



## PREFACE

Dear Partners and Friends of Fraunhofer IGD,

In the name of the researchers at Fraunhofer IGD I wish you all the very best for 2010. We are well prepared to address the demanding challenges in Visual Computing in this new decade and are confident that we will succeed in reaching our goals. This issue's short review of the last quarter in 2009 shows that the world's leading institute for applied Visual Computing continues to progress very nicely.

I hope you will enjoy this report.

Dieter W. Fellner, Professor

## WORLD CULTURE IS GOING 3D DIGITAL

Project 3D-COFORM, which is a European consortium, is collecting works of art and museum exhibitions in a digital archive in three-dimensional form. This is being done to make it easier for researchers to find suitable reference objects and also offer lay persons a fascinating 3D show.

Printed catalogues with photographs and written descriptions of museum exhibitions are the standard of today. Taking a look into the future on a display screen, one can watch Michelangelo's David statue and other masterpieces rotate around their axes in 3D to get an idea of what this project's researchers are developing: a virtual archive of the world's works of art. Vases, historic spears and entire temples are safeguarded this way in three-dimensional digital form.

This virtual collection is particularly intended to make it easier for scientists to find reference objects that are stored in museum archives but have otherwise been forgotten. Moreover, information about surface condition or the state of a color can also be collected and retrieved

in three-dimensional form. As the David statue shows, we already have impressive 3D models of works of art. »However, effective linking between three-dimensional components of different objects is still out of reach,« explains Dr. André Stork, Fraunhofer IGD's department head for the 3D-COFORM project.

The 3D models for the digital archive are created at Fraunhofer IGD. In the future, certain structures such as the arms of statues, columns of buildings and recurring patterns on vases will be recognized automatically. The picture below shows digital replicas from exhibits from the Victoria & Albert Museum in London.

For further information please visit: [www.3d-coform.eu](http://www.3d-coform.eu)



## THE FREEDOM OF THE THIRD DIMENSION

The Internet is 'going three-dimensional'. Three researchers from Fraunhofer IGD, Dr. Johannes Behr, Yvonne Jung and Peter Eschler, have presented X3DOM, a solution that extends Internet applications into the third dimension on the basis of open standards.



Every day we use the Internet to receive information. Two-dimensional contents like texts, pictures and videos predominate. This could soon change. »3D is becoming a decisive technology component in the Internet,« says Dr. Johannes Behr. »Currently there are only isolated solutions from individual providers. In the future, open standards will have to be used to guarantee the exchangeability and longevity of web application.« With X3D such a standard

now exists but it is still dependent on additional programs (plug-ins).

Fraunhofer IGD presented a solution for this deficiency with its software platform X3DOM, which is pronounced »XFreedom«, as Behr says with a wink in his eye. »The objective is to create an open, freely available solution for spatial representations in the Internet.« Behr says that with X3DOM it will be possible for the first time to visualize 3D

contents such as walk-in architectural models and objects that can be observed from all sides without the use of dedicated plug-ins. It is anticipated that as early as the first quarter of 2010 the »Mozilla Firefox« and »Apple Safari« browsers will support the underlying technology (WebGL), which permits hardware-accelerated representation of 3D data. More browsers are likely to follow.

X3DOM has been developed in collaboration with the »Web3D« and »World Wide Web« consortia. It is based on the X3D standard and is an open source project. This means that everybody may use and further develop the program free of charge provided that his or her work results are also made freely accessible to others. While actual standardization has not yet been concluded, the system already shows what the future could look like.

»Since X3DOM is free of charge and freely available, everyone can integrate 3D applications in his or her home page in a simple manner without additional cost,« says Behr. »Thus a three-dimensional Internet is no longer just a dream.«

For further information please visit: [www.x3dom.org](http://www.x3dom.org)

## CONTRIBUTION TO MEETING THE CRISIS IN SHIP CONSTRUCTION

Ship construction has been going downhill throughout the world. The use of virtual and augmented reality is a step along the path out of this crisis. Researchers at Fraunhofer IGD and other partners are developing new solutions for German shipyards and suppliers. This project has a volume of 5.4 million euros.

