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PERFECT VISUAL SOLUTIONS

openWARP - A new dimension of flexibility in the sector of realtime-video-combination

Preliminary Documentation

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Behind the term openWARP, there are a large number of soft- and hardware-solutions for a general application in the projection- and simulation-sector. For one-channel- as well as for multiple-channel-applications, the openWARP product range offers fully new alternatives, which allow flexible and at the same time compact solutions.

Out of the opinion, to have an easy and flexible solution for the combination of pictures, at the Max-Plank-Institution of biological cybernetic in Tuebingen, there was created the basis for an almost for all purposes applicable hardware. Together with the transtec AG in Tuebingen, on this basis a product was designed, which is ready for the market and which has with the company eyevis from Reutlingen found a competent partner for commercialisation.

With openWARP basic a very flexible solution is available, to correct geometrically video- or computer-signals for the projection onto any kind and shape of screens. Beside this, the device comes with a procedure, to realize almost any screen-distortion because of the usage of fifth element polynomials. Beside the normal distortion also color- and brightness-calibrations can be made. Therefore, for example a remove of border areas for overlapping in multiple-channel-projections can as easy be realized as a 'Hot-Spot'-correction for reprojection. openWARP basic comes with different inputs (video, RGB, DVI-D) as well as a DVI-I output and is prepared for resolutions up to SXGA+.

Both devices come with a realtime-mode in which the input-signals can be worked up with a very little delay (< 3 lines). As a prevention of frame tearing, the devices can also be used in a double-buffering-mode. The openWARP combiner additionally comes with a special sync-input, with which a GenLock-functionality can be reached.

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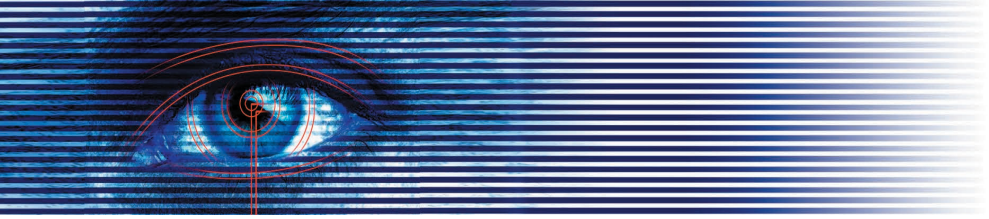

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For configuration, both devices are beside a RS232-interface also equipped with a LAN-interface (10/100Mbit). Because of this, the devices can be integrated without problems in any network and be configured with the control software openWARP control from any computer in the network.

With openWARP designer, a very comfortable software-package is available, which makes possible a quick and precise creation of deformations for all imaginable forms of silver screens and projection-geometrics. It doesn't matter if there is a trapeze-deformation or a spheric correction, a color- or brightness-correction for one or more Channels – the openWARP designer is the perfect tool.

openWARP enables applications in the sectors of virtual-reality, realtime rendering, graphic-cluster or simulation, as well as for operation in control-rooms, shows and events or digital cinema fully new cost-effective solutions. openWARP makes it possible to use standard-components in sectors, where up to now highly special picture-generators or very cost-intensive special projectors had to be used.

Features:

- Realtime highly flexible Image Warping
- Softedge Blending
- Pixel accurate synchronization of all inputs
- Image scaling and deinterlacing
- Image Combining / Compositing
- Chroma Key
- User defined transparent or nontransparent overlays
- Pixel accurate defining of position and size of windowed inputs
- Text–treadmill-flash

- openWARP comes with the highest resolution of all current at the market available products: highest resolution at the output – up to 2 K

- openWARP is the sole device on the market, which comes with an easy geometric correction through software masks.

- openWARP has an excellent cost/performance ratio compared to similar, on the market available products, which are coming with less possibilities and features.

Innovation:

- With the openWARP solution, in opposite to all other currently available technologies, every standard projector can be used.

- openWARP is a revolutionary device which replaces many single devices.

