

Whitepaper Stereoscopic 3D visualization

Bitmanagement offers software for stereoscopic rendering
of 3D content – such as pictures, films, 3d models –
from stereoscopic projections to cave solutions up to auto stereoscopic screens
without special eyewear need

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1. The market for stereoscopic visualization

At present market reviews and informative figures for the market of stereoscopy are very rare. However a considerable number of applications and/or technical solutions exist in the literature. Never the less its much to early to speak about an established market. Analysts see the market formation developing only step by step. To days participants are on the one hand suppliers of displays (hardware) and suppliers of a high performing 3D visualization software on the other hand. The product bundle consisting of hard and software is sold to the end users as a complete system. From such stereoscopic solutions with special software can more or less benefit all market-player who are using 3D technologies or intend to use it. Aside from the service sector, the medical industry, research labs and science institutions, mainly the advertising industry is interested in stereoscopic applications, particularly for presentation. Also the television services and the film industry are among the future customers and users of stereoscopic presentations of images, films and videos. The film Industry actually invests increasingly in stereoscopic technology. But for all that the use of this technology has not reached the mainstream of the societies.

Anyway, auto stereoscopic displays already attained readiness for the upcoming markets and, according to market experts, specific applications will soon outperform and should bring the breakthrough for a stereoscopic rendering market.

Regardless the costs of stereoscopic solutions has reached a level which allow even to medium-sized companies to utilize stereoscopic technologies. Thus, such firms can benefit from company image improvement, which bigger enterprises already experience using the innovative, multimedia „state of the art“ stereoscopy. Beyond that the step to economic 3D monitors for private households is not any longer a bigger obstacle, say analysts.

As the upcoming stereoscopic marketplace will further develop to become a mass-market in the near future, analysts are expecting fundamental impulses from the further market penetration of „video on demand“ on each standard computer, followed by „stereo video on demand“. The next level of development will be reached with the introduction of „stereo television“. Then the mass-market will definitely become reality. For the TV service stations then ultimately the time has come to radiate 3D television programs in a broad coverage. In order to support this technical evolution the 2D and 3D capable hardware would have to be marketed more intensively. But at present the hardware industry is still hesitating to move to mass production. Nevertheless, according to experts the upcoming market

will turn out to become a mass market in less than 5 years. The high performing stereoscopic technology is already available, such is the required hardware and the supporting software.

2. Applications

Beside stereoscopic projections and cave systems the auto stereoscopic solutions provide many clear advantages to users who recondition their solutions like professional videos and interactive applications, for example in maintenance, repair services or in the medical sector, with integration of stereoscopy. Mainly in the medical sector a surgeon benefits from better size - and distance estimation when he is operating inside the body of a patient. For example an antrum inside the human body can also be represented in 3D by applying stereoscopic endoscopes. It also provides the medical doctor with additional depth information.

With the use of tele robots in precarious and inaccessible environments (e.g. blast furnaces, aluminium furnaces with temperatures higher than one thousand degrees Celsius) the stereoscopy permits a more exact steering of robots than in case of non stereoscopic visualization.

3. Single View and Multi View applications

The auto stereoscopic visualization of 3D images is certainly one the most challenging advancement within the area of 3D visualization, also towards the quality of multimedia applications. But one has to differentiate between two applications: Single view and multi view.

A single view solution is dedicated for one spectator. It offers in fact a higher rendering quality than a multi view application, that does not necessarily need the same level of performance. However the visualization software needed should be in any case designed for easy integration into both single and multi user applications - apart from the number of other requirements.

Single view applications above all offering the advantage for use in the medical sector, in research labs and development centres since they offer a higher effective image resolution and provide images of much higher quality unlike multi viewer systems. Beyond that single view solutions allow to show stereoscopic contents on terminals with a much smaller budget.

Since with both single view and multi view-solutions 3D-Videos can be presented in real time and live stereo cameras can be integrated, nothing gets in the way of stereoscopic presentation in the near future, e.g. general monitoring tasks and similar applications during a medical operation.

The 3D stereoscopy will be used as a multi view application, when stereoscopic content should be presented to several observers, like in the promotion and advertisement branch, which is actually one of the major operational areas of multi view applications. Beyond that this multi view systems could be used in the future in 3D-Displays for game consoles or in 3D-television terminals.

Accordingly the manufacturers of stereoscopic technologies are about to substantially increase the resolution of images, developing also movie cameras, which can map synchronously e.g. eight pictures or more. Depending of the used technology, information from at least eight different view points are needed to create 3D-images on multi viewer displays in best rendering quality.

At the time being also mobile solutions for handhelds and mini laptops are in an developing process. Both for reference purposes and visualization tasks the regional computing centre of Niedersachsen (RRZN, University of Hanover) has developed a mobile "3D-VR presentation system". Thanks to this new application stereoscopic 3D-presentations can be shown locally during lectures.

