



Fraunhofer
FOKUS

FRAUNHOFER INSTITUTE FOR OPEN COMMUNICATION SYSTEMS FOKUS

**COMPETENCE CENTER
VISCOM**



SMART ALGORITHMS FOR BRILLIANT PICTURES

The Competence Center Visual Computing of Fraunhofer FOKUS develops visualization and assistance systems that are deployed in the entertainment industry, in medical technology as well as in the aerospace industry. The basis for this are real-time image processing and graphic algorithms, fusion of sensor data and the development of system architectures for image-processing and imaging systems.

Images have always been used to illustrate complex issues, and by this means to impart knowledge. Today computer science and allied branches are trying to create, process and analyze images as a medium of information transmission and to enable the interaction with them. This is known as Visual Computing. In order to provide user-oriented information systems, techniques of simulation, data analysis, visualization and man-machine interaction are brought together. The researchers of the competence center Visual Computing (VISCOM) are working on appropriate processes and are developing real-time capable algorithms for visualization, tracking, data fusion and interaction. On the one hand they enable the delivery of crystal clear, brilliant images in high resolution and on the other hand ensure the required intelligence in the evaluation and fusion of data from imaging and other sensors. Technologies from VISCOM are utilized in the auto calibration of large multichannel projection systems, in the enrichment of visual perceptions through computer generated supplementary information i.e. infrared, the positioning and tracking of movements for assistance systems as well as in the in the development of simulators.

AUTOMATIC CALIBRATION OF PROJECTION SYSTEMS

Projection systems wherein numerous projectors are connected together to form a so called projector cluster are currently installed in planetariums, simulators or in the event business. In order to project a uniform image on screens of any shape, the images of the individual projectors must be adjusted with one another in terms of their color, form and brightness. For

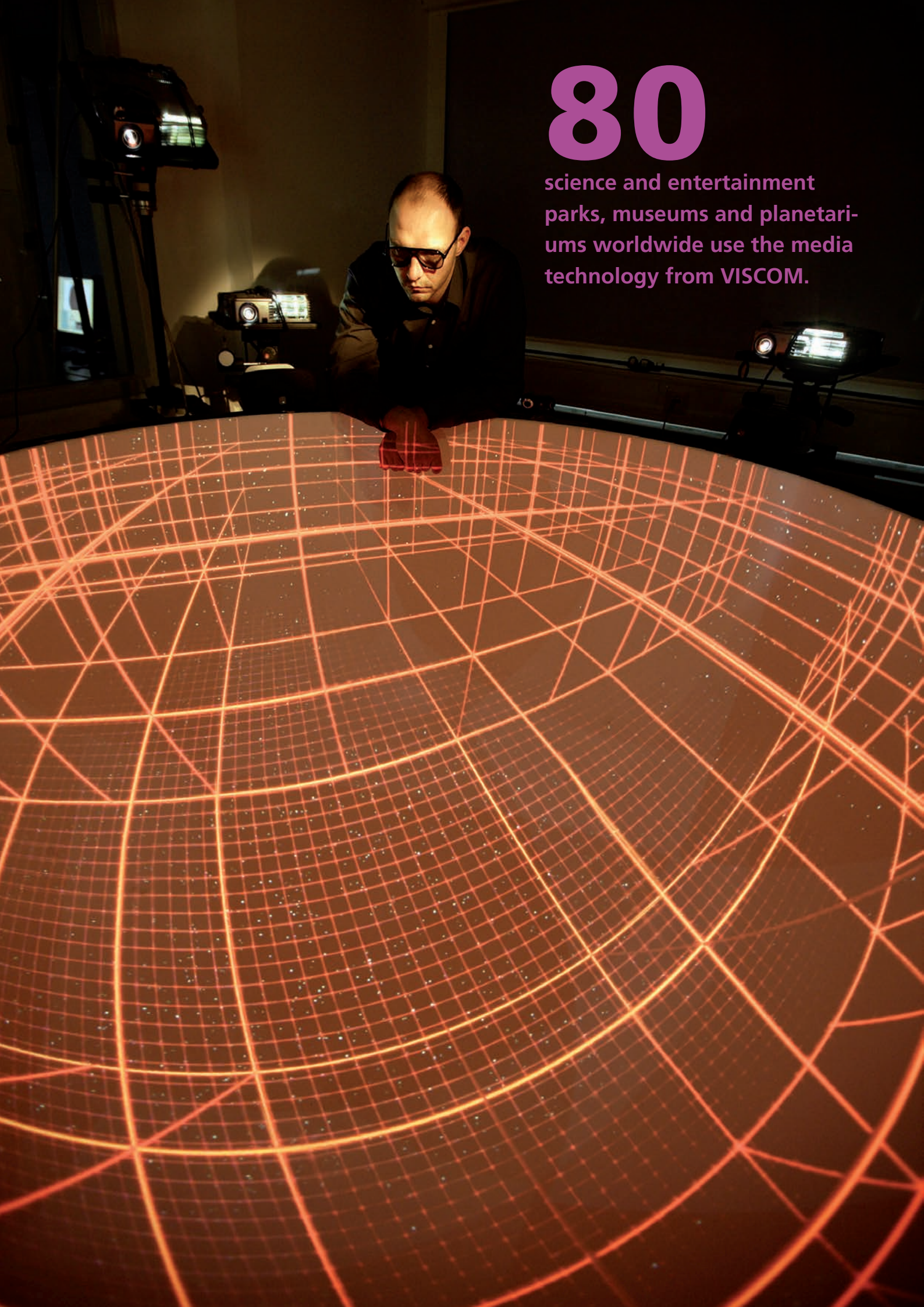
this purpose the Competence Center VISCOM together with the company Carl Zeiss, has developed a system for auto calibration for projection systems as well as media payout, which is deployed in planetariums and 360° cinemas worldwide. Most recently the national park center Hohe Tauern in Austria opened a 360° Panorama-world wherein nine projectors are controlled by this system. With the help of intelligent algorithms it generates a uniform combined image from the individual projected images of such a projector cluster.