*Softedge Blending
*Image Warping
*Seamless Switcher
*High Definition Multi Screen Presentation Mixer/Switcher
*Image Combining
*Multi Window Split Controller

openWARP is predestined for the following sectors:

-Virtual Reality
-Events
-Shows
-Design
-Simulation
-R&D

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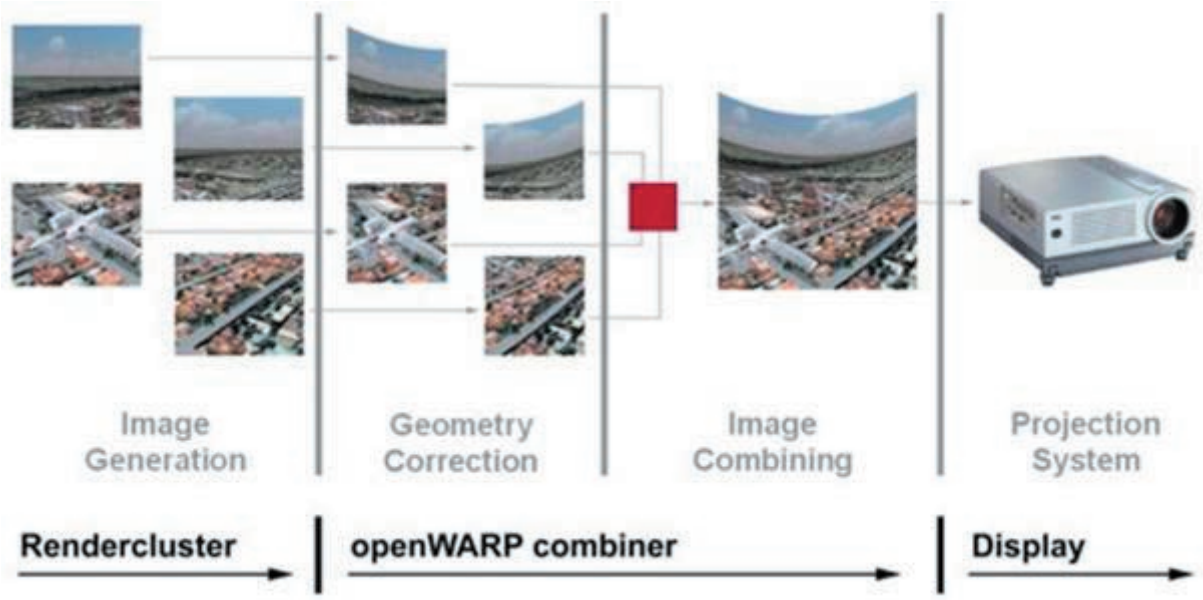
Functional principle:



Advantages of openWARP:

- Realtime-ability (Low Latency < 1 frame)
- DoubleBuffering
- Genlock external input/output

Signal-inputs and -outputs:

Inputs:	8 inputs up to SXGA+ (1400x1050 pixel) or 4 inputs up to UXGA (1600x1200 pixel)
Outputs:	2x QXGA (2K) or 4 x UXGA