The order books of most shipyards are empty, revenues are falling and jobs are in jeopardy. Since the market for con-

tainer construction has all but ceased to exist, the focus is now on specialized ships with demanding technical require-

ments. »It is primarily through new technologies that this industrial sector will be able to quickly emerge from the crisis in the long run,« says Rainer Brüderle, the federal minister of economics and technology. »Investments in new solutions and faster application of research results to building ships will trigger an enormous innovative leap.«

The researchers at Fraunhofer IGD are working with well known shipyards, suppliers and software companies in the POWER-VR joint project on reducing ship construction costs and ideally adapting each and every special ship to its requirements. The work with virtual ship models ranges from the initial quote to planning and upkeep on to coordination of the construction strategy for a given ship. »Fraunhofer IGD is developing various virtual reality (VR) tools that can be integrated into daily work processes,« explains Dr. Uwe von Lukas, head of Maritime Graphics at Fraunhofer IGD. The objective, among other things, is to

achieve a high degree of automation in preparing the construction data for VR. Another point of focus is the use of augmented reality in the area of fitting ships, say by developing virtual methods for positioning rescue equipment.

New solutions are tried out in the shipyards and supplier companies so that the insight gained can be used in German ship construction. The POWER-VR project is funded by the German Federal Ministry of Economics and Technology.



## SCIENTISTS AT FRAUNHOFER IGD WIN AN INTERNATIONAL COMPETITION

The term »tracking« refers to software-supported recording of things or persons in video sequences. Fraunhofer IGD is at the forefront of this research discipline. In 2009 its researchers were awarded first prize in the ISMAR tracking competition in the discipline of computer vision-based tracking.



With computer vision-based tracking researchers always ask where the camera is and in which direction it is pointed. Objects are filmed with a video camera and software recognizes them on the basis of their geometric properties and shape.

»Software recognizes an object on the basis of pictures delivered in real time. Then, for example, images that should stay in the same place despite movements of the camera can be superimposed on the object,« explains Dr. Ulrich Bockholt, a department head at Fraunhofer IGD. »Something that looks like a simple matter at first glance turns out upon closer examination to be very complicated indeed.«

Tracking forms the basis for applications of augmented reality (AR). These applications are concerned with superimposing image and text information on recordings. Only when objects are recorded precisely is it possible, for example, to superimpose

an historic photograph on a sequence of Berlin's Reichstag building taken by a mobile phone or for an engineer to see his digital construction manual synchronized with his hand movements on the display screen.

A computer can only be endowed with this capability when it is run by intelligent software. The Fraunhofer IGD researchers Dr. Harald Wuest, Mario Becker and Folker Wientapper developed a solution called markerless tracking and submitted it to the ISMAR tracking competition, where it won first prize. The International Symposium on Mixed and Augmented Reality (ISMAR) is the world's most important conference for AR. In the competition, each entry had to record areas of various objects (bookshelves, automobile motor, interior of an automobile). The objects and tasks were not known in advance.

## EDITORIAL NOTES

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## NEW DIMENSIONS OF PRESENTATION TECHNOLOGY FOR COMPANIES

The future of presentation technology was unveiled in Darmstadt on October 21, 2009 when researchers from Fraunhofer IGD, the world's leading institute for applied Visual Computing, and developers from New Media Yuppies GmbH (NMY), the creative agency for new communication in Frankfurt am Main, presented TouchLab. This technology makes it possible for demanding product presentations, simulation applications and architectural visualizations to be experienced in three dimensions.

The German premiere of a new 3D presentation technology took place in Darmstadt in October 2009. This new generation of multi-touch technology, which has been known by the general public since iPhones were introduced, is called TouchLab. »TouchLab is leading the way into the third dimension in a practicable way,« explains Sebastian Demmerle, NMY's managing director. »Users enjoy a completely new virtual experience: they control highly complex 3D data interactively at live-action speed.«

TouchLab is the interplay between multi-touch technology and open software. The multi-medial contents are compatible with the coming 3D standards of the Internet. Companies can use TouchLab as a completely new level of multi-media presentations beyond PowerPoint and videos. Perceptions of products and services are shared quickly, flexibly and in a fascinating way.

High quality communications tools that attract attention at trade fairs, events and in showrooms are in demand. Although TouchLab has just become available, it has

already aroused great interest because of the great variety of its areas of application.

In developing the software for TouchLab NMY has relied on Fraunhofer IGD's many years of experience in the area of hardware and software for virtual realities. »Yet another part of our futuristic work has become available in practicable form with NMY's TouchLab,« says Dr. Johannes Behr, the developer in charge at Fraunhofer IGD.

While TouchLab is a highly complex matter technically speaking, its use is unbelievably simple. Anybody can use TouchLab and many companies will be able to afford it. A modular version that can be precisely tailored to the demands and budgets of a variety of customers has been developed. »TouchLab could become the standard for high quality 3D presentations in a short period of time,« says Behr.