PARALLAX IN 3D

Definition

Parallaxe is the horizontal shift of two homologous points in the left and right views of a stereoscopic pair.
The parallax can be condidered either linear or angular.

Parallax in the imaging system.

The imaging system is creating the image while shooting. It s a stereoscopic device, either our eyes, a 3D still camera, a 3D movie camera, any twin devices which record a pair of views, or a pair of binoculars which lenses and prisms make two virtual images. The parallax is the consequence of the space between the imaging sensors, inter-axial distance, or pupillary distance for our eyes. It is named deviation or disparity.
The deviation in the imaging system varies with the inter axial distance and with the convergence of axis of the lenses.

Parallax and relief sensation

In direct vision the parallax gives only an indication of the distance of the observed object. However this is not sufficient to create the sensation of relief. When I'm looking at this near text, I understand at which distance it is because of the accommodation and the convergence of my eyes, but it has no relief. What geometrically creates the relief is the variation of disparity on successive plans..
When I look at my pen in my hand, arm stretched, the convergence and focus put each image exactly in coincidence in each eye, with a zero parallax. On the contrary, the homologous points of the walls of the room are greatly shifted, giving to the pen a very strong relief. These are the deviations, or stereoscopic disparities, which make the sensation of relief. Their range is the stereoscopic depth.

Parallax in the restitution system

The restitution system is a stereoscope, a 3D screen, printed views as parallel or crossed, or a pair of binoculars which lenses let see two virtual images.
The stereoscopic deviations made by the imaging system are in the physical or virtual images placed in the restitution system. Though the restitution system can on its turn, modify the parallax of the homologous points. The magnification of the views and their position can remarkably differs.
For exemple on a very large screen the stereoscopic deviation could be over the inter ocular space of people and make impossible the stereoscopic vision.
By shifting the images about the convergence center of the optical axis of the restitution system, the plan of maximum convergence could be before or after the screen.
It is this shift value which is usually named the convergence or parallax control.

Conclusion

The global parallax is the sum of the stereoscopic deviation from the geometry of the imaging system with the shift of the restitution system.
The parallax control of the restitution system modify the position of the plans, it do not change the depth of relief.

The global parallax shall always be less than the inter ocular space of the people. Note that the mean value 65 mm should not be taken, but the distance potentially the smallest for the spectators, which is 56 mm for adults and 50 mm for childrens shall be kept.

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