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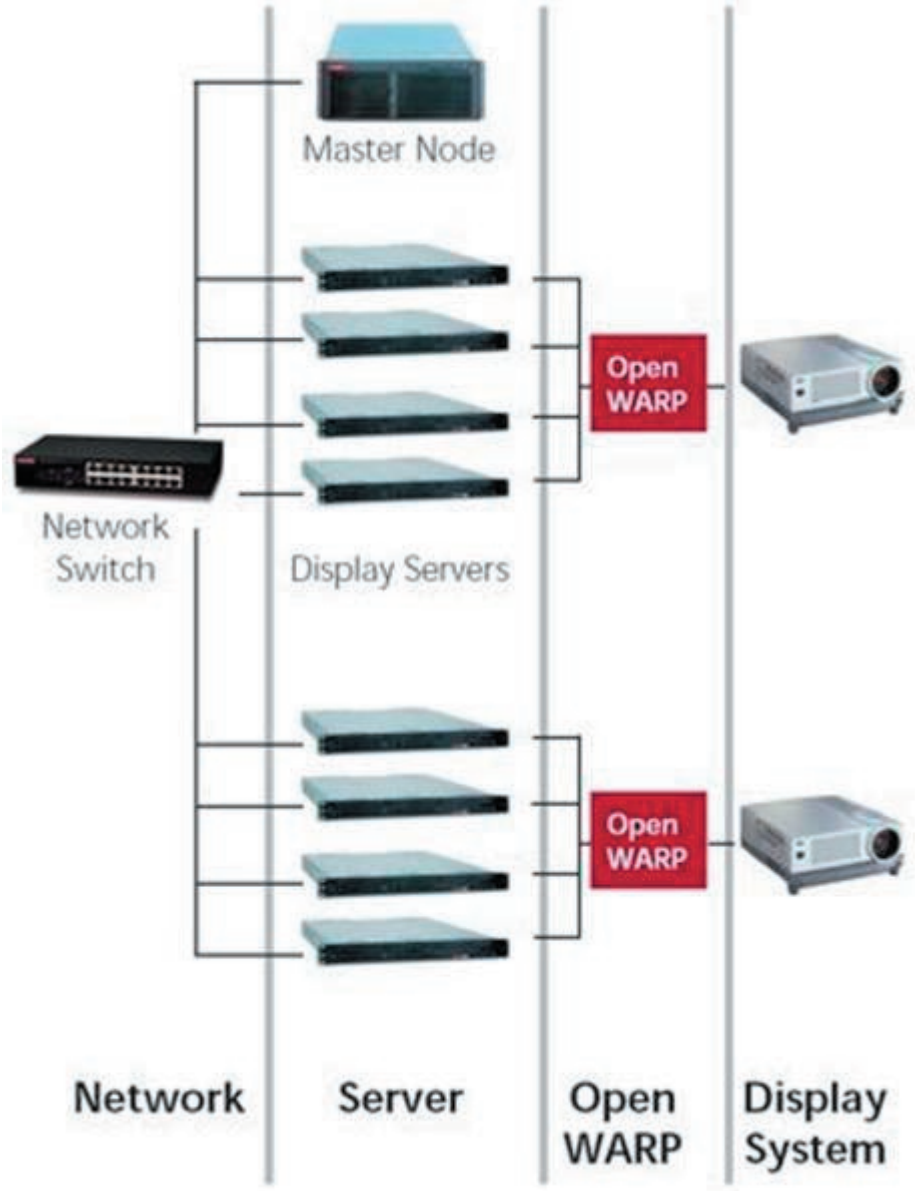
Example for a clusters with openWARP:



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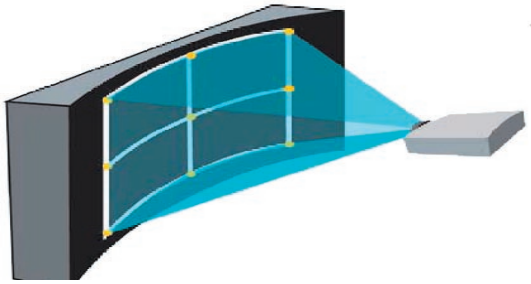
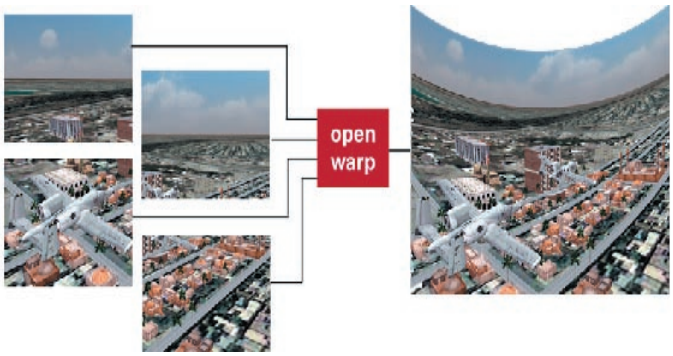
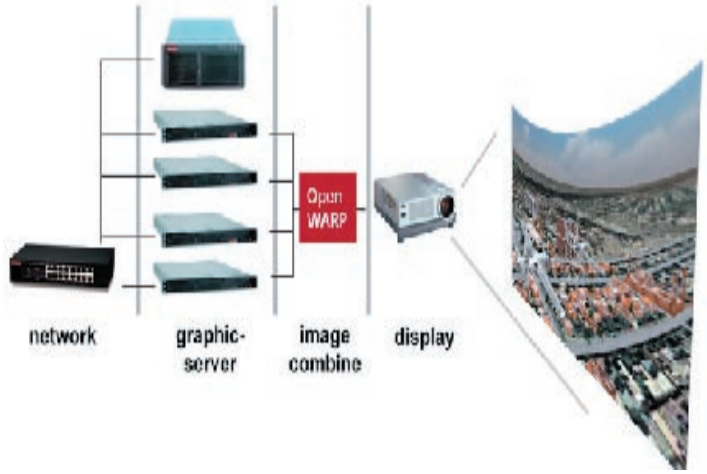
Projections on curved or arched surfaces makes necessary a geometrical correction of the picture-content, to make sure, that the simulation is experienced realistic by the viewer.