4. Four methods to create the immersive (stereoscopic) effect

Generating the stereo-effect - the depth effect of digital pictures - four different methods are available:
- anaglyphic stereo-projection ,

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- active stereo-projection,
- passive stereo projection and
- auto stereoscopic projection.

It is common to all derivatives that in each case different images are sent to the eyes of a human being. Then different pictures will be transferred in spatial images in the human brain. This spatial impression is called „the stereo-effect“. This effect is then created in the same way how our brain perceives the real world around us - without any technical support like special 3D glasses.

4.1. Anaglyphic Stereo Projection

To separate two single pictures, different colour filters are used in 3D-eye wear, e.g. red filters for the left eye and a green one for the right eye. When a human being is looking at a projection the red filter extinguishes the red film images whereas the green filter becomes black. On the other hand the green filter extinguishes the green colour pictures and then the red becomes black. Since both eyes see now different pictures respectively, the human brain recognizes a spatial immersive picture.

4.2. Active Stereo Projection

In the case of active stereoscopic visualization a screen with a high frequent image regeneration rate (100-160 cycles per second) produces the stereo-effect using either active stereo eye ware or a head mounted display. The eyeglasses consist of lattice structures, which can fade out and fade in single lines. Fading out and fading in is also named “shut”. The eyeglasses - thus actively – lock or shut the field of view in a fast manner, whereby the depth effect is generated.

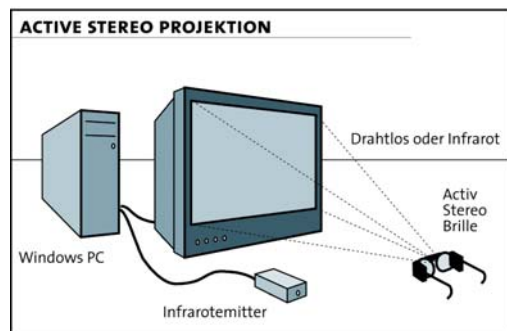


Fig: Using the active stereoscopic visualization the fast fading in or fading out of the glasses create the immersive effect.

4.3. Passive Stereo – Projection

As to this most common projection technology the separation of single images will be achieved by polarized light. The stereo glasses of the watcher therefore must not actively lock the lines, but only filter passively. In addition there are in each case 90° shifted polarizer-foils in front of the projection and in the passive stereo pictures. Thus the left eye only sees the left picture and the right eye only the right picture. The left picture extinguishes the right eye and vice versa. This fading out and fading in creates in each case different pictures for the watching person.

To maintain the polarization status of the light a metallic laminated screen is needed. A normal white screen would disperse the light; the separation of the channel would vanish. This projection technology offers as its greatest advantage a brilliant quality of colours of the presented pictures.

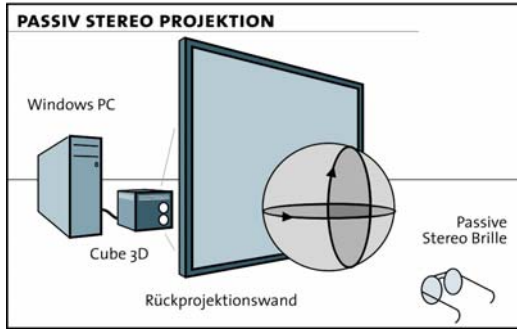


Fig. This projection technology offers as its greatest advantage a brilliant quality of colours of the presented pictures

4.4 CAVE solutions

CAVE solutions at the high end execute both the active and passive stereo projection to strengthen the spatial / immersive effect by projecting a 3D content on different sides of the CAVE including the floor and the ceiling. The respective position of a watcher can be determined by magnetic or optical tracking. That even improves the depth and immersive effect.

Round cave

A particular version of a cave application is the so called round cave systems offering a much higher 3D depths and immersive effect compared to angular caves. Moreover this method is what the hardware side is concerned up to 75% more cost effective. Due to this fact even medium-size enterprises in particular can also benefit from round cave systems.



Fig. The round cave method offers a much higher immersive effect compared to angular caves. Since 2009 Bitmanagement and IPL have agreed to jointly market round cave systems.

4.5. Auto stereoscopic displays

Auto stereoscopic displays – unlike the above mentioned methods - separate the pictures for the two eyes of a human being directly on a screen. In consequence to that no additional eyeglasses are needed. A light modulator effectuates that the left eye and the right eye are seeing only the matching picture. The software renders the picture two times in single view mode (one user in front of a stereoscopic display with full stereo effect); in the multi view mode (multiple users with full stereo effect) however the pictures are rendered several times, e.g. five times in case there are five stereoscopic slots). The stereoscopic effect emerges without special glasses, enables multiple advantages in handling and using the display.