FUSION AND PROCESSING OF SENSOR DATA

Irrespective of in aerospace, medical technology or in the development of simulators, everywhere processes for the fusion and processing of data from imaging sensors is required. The competence center VISCOM uses its technologies in a project with the competence center SQC in which it develops application for an onboard satellite computer, that processes a flood of visual information in real-time in order to position a space vehicle reliably. Similar processes are implemented in the development of endoscopy systems: to ensure the safe positioning and tracking of instruments within the human body, processes for the optical tracking are implemented. Furthermore they serve for a 360° view of the operating field and for a better orientation. For this VISCOM provides the required processes for the real-time processing and integration of additional sensors.

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science and entertainment parks, museums and planetariums worldwide use the media technology from VISCOM.





WITH THE DESKTOP WARPING SOFTWARE FROM
FRAUNHOFER FOKUS, RANDOM CONTENT CAN BE
DIRECTLY PROJECTED ON UNEVEN SURFACES AND
CAN BE ALIGNED TO THESE.

DEVELOPMENT OF SIMULATORS DESKTOP WARPING

Competencies from the area of optical tracking as well as the fusion of sensor data, are employed in the building of simulators e.g. for the development of equipment or for professional training. The work of VISCOM already starts with the development of the required models, for example of the human body or of the device to be developed.

In a joint project with the Fraunhofer Institute ITWM, the researchers of VISCOM deployed automatic calibration technologies in the first simulator worldwide on the basis of an industrial robot with a load capacity of 1000 kg. The aim of the project was to ascertain and improve the efficiency, productivity, operational stability and reliability of complex mechatronic systems e.g. commercial vehicles. The simulator allows for a detailed and risk-free examination of the behavior of a driver in complex situations and thereby controlling and influencing the vehicle parameters and environmental parameters.

For places not normally frequented by humans, VISCOM provides immersive augmented reality solutions. Deep-sea robots fitted with cameras transmit live images onto an immersive screen in the control center of the research-ship. The software from VISCOM ensures that the images can be seen true to scale and are enriched with normally not visible image information, like e.g. sonar data and previously recorded GIS (Geo Information System)-data about the structure of the seabed. The thereby resulting larger, forward-looking field of vision enables the expedition team a refined search for geographic peculiarities on the seabed.

Also in the development of the desktop warping technology from VISCOM, the sea plays a deciding role. On drilling-platforms like the 472 meter high Sea Troll off shore of the Norwegian coast, security and safety from accidents is of paramount importance. Therefore engineers in the control rooms on the mainland monitor the offshore activities. With modern media technologies a better overview can be provided, if the information pertaining to the oil rig is visualized and displayed such that it surrounds the engineer. In this case also projector clusters ensure that media content is projected on complex geometrical surfaces such as panoramic screens or dome cinemas. VISCOM has adapted its media player for play back of content on various surfaces of different shapes, such that desktop content from other computer programs can now be represented on a projection surface. Previously, special capture-cards or a so called warping box were required that had to be installed between the graphics card and the projector. This leads to a delay in the delivery of the image. For large real-time graphic cluster the correction components will be integrated in the visualization software of the individual image. This enables a high scalability of the graphic performance.

For small and medium systems up to 16 image channels VISCOM in cooperation with the graphic processor manufacturer NVIDIA has developed a process for desktop-warping wherein warping and blending – the correction of geometric distortion and brightness – of the desktop content to be projected, takes place directly in the driver of the high-performance graphic card. Since about a year ago the high-end models of the NVIDIA-Quadro-Graphic series for professional applications, provide programming interfaces (APIs) in their



THE AUGMENTED REALITY SOLUTIONS FROM
VISCOM ENABLE THE ENRICHMENT OF LIVE-
IMAGES WITH OTHERWISE NOT VISIBLE
INFORMATION.

drivers for desktop-warping. With the desktop warping software from VISCOM, everything that is processed on Quadro-Cards i.e. (the desktop, various programs) can now be adjusted and projected directly on an uneven surface. The process works trouble-free in real-time, even on PC and projector clusters which are frequently used in simulators and control rooms. To summarize the aim of VISCOM is to develop visual and assistance systems as well as user-interfaces with the help of the processes of Visual Computing, in order to support the person using them in an intuitive manner.

The offer of VISCOM ranges from consultancy in the creation of architectures for complex distributed systems, development of prototypes right up to the licensing of individual components. Main focus is on the areas education and entertainment, medical technology as well as aerospace.

"Our offer ranges from consultancy for development of prototypes of systems right up to licensing of individual components."

OVERVIEW

Offer

- Development of visualizing and assistance systems
- Real-time capable image processing and graphic algorithms
- System architecture for image processing and imaging systems
- Integration and fusion of sensor data

Tecnologies

- Distortion, brightness and color correction in real-time
- Automatic camera based projector calibration
- Media-server for the control of multi-projector systems
- Active and passive-Stereo 3D-Projection
- GPU-Processing (Implementation and parallelization of image processing processes on the GPU)

Branches

- Education and entertainment
- Medical technology
- Aerospace
- Simulator development



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