This correction is especially important for multi-channel-projections. In the overlay-area of the projectors, a very precise alignment of the deformation and the brightness overlay has to be made, to assure that no changeover is visible.

For graphically complex simulations, like for example realistic flight- or driving-simulations, the performance of single graphic-cards very often doesn't suffice for the whole scene. For such realtime-simulations, the picture-calculation has to be distributed to multiple points of a clusters and has finally to be combined for the graphic-output.





With different methods, the openWARP combiner enables to generate a realtime simulation out of different individual signals. Therefore for example low-resolution screen-cuts out of a simulation can be composed to a high resolution picture.

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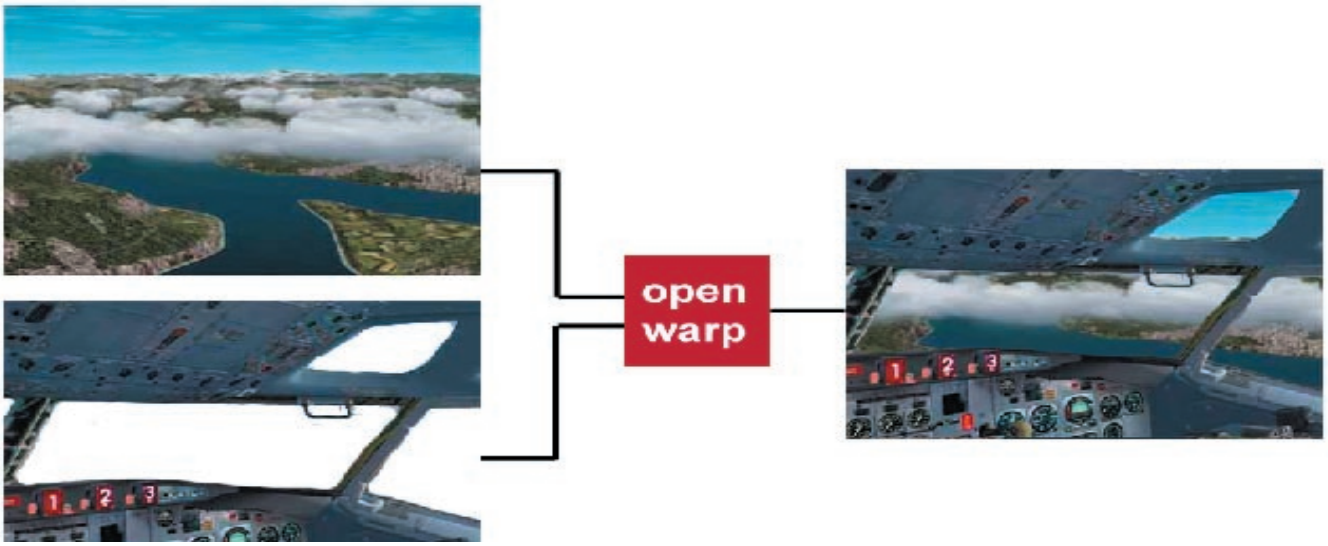
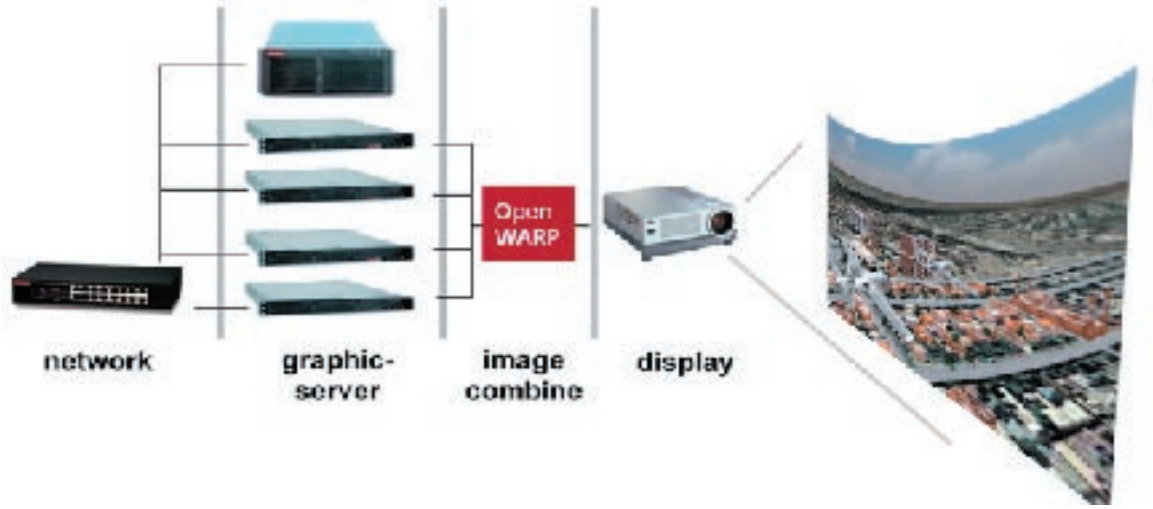
Another method of load sharing at realtime-simulations is the overlay of screen-contents. Hereby on multiple computers, different scene-contents are calculated, which are finally composed by the openWARP combiner with help of masks or keycolors (similar to the blue-box-method).



The special construction of the openWARP combiner allows a pixel-exact synchronization of different graphic-inputs, without the neccessarity of special graphiccards. Therefore very flexible COTS-based cluster-solutions can be realised.