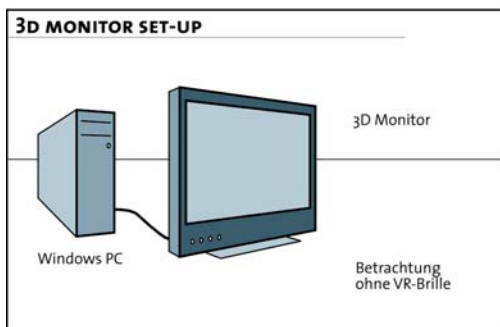


Fig. This method allows to experience the full 3D stereoscopic effect without any eye ware.



Fig. This example of an display shows what it means when it is about 3D stereoscopic presentation.

5. BS Contact Stereo is based on the ISO standard VRML/X3D

Bitmanagement Software GmbH is a 3D Software supplier which has recognized in a very early stage that 3D stereoscopic visualization will become a next developing step of 3D applications. Therefore the company offers – since early years of 2003 – a special software for 3D stereoscopic applications. The format, which BS Contact Stereo is based on, is the ISO standard VRML/X3D. It is both usable interactively in real time applications and in web applications. BS Contact and BS Contact Stereo accomplish the requirements for 3D rendering of pictures, videos and models in highest quality. As a matured and fully developed Software - in more than 10 years – this 3D software offers all advantages of a „state of the art“ standard software.

Performance characteristics of BS Contact and BS Contact Stereo

- It is compliant to the ISO standard formats VRML/X3D, which is in a continuous developing process by the standardization activities of the Web3D consortium in the US.
- The software can simply be integrated, because Software Developing Kits (SDK) gives extensive support to developers.
- The concept know-how of the customer is protected by encryption software (BS Encrypt).
- The high rendering performance and operating stability is the basis for real time capability and interactivity and thereby fundamental for new business models, which involves user directly.
- The software supports the use of trends and new business models, like the increasing digitisation, or the 3D visualization of geo data to develop „digital maps“ or covering new markets and sales prospects.
- BS Contact VRML/X3D is internet compliant, because the software needs only small bandwidths and is therefore prepared for mass markets.

6. BS Contact Stereo - the software for stereoscopy with high visualization quality

For the rendering quality the native integration of hardware and software plays an important role. Consequently the 3D software must assure that modern features which displays today perform can be transformed on the internet into highest possible visualization quality.

BS Contact Stereo meets the software requirements necessary for stereo displays regarding the image quality, resolution, brightness, contrast and colour reproduction. Only this way it is assured that stereoscopic rendering creates a significantly stronger presence and attractiveness and thus leading to a higher readiness to use stereoscopic applications.

Bitmanagement supports screens by co-operating with different manufacturers like NewSight, SeeReal, Alioscopy, Sharp, Spatial View, Techxpert, Tridality and more.

7. Stereoscopy - topic of numerous European and overseas institutions

APS – association, Berlin, Germany, is playing an important role for the promotion of European co-operation in research and development and education programs. This association is supported by companies like the German Post authority, Siemens and N24. In this forum approximately 50 further companies are participating, among them also the German publishing house Bertelsmann Group. Besides other duties and responsibilities APS disseminates information about new technical developments.

Concerning stereoscopy the association has recently published: "Quality increases with 3D pictures by using stereoscopy ". The article refers particularly to the HFVM procedure (Hierarchical Feature Vector Matching), which can help to lower the cost to improve the rendering quality.

Other institutions: DGS (German society for stereoscopy), SGS (Swiss society for stereoscopy in Bern), the RRZN, (regional computer centre, Niedersachsen, University of Hanover), which is intensively engaged in the topic of 3D technologies for stereoscopy; among others also involved with ISO 3D standard VRML/X3D.

Beyond that there are numerous further European and overseas institutions, for example the Stereoscopic Society in Dorset, UK, and the Stéreo Club Francais, in Verrières de Buissonn, the Stereoscopic Society of America, Fort Collins, Colorado, and The Victorian 3D Society, in Melbourne, Australia.

8. Our target group for BS Contact Stereo

We are addressing our 3D software offers and sell our BS Contact Stereo software particularly to display manufacturers, software developers for specific solutions, research and science institutions as well as to relevant exhibitors and the advertising and marketing industry.

Dear reader, we are looking forward to the discussion of individual ideas with which 3D applications can make stereoscopy more attractive also to the mainstream of the society . Please get in contact with us. We help you to realize your ideas. We are also ready to propose new business models as well as new applications. Bitmanagement has the deepest knowledge of how its software „ BS Contact Stereo “and „BS Contact“ can perform. We would like to share our knowledge with you.

9. Contact

Please find our product portfolio, demos and test-download of our software at:

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