companies must do without many of the possibilities offered by engineering software available today,” explains Professor André Stork of Fraunhofer IGD, Coordinator of CloudFlow. “Small engineering firms need some special solutions only a few times a year and therefore pass them on to experts or refuse to take them on in the first place.”

The special software made available with CloudFlow no longer needs to be installed and licensed on local computers, but is used online for the time needed. Business models such as pay-per-use are thus possible. The user pays for the computing power and the time he or she is using the software online.

The company BOGE KOMPRESSOREN is one of the oldest manufacturers of compressors in Germany and one of the partners of CloudFlow. In order to meet its high quality requirements, the software used for development is of great importance. For instance, BOGE designers work on improving the machine’s efficiency by lowering fan performance and reducing noise emission.

In the case of BOGE, Computational Fluid Dynamics (CFD) simulation software FlowVision by Capvidia is used, which was optimized by the provider for this application and use in the cloud. Via the CloudFlow platform, BOGE can cost-effectively use the software, while at the same time taking advantage of the high-performance computing infrastructure, by calculating and evaluating different scenarios in parallel.

CloudFlow is funded as a joint project within the scope of the 7th Research Framework Program of the European Commission (Grant Agreement No. 609 100).

For more information: http://www.eu-cloudflow.eu

YOUTUBE PODCAST

Our Visual Computing Report is also available as a video podcast. We present our most exciting research projects once a quarter on Fraunhofer IGD’s Youtube channel. Stop by and have a look!
https://www.youtube.com/user/FhVCC
FRAUNHOFER 3D SCANNING TECHNOLOGY FACILITATES FULLY AUTOMATED DIGITIZATION

3D models of objects can enhance online stores. However, 3D scans are time-consuming and cost-intensive. Fraunhofer IGD has presented a solution for the mass digitization of 3D objects at this year’s Hannover Messe.

Owners of online stores rely on image material. Photos on the internet show the customers what the product to be ordered looks like. However, this is often a very superficial assessment. If, instead, you can take an object off the virtual shelf and look at it from all angles as a 3D model, the customer benefits. For such a 3D online store to be realized, the objects first need to be scanned. “With the fully automated scanning facility CultLab3D, this is economically and expeditiously feasible,” explains Pedro Santos of Fraunhofer IGD.

Santos and his team originally developed the scanning facility for the digitization of cultural artifacts. For the millions upon millions of artifacts preserved by museums, the usual recording by means of manually positioned 3D scanners cannot be mastered and is nearly unaffordable. In the past three years, an option was created with CultLab3D to digitize small to medium-sized objects in a fully automated manner. For this purpose, the cultural artifacts or products are placed on a perspex tray and taken to the first scanning station on a conveyor belt. There, industrial cameras installed on a mobile camera arc and below the tray capture the artifact with a great number of high-resolution 2D images from different angles.

A first 3D model can already be computed from these images. The procedure is called photogrammetry. Based on this first model, an intelligent robot arm works at a second station. It is equipped with a camera and able to efficiently and quickly photograph all those spots the scanning arc was not able to capture. Any possible gaps in the 3D model are thus closed. “Capturing geometry and texture takes about 10 minutes,” explains Santos. “The 3D model is finished after about another 30 minutes.”

For more information: http://www.cultlab3d.de