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Beside the possibility to use diverse graphic cards of different manufacturers together in one Cluster, variable signal-sources can be imported and be configured in the openWARP combiner. Therefore e.g. an overlay of a video-signal on a computer-signal is possible.

	openWARP BASIC	openWARP COMBINER
Inputs:	1 user-defined input up to SXGA+ (1400x1050 @ 60Hz)	8 user-defined DVI-D inputs up to SXGA+ (1400x1050 @ 60Hz)
	Fully scalable to desired output resolution	4 user-defined DVI-D input up to UXGA (1600x1200 @ 60Hz)
	2 video inputs (YC or F-BAS)	
	1 component input	
	1 analog RGB + 1 DVI	
Outputs:	1 DVD-D / RGB outputs up to SXGA+ (1400x1050 @ 60Hz)	4 DVI-D / RGB outputs (Digital output upt to 2k resolution)
Image applications:	Realtime highly flexible Image Warping	Realtime highly flexible Image Warping
	3D keystone correction (up to 40 degrees vertically)	Pixel accurate defining of position and size of windowed inputs
	Edge-blending	Edge-blending
	Image scaling and deinterlacing	Image scaling and deinterlacing
	PIP: between RGB and video inputs	Pixel accurate synchronization of all inputs
		Image Combining / Compositing
		User defined transparent or nontransparent overlays

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